Bourne Valley Associates Ltd

Downstream Effects of Nutrients

From

The erection of and the construction of an anaerobic digestion (AD) plant with associated facilities, including feedstock storage clamps; tanks; lagoons and wetland filtration system; and connection to the national gas grid, together with the installation of photovoltaic panels on buildings, a grain store and dryer and the construction of an upgraded vehicular access to the A417

at

Whitwick Manor, Lower Eggleton, Ledbury, Herefordshire, HR8 2UE

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1. Introduction

1.1. This Statement accompanies and supports an appeal against planning application 222728 refused by Herefordshire Council (HC). The statement is in response to the judgement in Caffyn v Shropshire, saying: "*Digestate replaces one perilous source of nitrogen and phosphate (raw manure) with another (digestate). These indirect effects needed to be brought within the scope of the EIA*." (At 29 (ii)).

1.2. The development proposals being considered at appeal processes manure, creating digestate that is subsequently further processed on site to produce primary compounds that can be used as fertilisers. Therefore, the downstream effects of these fertiliser products are considered within this statement.

2. Current Situation in the Wye Catchment

2.1. It is alleged that pollution has been caused by water run-off from farmland containing high concentrations of phosphorus, nitrogen and bacteria resulting from the spreading of thousands of tonnes of poultry manure and sewage bio solids. These levels of nutrients are, it is alleged, the result of spreading of poultry manure directly onto farmland within the catchment of the River Wye and of its tributaries, including the River Lugg. It is also alleged that bacteria and nutrient pollution has been caused by the discharge of sewage directly into the rivers from Welsh Water sewerage systems[1].

2.2. High concentrations of phosphorus and nitrogen in the river have caused substantial growth of algae which cuts oxygen, suffocating fish and harming fauna, leading to key species deaths, as well as reduced growth and bad smells as it decays.

2.3. It is alleged that the pollution has caused private nuisance, public nuisance and trespass (from sewage deposited on the river bed) as well as negligence, and that the deposit of manure and bio solids on agricultural land is a breach of section 73(6) of the Environmental Protection Act.

[1] "the allegations of pollution are set out in the current claim against the Avara Foods poultry group and Dŵr Cymru Welsh Water, and so not set out in detail in this statement". The first hearing for this claim was held at the High Court in London on Monday 27 April 2026

3. AD Plant Inputs

3.1. *Raw Materials*

The following feedstocks will be used as inputs to the AD process annually:

- 100,000 tonnes/annum of poultry manure from local farming operations;
- 60,000 tonnes/annum of liquid feedstocks from agricultural processes; and,
- 16,000 tonnes/annum of apple pomace.

3.2. *Primary Nutrient Compounds included in feedstocks*

- 1,658,093 kg Phosphate
- 3,883,000 kg Nitrogen

4. Site Nutrient Outputs

4.1. *Primary Nutrient Compounds*

4.1.1. After processing on site, the following primary compounds produced by the plant will be sold to the market as agricultural fertilisers annually. The text in brackets refers to the stage in the process where the materials are extracted:

- 35,000 tonnes high quality 0.3:2.4:1% (N:P2O5:K2O%) fibrous soil improver (Centrifuge 1)
- 1,800 tonnes Struvite (Magnesium Ammonium Phosphate) with constituent ratios in the order of 2.9:11.6:0:0:6.6 (N:$_{P2O}$:K_2O:SO_3:MgO%) (Soluble Phosphate Recovery)
- 8,225 tonnes quality high available phosphate rich soil improver 5.7:6.4:11.6 (N:P_2O_5:K_2O%) (Centrifuge 2)
- 34,400 tonnes liquid Ammonium Sulphate fertilizer 19% concentration 6.4:0:0:18.2 (N:P2O5:K2O:SO3%) from the reception building and process scrubbers;
- 3,000 tonnes Phosphate rich Clay pellets 0:3.9:0 (N:P_2O_5:K_2O%) (Phosphate Filters)

4.1.2. As set out in the table below.

Fertiliser Outputs	Tonnage pa	DM%	Agricultural ratios					
			N	P205	K2O	SO3	MgO	Trace elements
Fibrous Soil Conditioner	35000	35%	0.26%	2.42%	1.03%	0.00%	0.00%	Yes
Struvite in solution	1800	20%	2.85%	11.57%	0.00%	0.00%	6.57%	No
Fine solids	8225	18%	5.67%	6.44%	11.57%	0.00%	0.00%	Yes
Ammonium Sulphate	34000	30%	6.36%	0.00%	0.00%	18.17%	0.00%	No
Aluminized Clay pellets	3000	80%	0.00%	3.91%	0.00%	0.00%	0.00%	Low

4.1.3. Please note that these volumes will vary depending on exact nutrient loadings of the organic manures and substrates coming into the plant. The figures above have been converted to the agronomic ratios used by farmers. The letter from Hutchinson agronomy, at Appendix 1, highlights the benefits of these compounds.

5. *Agricultural Practices and Potential Change*

5.0.1. Arable production within the Wye Catchment and across the UK has historically and presently required the application of fertiliser products to ensure the land has the required nutrients to benefit the crop to produce maximum yields.

5.1. Current Practices

5.1.1. Farmers apply fertilisers in different ways subject to availability of fertiliser supply and crop need. The type of soil is a primary factor in determining the need for fertilisers. Farmers monitor the level of nutrients in their soil and will only apply additional nutrients, in the form of fertilisers, when it is needed for a specific crop type. Farmers are advised by agronomists so as to minimise inputs to achieve a suitable nutrient balance and their decisions are increasingly informed by detailed soil analysis and artificial intelligence. The application requirement of fertilisers can even vary within one field, with the rate being controlled by an on-tractor computerised regulator. Using these technologies, farmers can minimise expenditure on fertilisers ensure cost-efficient production.

5.1.2. Manures are spread to land and typically this is for its Nitrogen benefit, where necessary. Nitrogen is essential for photosynthesis; is an important component of plant protein; and is necessary for cell division and plant growth. However, untreated manures also contain high levels of Phosphate. This Phosphate is believed to be one of the causes of river pollution not only within the Wye catchment, but in other sensitive areas. Manures are spread locally due to their easy availability, given the high numbers of poultry farms in the catchment, and the economic benefit of offsetting imported Nitrogen. Due to their availability, they are considerably cheaper than conventional fertilisers.

5.1.3. Spreading of manure takes place locally because poultry producers have an excess that they often have difficulty in storing. If the producers have a reliable market for the manure, and one that pays better than local farmers for spreading (i.e. the proposed Whitwick AD plant), they will readily appreciate the economic advantages. That situation would arise were the Whitwick AD plant to proceed.

5.1.4. Conventional commercially manufactured fertilisers are also applied, especially in areas where manure is not readily available. This is more generally in pellet or liquid form and would be for a specific nutrient need. The fertiliser bags or containers will specify the contents in proportions or ratios of nutrients. Therefore, only one nutrient, for example Nitrogen, can be applied to address soil nutrient shortages, as and when it is required, under close control.

5.1.5. Phosphates are also important for good plant growth, especially root growth and for the transfer of energy to the growing tip. Phosphates tend to be low in proportion in sandy soils, acidic soils and even peaty soils. In peat soils, the organic matter proportion is high, but there are low mineral levels. Plants only take up Phosphates (and other soluble minerals) from the soil through their roots when they can detect a deficit for their successful growth. So, when a plant has enough Phosphate, it no longer absorbs it. While it can

remain in the soil, it can be leached out, especially during rain spates (more frequent under climate change), so that it reaches watercourses, leading to the problems outlined earlier.

5.1.6. It is also worth noting that over recent years with reduced industrial emissions, farmers are having to apply more sulphate, which is one of the fertiliser product outputs from the plant.

5.1.7. The initial submission for the application referred to the widespread practice of spreading manure on land in the Wye catchment. That situation was correct at the time of submission. However, since then, the major poultry producer Avara announced plans to end the spreading of chicken manure from about 75 of its supplying farms within the River Wye Catchment.[2] So, in January 2024, Avara announced "*any manure generated on farms that supply us and would have been sold as fertiliser in the catchment is being exported*."[3]

5.1.8. Despite Avara's management measures, there remains a significant volume of poultry manure that will remain within the catchment. Current estimates[4] are that there are about 24 million chickens bred for meat production in the Wye catchment. Avara claims to be responsible for about 16 million of these chickens, so a significant number of chickens still produce manure that remains in the catchment and could potentially pose a threat to water quality if not managed properly or utilised creatively, as is sought under these appeal proposals.

5.2. Potential Improvements to utilise the concentrated outputs from the plant

5.2.1. Working closely with their agronomists, STL are providing a fertiliser 'recovery service' concentrating the outputs from the plant into more tailored products for use inside the catchment, where the need for Phosphates is lower and potentially damaging. All products could be exported to areas where they are required to satisfy agricultural requirements.. Appendix 1 highlights the agronomic benefits in greater detail, but the following key benefits should be highlighted:

- Ammonium sulphate produced from the process allows much of the Nitrogen derived from the poultry manure to be applied within the catchment in a selective manner, and thus without overloading phosphate levels.
- Struvite as a phosphate fertiliser most likely used outside the area, has benefits to reduce lockup and runoff, whilst also achieving an improved take-up efficiency by plants.
- The fibrous 'soil conditioner' has a more beneficial contribution to soil Carbon replacement and root health than manures, straw and liquid digestate. It is frequently used as a mulch to minimise weed invasion and to control evaporation.

[2] See, for example, article in Farmers Weekly, 11th August 2023.
[3] https://www.avarafoods.co.uk/for-good/our-planet/the-river-wye
[4] BBC UK's biggest ever environmental pollution claim reaches High Court, 30th April 2026

- Ammonium sulphate would also bring sulphur additions, which are needed to assist nutrient take-up. Sulphur is frequently in deficit, particularly in grassland, exacerbated by reducing manure spreading.

5.2.2. Appendix 1 also highlights how these outputs will reduce net fertiliser imports into the area and also help supply whilst the world fertiliser supply is currently challenged by the disruption in the Middle East.

6. *Current Environmental Controls*

6.1. There are two principal pieces of legislation controlling how farmers apply nutrients and look after the environment. These are The Reduction and Prevention of Agricultural Diffuse Pollution (England) Regulations 2018 (also known as Farming Rules for Water), which came into force on 2 April 2018. And the Nitrate Pollution Prevention Regulations 2015 (NVZ). The Environment Agency (EA) monitors and controls the legislation and, if necessary, may take formal enforcement action, which may include prosecution.

6.2. Farming Rules for Water

6.2.1. You must follow these regulations if you are a land manager in England. The regulations define a land manager as any person who has custody or control of agricultural land. This includes farmers and tenant farmers.

6.2.2. You must also comply with these regulations if you are in a Nitrate Vulnerable Zone (NVZ).

6.2.3. You mut take steps to prevent agricultural diffuse pollution (pollution) occurring. This is when pollutants from organic manure, manufactured fertilisers, sediment, soil and other pollutants get into:

- inland freshwaters
- coastal waters
- springs
- wells
- boreholes

6.2.4. Runoff, erosion, and leaching are the main causes of this pollution.

6.2.5. These regulations apply to agricultural practices, such as:

- using and storing organic manure or manufactured fertiliser
- planting and harvesting
- soil management – for example, ploughing or planting cover crops
- managing livestock on your land

6.2.6. Organic manures are fertilisers produced from one or more animal, plant or human sources, including:

- livestock manures
- sludge
- slurry
- anaerobic digestate
- compost

6.2.7. The legislation provides specific guidance on;

- Assessing pollution risks
- Before you apply organic manure or manufactured fertiliser
- Soil test results for cultivated agricultural land
- Applying manufactured fertiliser
- Applying organic manure
- 6m exception for precision equipment
- Exception for environmental benefits
- Reducing pollution risks when you use organic manure or manufactured fertiliser
- Storing manure
- Preventing erosion: managing livestock and soil
- Planting, harvesting and soil management
- Managing livestock
- How inspectors check you're complying with the regulations
- If an inspection finds you're not complying with the regulations

6.3. Nitrate Vulnerable Zone

6.3.1. Nitrate Vulnerable Zones (NVZs) are areas designated as being at risk from agricultural nitrate pollution. They include about 55% of land in England.

6.3.2. The Department for Environment, Food and Rural Affairs (Defra) reviews NVZs every 4 years to account for changes in nitrate concentrations.

6.3.3. If your land is in an NVZ, you must follow rules when you:

- use nitrogen fertiliser
- store organic manure

7. *Benefits of Whitwick Fertiliser Products*

7.1. The Whitwick AD Plant will process the raw manure and separate it into several discrete defined ratios of Phosphate and Nitrogen, which will be sold to the market as agricultural fertilisers for specific requirements.

7.2. The appellant did offer to limit the supply of phosphates back into the catchment, by means of evidence of soils samples prior to purchase. He also offered to not supply any phosphate back in to the catchment. However, the LPA has determined that there are already controls (as summarised in Section 6 of this statement) in place to control the spreading of fertilisers. Therefore, the LPA believes additional controls through the planning system are not necessary.

7.3. It should be noted that, if a farmer has high phosphate levels in their soils, there is no logical reason for them to purchase a phosphate fertiliser to be applied to the land, as this would defy economics and common sense. Plants will not absorb excess phosphate if it is not required for good plant growth.

7.4. It should also be noted that the AD Plant is not producing new nutrients, as they already exist in the form of manure. The plant is merely separating the nutrients so that they can be applied to land in a targeted manner, only where there is a proven need. The demand for these products is not local, but rather on low nutrient soils, such as those found in the Cotswolds and in East Anglia[5].

[5] For example, on the sandy, nutrient-poor soils of the Brecklands.

8. *Downstream Effects of Whitwick Fertiliser Products*

8.1. Farmers will purchase the nutrient products as specified fertiliser types only for a specific need. For example, if soil testing has been caried out and the land requires nitrogen for that year's crop, bespoke fertiliser can be purchased and applied. This logical approach would prevent the current situation whereby poultry manure can be applied for Nitrogen, but Phosphate is also applied accidentally, although there is no need, because it is within the manure. Therefore, the Whitwick nutrients will provide a **betterment** to the current local situation, by avoiding this accidental and damaging impact. Additionally, there would be a **neutral effect** with respect to Nitrogen, as a manufactured fertiliser with specified nitrogen content would still be applied in the absence of the Whitwick Nitrogen.

8.2. In order to obtain an objective review of the likely potential use of fertilisers produced by the development proposals, agronomists Hutchinsons were commissioned by STL Energy to set out details. They did this in a letter dated 28th April 2026. It is appended to this statement. The Hutchinson document sets a national context for the demand for fertilisers before considering nutrient requirements for land within the catchment, and how the products of the plant could be used outside the catchment.

8.3. Hutchinson drew the following conclusions:

"Based on the analysis of the fertilizer demand and plant by products we estimate that the following downstream fertiliser benefits will accrue from this plant

1 Removal of 100,000 tpa of poultry litter from direct spreading in the area

2 Ammonium Sulphate will offset nitrogen fertilisers imported into the area

3 Concentration of the phosphates will allow efficient distribution to other areas outside of the catchment

4 Use of Struvite is preferable and less prone to lockup / run-off than poultry manure

5 Soil structure improvement and carbon incorporation is better from solid digestate than re-incorporated straws or liquid digestate.

6 Concentration of these nutrients in the plant outputs will facilitate lower carbon intensity redistribution outside of the Wye catchment where appropriate."

8.4. There is thus a demonstrable demand for beneficial and targeted use of products from the plant as fertiliser not only outside the catchment, but also inside it too. For example, Ammonium Sulphate can safely be applied locally to offset the need for nitrogen imports into the area.

9. Downstream Effects of Water Discharges

9.1. After processing and the removal of nutrients, the Whitwick plant will discharge water to the local water course. The discharges will meet the thresholds of nutrients required under Regulations and as directed by the EA's operating permit. The Nutrient Budget Calculator submitted in July 2023 to support the application demonstrated that only 4.5kg TP/year phosphorus will be discharged.

9.2. The Herefordshire Council's River Lugg Nutrient Budget Calculator was been used to calculate the amount of phosphorus produced by arable agricultural land. The calculator demonstrated that there will be a nett decrease in phosphorus of 5.76 kg per year as a result of this development (on account of agricultural land being used for the development itself). Thus, the Council's own metric demonstrates the environmental benefit achieved through the process, through the reduction in risk from phosphates leaching into watercourses.

10. Conclusion

10.1. The Shropshire judgement did not apply at the time of the submission of the initial and subsequent Environmental Statements. Nonetheless, those submissions and associated communications with Herefordshire Council did seek to show that the design of the process had taken into account the impacts of the process on waters within the catchment and through the subsequent spreading of the specific products of the plant.

10.2. This Statement illustrates that due consideration has been taken of *Caffyn*. It recognises the value of nutrients to viable plant growth, but also sets out the risk associated with unnecessary or over-application of such nutrients, as currently happens with widespread manure application in the Wye/Lugg catchments. It has focussed on "downstreameffects ", that is subsequent impacts of the development and associated processes, so that it is evident they have been addressed. Also it explains that the controlled production and distribution/use of outputs from the plant would lead to no such indirect negative impacts being produced, and also to a reduction in risk of Phosphate pollution locally, through the significant reduction in manure spreading.

11. Appendix 1 – HUTCHINSON letter

Appendix 1 – Hutchinson Recommendation

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28 April 2026

Dear Sirs,

Fertiliser Benefits from the outputs from the Whitwick AD Plant proposal

Following our meetings and conference calls discussing the organic fertiliser outputs from the proposed plant at Whitwick we are very encouraged for a potential source of recovered nutrients and soil carbon for application to land. This comes at a very apposite moment with low availability and high prices of fossil-fuel derived fertilisers.

1 Hutchinson Background

Founded in 1938, Hutchinsons is a family-owned business and a leading UK agricultural and horticultural input advice and supply company, having grown from a local crop protection supplier into a nationwide provider. With over 85 years of experience, the company advises on more than one million hectares and has a strong focus on technical innovation and sustainable crop production. Hutchinsons' agronomy credentials are built on a highly qualified team of over 200 field-based agronomists, supported by in-house technical experts and specialists. They are committed to continuous professional development, requiring staff to hold BASIS, FACTS, and environmental qualifications. Their expertise spans across arable, vegetable, and horticultural sectors, leveraging digital tools like Omnia precision farming software to deliver tailored advice. Hutchinsons have been advising STL for many years on their agronomy and fertiliser requirements.

2 The fertiliser products available from the plant

The following outputs from the proposed Whitwick plant will be available:

Fertiliser Outputs	Tonnage pa	DM%	Agricultural ratios N	P2O5	K2O	SO3	MgO	Trace elements
Fibrous Soil Conditioner	35000	35%	0.26%	2.42%	1.03%	0.00%	0.00%	Yes
Struvite in solution	1800	20%	2.85%	11.57%	0.00%	0.00%	6.57%	No
Fine solids	8225	18%	5.67%	6.44%	11.57%	0.00%	0.00%	Yes
Ammonium Sulphate	34000	30%	6.36%	0.00%	0.00%	18.17%	0.00%	No
Aluminized Clay pellets	3000	80%	0.00%	3.91%	0.00%	0.00%	0.00%	Low

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These can be utilised as is or combined with other products to optimize agronomic benefit and adapt to specific soil / plant requirements.

3 The fertiliser market and nutrient requirements

The UK remains heavily dependent on imported fertilisers:

- Around **80% of nitrogen fertiliser** requirements are imported.
- **100% of nitrogen-sulphur (NS) fertilisers** are imported.
- **Almost all phosphate fertilisers** are imported, aside from limited recycled products, where the original phosphorus source was also imported.

Around **half of UK food production depends directly on fertiliser use**, making secure supply critical. Recent geopolitical events have highlighted this vulnerability. Nitrogen and NS fertiliser availability has been disrupted by the current Middle East crisis, just as it was in 2022 following Russia's invasion of Ukraine.

3.1 Nutrient requirements required in the catchment area

The Wye catchment covers approximately 4,285 km² (around 428,500 hectares), spanning two countries and five counties. Catchmentbasedapproach The land use is predominantly agricultural, with livestock farming in the north and west and intensive arable farming in the south and east. Roughly 75–80% of the catchment is agricultural land (~170,000 ha of agricultural soils are referenced in the phosphorus surplus calculations).

3.1.1 Phosphorous

The phosphorus picture is the better-documented of the two nutrients, thanks to extensive research (particularly the RePhoKUs project by Lancaster University):

Total phosphorus inputs: Around 6,500 tonnes of phosphate are brought into the catchment every year, of which approximately 4,000 tonnes arrives as chicken feed Savethewye — most of which is excreted and spread on land as manure.

Sources by livestock type: The phosphorus distribution by source has been calculated as: poultry (42%), cattle (27%), sheep (28%), pigs (1%), and other (1%). Herefordshirewt

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Annual surplus: The imbalance between agricultural P inputs (fertiliser, manure, and biosolids) and offtake (grass and crops) means that around 3,000 tonnes of surplus phosphorus are accumulating in agricultural soils in the Wye catchment every year — a rate equivalent to 38.9kg P2O5 (17 kg P) per hectare, which is considerably higher than the national average of 17.0kg P2O5 (7 kg P) per hectare. Herefordshire

Losses to water: Losses were estimated at 83 tonnes of P per year from wastewater treatment centres and 225 tonnes per year from agricultural land. Herefordshire

So in summary, total P inputs (inorganic fertiliser + manure + biosolids) are likely in the region of **5,000–6,500 tonnes P_2O_5 equivalent per year**, with crop and grass offtake removing only around half of that, leaving the ~3,000 tonne annual surplus.

3.1.2 Nitrogen

Nitrogen data for the Wye catchment is less comprehensively published than phosphorus, but reasonable estimates can be constructed:

Poultry manure contribution: Over 20 million birds are housed in the catchment at any given time AquaSwitch, with each crop producing around 15,000 metric tonnes of poultry manure annually. Poultry manure at 80% dry matter contains on average around 30 kg/t of total nitrogen. Cawood This suggests poultry manure alone contributes roughly **4,000–5,000 tonnes of nitrogen** per year to the catchment.

Cattle and sheep: The catchment supports a large beef and dairy herd plus substantial sheep numbers. Based on typical UK livestock densities for a mixed grassland/arable catchment of this size, cattle and sheep manure likely contributes a further **8,000–12,000 tonnes of nitrogen** per year.

Inorganic (manufactured) fertiliser: Typical UK application rates for mixed farming regions run at 80–150 kg N/ha on arable land and 50–100 kg N/ha on improved grassland. With an estimated 50,000–70,000 ha of arable land and 80,000–100,000 ha of improved grassland, manufactured nitrogen fertiliser inputs are likely in the range of **10,000–15,000 tonnes N per year**.

Estimated total nitrogen input: Combining all sources gives a rough figure of **22,000–32,000 tonnes of nitrogen per year** entering the catchment's agricultural system. Monitoring data has shown an increasing trend in nitrogen across most of the catchment Wyecatchmentpartnership, with arable land use — particularly maize

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and autumn-sown crops like winter wheat on permeable soils — contributing significantly to nitrogen concentrations in waterways. Wyecatchmentpartnership

NOTE: These statistics are indicative from the publications noted.

There is considerable permanent grassland in the catchment which would benefit from the Sulphur and nitrogen content in the Ammonium Sulphate especially to substitute the application of Poultry Litter which also includes Phosphates.

3.2 Potential nutrient applications for use outside of the catchment area

There is widespread demand for more Nitrogen / Sulphur (NS) products across the whole of the UK. As Sulphur depositions have reduced – so the need for Sulphur as a fertiliser has increased. With the closure of the Ince factory that was producing 350K tonnes per annum of NS compounds – the UK has become solely reliant on imports. In particular the use of NS products on grassland is lower than agronomically recommended – according to the BSFP only 12% of grazed grass received Sulphur in 2024. A significant proportion of this grass would be within reasonable distance from the production point. Applying the right amount of Sulphur helps improve the Nitrogen Use Efficiency (NUE) – as without sufficient Sulphur, the Nitrogen cannot be assimilated.

3.2.1 Agronomic Benefits of Domestic Sulphur supply

Data from the **British Survey of Fertiliser Practice** shows that much of the UK's grassland, and some arable land, receives insufficient sulphur. This can lead to:

- Reduced crop and grass growth
- Lower yields and poorer plant health
- Reduced nitrogen use efficiency
- Greater risk of unused nitrogen being lost through leaching

Sulphur is most effective when applied alongside early spring nitrogen. However, farmer choice has reduced significantly since the closure of the CF Industries Cheshire site, which previously produced around **350,000 tonnes of NS fertiliser annually**.

A new domestic source of ammonium sulphate would improve supply resilience and farmer choice, particularly in the **West of England and Wales**, where grassland systems dominate and high rainfall increases the need for annual sulphur applications

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Permanent grassland in Shropshire, the Cotswolds and Wales relatively close by are also short of Sulphur.

3.2.2 Phosphate and the Role of Struvite

Phosphate moves slowly in UK soils and is often locked up by soil chemistry, reducing availability to crops. Farmers typically rely on imported **TSP and DAP**, which are highly soluble phosphate fertilisers. However, much of the phosphate applied in these forms can quickly become unavailable in the soil.

Struvite offers a more efficient alternative. It releases phosphate gradually in response to root activity, meaning crops can access nutrients more effectively and lower application rates may be required to maintain yields.

Benefits of struvite include:

- Improved phosphate efficiency
- Lower dependence on imported TSP and DAP
- Reduced long-term phosphate loading in soils
- Lower risk of phosphate loss through runoff and erosion when placed below the surface
- Stronger nutrient recycling within the UK

A new domestic source of struvite would be highly valuable. Current UK supply is limited, yet it is easy to transport nationwide, allowing phosphate-deficient areas access to supply while helping redistribute nutrients from regions with excess soil phosphorus

3.3 Soil Carbon and Organic material

The Environment Agency's 2019 *State of the Environment: Soil* report found that intensive agriculture has caused arable soils to lose about 40 to 60% of their organic carbon. GOV.UK A UK field experiment comparing long-term management systems found losses of soil organic carbon of 65% in the upper 15 cm of soil that had been converted from grassland to arable use over 59 years, and 78% under bare fallow over 49 years. nih Even at depth, losses were substantial — at 0.3–0.6 m depth, carbon losses under arable and fallow management were 41% and 52% respectively compared with grassland. nih

The solid (fibrous) fraction of digestate from anaerobic digestion (AD) offers a promising route to reversing these losses. Research using natural ^{13}C abundance

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tracers found that the solid fraction of digestate had a carbon sequestration potential of 86% of applied organic carbon — substantially higher than liquid digestate (56–73%) or raw crop residues such as maize straw (50%) MDPI (Béghin-Tanneau *et al.*, 2019, *Soil & Tillage Research*; Quantin *et al.*, 2023, *Agronomy*). This is because the AD process removes the most labile carbon fractions as biogas, leaving behind a more recalcitrant, stable organic matter that persists in soil rather than being rapidly decomposed. The solid fibrous fraction has been shown to reduce soil bulk density, increase moisture retention, improve macroporosity, and reduce soil penetration resistance Preprints.org (Garg *et al.*, 2005; Beni *et al.*, 2012; Wester-Larsen *et al.*, 2024). Field experiments in Central Europe demonstrated that application of digestates increased the stability of soil aggregates, accompanied by greater abundance of glomalins (the glycoprotein produced by arbuscular mycorrhizal fungi) and eubacteria nih (Řezáčová *et al.*, 2021, *Scientific Reports*). Digestate application has also been found to augment the soil microbial community in terms of mycorrhizal colonisation and enzyme activity MDPI (González-González *et al.*, 2025, *Biology*), with these fungal networks in turn improving root access to water and nutrients, binding soil particles into stable aggregates, and further enhancing long-term carbon storage.

4 Security of supply of fertilisers in the UK

The UK has just one Nitrogen fertiliser production facility, which is itself reliant on imported Ammonia, and is therefore highly reliant on imported Nitrogen fertilisers including Urea. The current crisis in the ME shows the exposure that The UK has to a volatile supply chain

There is also no domestic source of Phosphate , and limited global supply of made from mined rock Phosphate fertilisers with much of the supply now coming from Morocco.

All imported fertilisers increase the burden on UK soils rather than the re-use of nutrients from farm wastes and digestate by-products.

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5 Conclusion

Based on the analysis of the fertilizer demand and plant by products we estimate that the following downstream fertiliser benefits will accrue from this plant

1. Removal of 100,000t pa of poultry litter from direct spreading in the area
2. Ammonium Sulphate will offset nitrogen fertilisers imported into the area
3. Concentration of the phosphates will allow efficient distribution to other areas outside of the catchment
4. Use of Struvite is preferable and less prone to lockup / run-off than poultry manure
5. Soil structure improvement and carbon incorporation is better from solid digestate than re-incorporated straws or liquid digestate.
6. Concentration of these nutrients in the plant outputs will facilitate lower carbon intensity redistribution outside of the Wye catchment where appropriate.

As a firm we look forward to working with STL Energy in being able to offer local UK sourced nutrients to our many clients.

[redacted]

Tim Kerr

Head of Crop Nutrition

Hutchinsons

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