NFU Consultation Response

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The NFU represents 55,000 members across England and Wales. In addition, we have 20,000 NFU Countryside members with an interest in farming and rural life. Our trade association is the largest farming organisation in the UK, providing a strong and respected voice for the industry and employing hundreds of staff to support the needs of NFU members locally, nationally, and internationally. We are engaged with government departments covering agriculture, rural affairs, environment, energy, climate change, employment, infrastructure, and transport issues, directing policy into real economic opportunities for farming business to flourish, through promoting the production of sustainable, traceable food to high standards as well as creating new openings for diversification and jobs. The NFU champions British agriculture and horticulture, to campaign for a stable and sustainable future for our farmers and growers.

NFU response to the *reducing ammonia emissions from urea fertilisers* consultation

Overview

The NFU welcomes the opportunity to respond to the consultation on reducing ammonia emissions from urea fertilisers and we have set out our responses below to the questions therein. We have also included the results of a small member survey as an annex to illustrate the various ways in which our members rely on solid urea fertilisers and the likely costs to their businesses of losing the products.

Despite driving a 14% reduction in UK emissions since 1990, we acknowledge that the industry must do more to reduce the amount of ammonia it releases to the atmosphere. However, **further emissions reductions must be secured in a way that also allows the industry to achieve other important ambitions around improving the productivity of our sector and reaching net zero by 2040**. We envisage an invigorated industry-led drive to promote nitrogen use efficiency as a central mechanism for balancing these goals.

At the same time, **it is crucial that the ongoing efforts of farmers to reduce ammonia emissions are fairly reflected in the national inventory and that emissions from other sources are accurately modelled**. For instance, Ricardo recently suggested that ammonia emissions from road vehicles could be almost double those currently being recorded in the inventory[1]. While this finding may only have the effect of cutting farmers' share of ammonia emissions by 1-2%, it could mean that farmers' contribution towards particulate matter in urban areas is cut by far more.

We are conscious that action on urea fertilisers is one of several Clean Air Strategy measures aimed at reducing ammonia emissions from agriculture. **While reducing ammonia emissions is a shared endeavour across the whole industry, each of these measures must have a fair and**

[1] For more information, please see this article, dated 28 January 2020: https://ee.ricardo.com/news/are-ammonia-emissions-from-road-vehicles-important.

proportionate impact on the sectors affected. They should also combine with each other, as well as further voluntary action by farmers, to help meet legally binding targets without needlessly overshooting them.

Solid urea is a highly valued tool for farmers of both arable and grass crops and increasingly used as a part of balanced and integrated nutrient plans that draw on a wide range of manufactured and organic fertilisers. This approach allows farmers to reap the benefits of complementary products, such as urea and ammonium nitrate, and in doing so keep costs down, maximise food production and, most importantly, minimise nutrient loss to the environment by using the right product in the right conditions.

By using ammonia emissions to justify tough action on urea, we believe Defra is taking a siloed approach towards reducing the environmental impact of these products and fertilisers more generally, which will swap, rather than reduce net impact. The industry needs joined up fertiliser policy that recognises the environmental costs and benefits of individual fertilisers and allows farmers to combine them in a way that provides the optimum environmental solution overall.

For the sake of the environment and productivity, the NFU firmly believes that farmers need continued access to untreated solid urea for at least part of the year and, therefore, we strongly oppose options one and two in the consultation. However, we also recognise the limitations of option three and the difficulties it may present for Defra.

Therefore, alongside a number of key industry partners, we are proposing an alternative, industry-regulated 'option four' for Defra to consider. In developing this option, we have carefully considered the needs of both industry and Government and commissioned experts to ensure it delivers the scale of emissions reduction necessary. We are confident that we have found a workable solution for all and have set out the detail in response to question 5b.

Through our own assessments and in conversation with industry experts, **we have developed serious concerns with some of the data that underlies this consultation**, namely:

- **UK ammonia inventory** – in addition to the apparent underestimation of ammonia emissions from road vehicles detailed above, an unpublished 2017 report by Tom Misselbrook on uncertainties in the agriculture inventory described the data underlying both the urea emissions factor and urea mitigation uptake as 'poor', resulting in the lowest possible confidence rating of '1' for this section of the inventory.
- **NT26 programme** – there is widespread scepticism around how robust this research is. For example, the finding which says 20% more urea is needed to produce the same crop yield and grain protein as AN is strongly disputed – NIAB has found no difference in efficiency on soils other than chalk or limestone.
- **Urea use** – the latest BSFP data, published since the consultation was written, indicate urea use is down further and UAN is up further[2]. These data need to be run through the inventory model to reinform the Defra risk assessment, together with the previous two years data (corrected). In addition, the consultation uses a 2013 baseline for urea use, which was unusually low – average use over, say five years, would give a fairer baseline.

Question responses - general urea fertilisers policy

Q1a: Should the use of liquid fertilisers (such as UAN) containing urea remain unrestricted? Yes/No/No view.

We cannot answer this question with a simple 'yes' or 'no' as it depends on which policy approach is taken forward on urea fertilisers. As outlined in the Impact Assessment, placing restrictions on liquid

[2] https://www.gov.uk/government/statistics/british-survey-of-fertiliser-practice-2019

urea is considered more costly and less beneficial than solid urea and, therefore, would need to be compensated for in a balanced policy option.

As the impact assessment shows, banning untreated liquid urea alongside solid urea would increase the cost of option one to farmers without delivering benefits in proportion and, therefore, provide a very low cost to benefit ratio. Similarly, requiring the use of urease inhibitors with liquid urea as well as solid urea under option two would double the cost to farmers with a relatively small gain in emissions abatement.

However, if options two and three are merged to produce an alternative, industry-regulated 'option four', the costs to farmers would be relatively small when compared with options one and two. Therefore, there is headroom within option four to accommodate the costs of restricting liquid urea, while the added benefits would lift the emissions reduction to an acceptable level.

It should be noted that the use of liquid fertiliser is growing in popularity, with more farmers making the significant investment associated with a move to liquid fertilisers. Farmers are doing this for numerous reasons, such as improving accuracy of application, with many sprayers adopting nozzle shut off systems, or for efficiency reasons, with increased bout widths that farmers are operating over, which most solid fertilisers cannot spread to. All of these measures are being adopted on farm to improve environmental performance (increased accuracy), soil health (wider tramlines less traffic thus less soil compaction) and drive efficiency and productivity. As mentioned, investment is high to move to a liquid fertiliser system and, if untreated liquid urea were included under option one, there would be a huge cost effect on those farmers already tied in. Alternatively, with liquid urea use on the rise (see figure 1 below), if liquid urea were included in the scope of an industry regulated option four, Government could expect to see growing gains from the inclusion of treated liquid urea.

Finally, it is worth highlighting that the addition of an inhibitor to liquid urea constitutes a simple inclusion in the tank mix when filling a sprayer. The inhibitor must be stored in the chemical store and added by the farmer as and when.

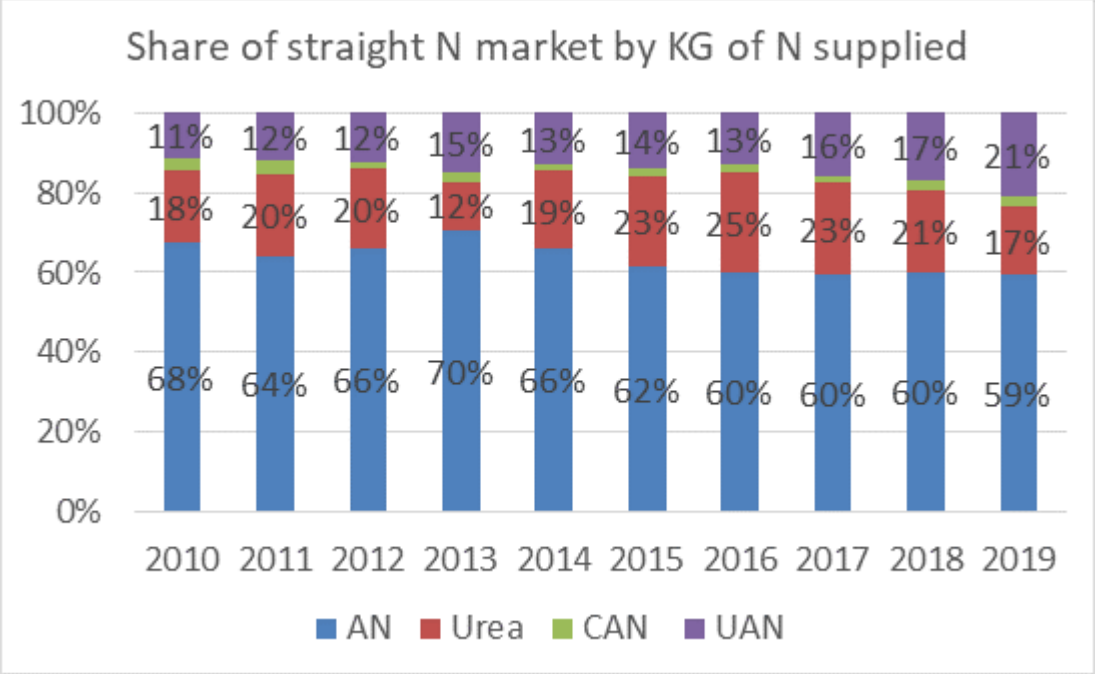

Figure 1 – an original analysis of data contained in last ten years of British Survey of Fertiliser Practice results[3].

Q1b: If No, why?

[3] https://www.gov.uk/government/collections/fertiliser-usage

Please see our response to question 1a.

Q2a: Should the policy applied relate to solid compound fertilisers (as well as solid straight urea fertilisers)? Yes/No/Don't know.

Again, our answer to this question depends on which policy approach is taken forward on urea fertilisers.

While the urea in solid urea compounds emits ammonia to the same degree as solid straight urea, they only account for around 10% of overall urea use and so little benefit would be gained by including them in any policy option. Moreover, using solid compounds allows a farmer to enjoy the benefits of solid urea while supplying other essential nutrients at the same time, reducing the number of field passes needed and boosting productivity. Blended solid compounds also allow farmers to tailor nutrient applications to the exact needs of the soil and crop, increasing efficiency and minimising losses to the environment.

Therefore, we believe solid urea compounds should be excluded from any of the three policy options set out in the consultation. Indeed, paragraph 46 of the impact assessment seems to indicate that they are omitted from the analysis of each policy option, due to a lack of reliable information. And, given the modelled emissions abatement for each option is at least adequate, there is no need to capture solid urea compounds in order to gain a little extra, unquantifiable reduction.

However, in the case of the industry-regulated option four, we believe it would be worth capturing solid urea compounds. Our work on option four has shown, by reducing the costs to farmers, we would need to take every opportunity to boost the emissions abatement and including solid urea compounds is such an opportunity. Furthermore, as option four would also encourage the use of inhibitors with liquid urea, we also believe it would be worth capturing liquid urea compounds to lift the abatement still further.

Q2b: If No, what solid compound fertilisers should/should not be restricted and why?

In terms of the three consultation options put forward by Defra, we do not believe any solid compound fertilisers should be restricted for the reasons given in response to question 2a.

Q2c: If you agree should the policy applied relate to all compound fertilisers containing greater than 1% carbamide (ureic) nitrogen? Yes/No/Don't know.

In terms of the industry-regulated option four, we believe all solid and liquid compound fertilisers containing greater than 1% carbamide (ureic) nitrogen should be included in order to maximise the emissions abatement provided. Any compound fertilisers containing less than 1% are likely to produce a negligible amount of ammonia emissions.

Q2d: If you disagree what should be the threshold of carbamide nitrogen content in order for the policy to reduce ammonia emissions to be effective?

N/A

Q3a: Do you agree or disagree with the Impact Assessment results for each of the policy options presented? Agree/Disagree/Don't know.

Disagree

Q3b: If you disagree please specify which of the results you disagree with and provide additional evidence to support your response.

In regard to option one, we disagree with the estimate of the cost to farmers provided in the impact assessment of £132m from 2022 to 2030. We have made our own calculations and believe the true cost to farmers over this period would be more like £166m. This figure is based on the average price difference between ammonium nitrate and urea over the last eight years (14p/kg N) when applied to the 287kt of urea sold in 2019.

For option two, the impact assessment suggests inhibited urea would cost just 10% more than the current market price of untreated urea, but our modelling suggests the true price to farmers would be significantly higher. Currently, a urease inhibitor costs between £30/t and £50/t over and above the cost of untreated urea. Using September 2020 prices, the addition of a £30/t inhibitor would raise the cost of untreated urea by 10.7%. Therefore, as the cost of inhibitors would probably rise under option two, this finding suggests the cost of inhibited urea would be significantly more than 10% above the current untreated urea price.

Q4a: Would these policy options (on an England only basis) have a significant impact on the UK internal market and ensure a level playing field for users? Yes/No

There appear to be two questions in one here: i) would the policy options have a significant impact on the UK internal market, and ii) would the policy options ensure a level playing field for users. In response to i), we believe options one and two would have a significant impact on the internal market, with the impact of option three far less pronounced. Similarly, in response to ii), we believe options one and two would not ensure a level playing field for users, whereas option three would be more likely to do so.

Crucially, as it would retain partial access to untreated solid urea for farmers in England, we believe the industry-regulated option four would have a minimal impact on the UK internal market and help ensure a level playing field.

Q4b: If Yes, please indicate how.

Both options one and two would significantly increase the cost of fertiliser for farmers in England – one of the biggest on farm costs for arable farmers – and place them at a competitive disadvantage with the rest of the UK. While English farmers would have to either switch to the more expensive ammonium nitrate or purchase an inhibitor on top of solid urea, farmers in the other three nations would retain access to the less costly option of using untreated solid urea. This situation would present opportunities for farmers in Wales, Scotland, or Northern Ireland to produce food at a lower cost than those in England. This would put yet more pressure on profit margins, allowing them to be further squeezed in England, putting English farmers at a severe disadvantage at a time of other significant uncertainty.

Of course, it is not just other farmers in the UK that farmers in England compete with; our members export food all over the world and options one and two would also affect these markets. We know that untreated solid urea is widely used to produce food in the rest of the world and, again, increased fertiliser costs for farmers in England would present opportunities for farmers in other countries to undercut them and take away business.

Grain, in particular, is easily shippable and a widely, globally traded commodity. UK prices are driven by grain production and trade all around the world and UK farmers are often not compensated for our higher standards. We are already seeing UK farmers undercut through imported produce, for example neonic treated OSR, since the ban on neonics in the UK. Banning urea would be another example of imports produced to a perceived lower standard, undercutting British farmers when the supposed environmental effects are simply being moved elsewhere.

No matter where English farmers would lose business to – other UK nations or foreign countries – the effect is likely to be that ammonia emissions are simply exported rather than eliminated. In fact, given

conditions in many other countries are more conducive to volatilisation, options one and two may actually cause global ammonia emissions to rise.

Question responses - ban

Q5a: The Impact Assessment suggests that this option provides the greatest reduction of ammonia emissions. Do you agree or disagree with this being the preferred option? Agree/Disagree/No view.

We strongly disagree with option one being the preferred option.

Q5b: If you disagree please explain why and what your preferred policy option would be.

The consultation document seems to provide two different explanations for selecting option one as the preferred approach, neither of which is satisfactory. On page 11, it suggests option one will help secure the most cost-effective route to meeting the UK ammonia target when combined with the other measures set out in the Clean Air Strategy. However, the impact assessment clearly shows option one is not the most cost-effective option in this consultation. While we recognise reducing ammonia emissions is a shared endeavour across the whole industry, each of the Clean Air Strategy measures must have a fair and proportionate impact on the sectors affected. On page 16, the consultation document suggests option one is preferred because it would secure the highest emissions reduction. We are fully aware of the degree to which emissions must be reduced to meet the 2030 target but, again, each Clean Air Strategy measure must be fair and proportionate on the sectors affected. In terms of urea, this outcome would best be achieved by focusing on the benefit to cost ratio of each option available.

If option one is pursued, we believe solid urea would largely be replaced by imported AN, sacrificing the economic, agronomic, environmental and safety benefits of using solid urea. For example, the cost of using solid urea – including the market price, transportation, and storage – is significantly lower than AN, so switching in the event of a ban would drastically increase the overall cost of fertiliser – one of the biggest farm costs for many arable farmers. Moreover, solid urea is the only main competitor or alternative to AN and, without this competition in the marketplace, the likelihood is that the cost of AN would be enabled to rise considerably. In this scenario, the NFU would, therefore, ask that a market or price monitoring mechanism is implemented.

Solid urea also helps to limit the nitrate leaching and greenhouse gas (GHG) emissions from the use of manufactured fertiliser. AN is more prone to nitrate leaching than urea and it also generates greater GHG emissions during its production and use, so an enforced switch under option one would exacerbate these negative environmental outcomes. Of course, the opposite is also true; if AN were banned and farmers had to switch to urea all year round, ammonia emissions would rise. Farmers need access to both products, as part of an integrated and balanced nutrient plan, in order to deliver the best solution for the environment as a whole.

In common with key industry partners, our preferred policy option is an alternative to those put forward in the consultation or discussed in the impact assessment – we refer to this as an industry-regulated option four. Our guiding principles for an option four are that it strives towards the ammonia emissions reduction achieved by option one (i.e., a ban on solid urea use), but would achieve this through an industry-led approach which can have high uptake, be measurable and enforceable. With this in mind, our proposal for an option four has four key aspects and builds on Defra's current options two & three:

- An open period for use of untreated solid urea between 15th January - 31st March and
- The use of inhibitors for solid urea used after 1st April which would be audited through a Red Tractor standard
- Untreated solid urea fertiliser could only be purchased by a Red Tractor member or a FACTS Qualified farmer

- Use of inhibitors for liquid UAN fertilisers after 1st April. Deviation from use of an inhibitor during this period would only be allowable following specific advice from a FACTS Qualified Adviser or completion of an appropriate Nutrient Management module and would be checked through Red Tractor.

We have also considered the potential for incorporation of urea (before sowing a spring crop) and maximum rate of urea nitrogen (in any one application) to be considered, ensuring applications follow best practice and nutrient management guidance.

This is based on:

- Over 95 % uptake of Red Tractor in Combinable Crops, which has over 80% of urea use in this sector. A suggested sanction for failing a Red Tractor standard is the need to undertake a recognised and approved industry training module, such as one run by FACTS.
- FACTS is the recognised industry standard for farmers and advisers to provide crop nutritional advice and fertiliser recommendations to balance agronomic, economic and environmental outcomes.
- Defra's aspiration for participation rates in ELMs to reach more than 70% of farmers by the end of the transition (end of 2027), with even higher participation in the first tier of the scheme (the Sustainable Farming Incentive).
- We expect a UK standard to be developed for inhibitors to make sure they achieve the required reduction in ammonia emissions.
- An annual review of implementation and a commitment to deliver estimated potential ammonia mitigation through option four by 2025.

We believe this option four will minimise the costs to farmers of restricting urea, while ensuring an acceptable emissions reduction is achieved for Defra, specifically 72% of the abatement that would be achieved by option one. The approach would retain access to untreated solid urea, but farmers would be encouraged to only use it between 15 Jan and 31 March. This aspect would be encouraged and measured through a Red Tractor standard, which would cover many solid urea users and thus ensure a high uptake.

At the same time, farmers would be encouraged to switch from using untreated urea to inhibited urea, in both solid and liquid form. Accelerating an existing trend, this aspect could be incentivised through the Sustainable Farming Incentive part of the future Environmental Land Management scheme. An incentive would ensure a high uptake, which would be easily measurable and enforceable through the scheme administration. We would also like the use of ELMs explored to see how it can help drive CPD in nutrient management and measurable improvements which can be part of delivering clean water, clean air and contributing towards net zero. There may also be an opportunity for industry-led initiatives, such as Tried & Tested and Championing the Farmed Environment, to encourage the use of inhibited urea.

Modelling that we have commissioned suggests that option four could contribute an ammonia abatement potential of 11.3 kt by 2030 at an uptake of 100%.

Q6a: Do you agree or disagree with the assumption that there will be a shift to the use of ammonium nitrate as a result of a ban? Agree/Disagree/No view.

Disagree

Q6b: If you disagree, what alternatives might be used?

We believe most farmers would shift to AN in the event of a ban, but some would switch to liquid urea instead. Recent data shows that the use of liquid urea has increased over recent years and we think this trend would accelerate if solid urea were banned. Considering the consultation assumes an

industry-wide shift to AN, we also believe the emissions abatement provided for option one would be lower than indicated, as a result of some farmers switching to liquid urea.

Q7a: Would storage and transportation of ammonium nitrate be a challenge to farmers and/or industry? Yes/No. Please delete appropriately: I am a farmer / an industry representative / Other (please specify).

Yes. The NFU is a trade association.

Q7b: If Yes, how? Please list the potential challenges and ways these might be mitigated.

The storage and transport of AN is generally more demanding than that of urea, owing partly to the lower nitrogen content of the former, i.e., more space is needed to store the same amount of nitrogen and more trips are required to transport it. However, due to its explosive nature, there are also regulatory demands when storing and transporting AN. Therefore, as evidenced in the annex to this response, an enforced switch to AN would have a significant impact on many urea users in terms of storage and transport costs, as well as handling and labour costs, plastic waste generation and regulatory burden.

As referenced in the consultation document, farmers have to comply with various levels of legislation when handling ammonium nitrate, depending on the quantity they possess and its source. This legislation is welcome to an extent as it helps keeps farmers and the wider public safe whilst ensuring compliance actions for farmers are kept in proportion. However, it can also be confusing for farmers and the dramatic uptick in AN use associated with option one would exacerbate this in the short term. To help mitigate this issue, Defra could launch a fresh publicity campaign around the rules to ensure farmers are made aware of any changes they need to make in order to remain compliant.

Considering the storage requirements outlined in AN legislation, it is likely many farmers will need to find extra storage space if they have to switch to AN. For bigger farms, which use manufactured fertilisers in greater quantities, new infrastructure may need to be built to accommodate a switch to AN.

It is not just farmers that face challenges in the face of a switch from urea to AN. Considering much of the extra AN would have to be imported, we are concerned that there will not be sufficient storage capacity at our ports to process it in much greater quantities and because of the safety concerns of AN, amending or attaining COMAH licences may not be straightforward.

Urea can also be stored or transported in bulk, whereas AN cannot be. Availability of curtain siders for fertiliser haulage are already well known to be stretched and demand pressure from an increase of AN to be moved around the country would increase this challenge. In addition, it is likely that movements of imports will need to be undertaken quicker, due to the aforementioned concerns around port storage capacity and this will again add to the problem.

Q7c: If you have suggested ways to mitigate potential challenges, what do you estimate the financial costs of these would be?

No comment.

Q8: If a ban is the agreed approach, how quickly following confirmation of this do you think this option could be introduced without impacting on the availability of suitable alternative fertilisers? a. 0 to 6 months b. 7 to 12 months c. 1 to 2 years d, More than 2 years

The NFU would suggest a full economic, agronomic and environmental assessment to be carried out of the unintended consequences a ban would have. Any change should be made with enough time to allow industry to adjust and a market monitoring mechanism to be in place, ready to assess the impact the removal of the only main fertiliser competing with AN.

If option one was to be introduced over a period of two or more years, the NFU would suggest trialling the industry-regulated option in the interim. This approach would give the industry an opportunity to show it can bring down emissions and potentially negate the need for any new regulation at all.

The NFU would urge government to consider the impact that further changes to farming legislation would have on an industry coming to terms with many other changes upon leaving the European Union. Therefore, it is essential that any changes which can be delayed should be, in order to enable farmers to adjust to a new era of farming policy that cannot be avoided or delayed.

Q9a: Would this policy option impact any other specific sectors such as horticulture or other small-scale end-users? Yes/No/Don't know.

Yes

Q9b: If yes, please indicate who.

Milling wheat producers, horticulture, and amenity sectors.

Q9c: If yes, please provide further details including whether alternatives can be used.

If a ban was introduced on the sale and use of solid urea, we can reasonably expect some impact on availability and cost of urea for melting into liquid and suspension fertilisers. This would impact milling wheat, horticulture, and amenity sectors, due to the feasibility of full vessels of urea coming into the UK if demand dropped substantially. This may cause regional variances and thus additional unfairness.

Q10a: If it is necessary to ban the use rather than the sale (and use) of solid urea fertilisers, do you agree or disagree that farmers should be required to hold and present records of fertilisers purchased, such as receipts or invoices, when required? Agree/Disagree/Don't know.

Agree

Q10b: If you Disagree, what other enforcement options would you suggest? Please specify.

N/A

Q11a: Do you agree or disagree with the analysis of the environmental impacts of this measure? Agree/Disagree/No view.

We broadly agree with the environmental impact analysis of this measure, but we do suspect the extra nitrate leaching associated with a switch to AN has been underestimated. The expected increase in embedded greenhouse gas emissions, associated with the production of AN, will also depend greatly on where the additional AN is sourced. If it cannot be sourced from producers who use best available techniques for mitigation, the increase will be far greater. Of course, this would not be in keeping with the industry or Government ambitions to reach net zero by 2040 and 2050, respectively.

Q11b: Do you have evidence of environmental impacts which have not been considered? Yes/No. If yes please provide links or references.

No

Question responses – urease inhibitors

Q12a Would farmers use solid urea stabilised with UI? Yes/No/No view.

As reflected in the annex of this response, some farmers do already use urease inhibitors with solid urea, but the majority do not for a variety of reasons. If they no longer had a choice, it is likely many farmers would simply switch to using AN, rather than persist with urea. This shift would produce the same downsides associated with a urea ban, namely, increased nitrate leaching and GHG emissions.

Q12b If not, why? What alternatives might farmers use?

Many farmers would not carry on using solid urea if it had to be inhibited because the cost would rise significantly, somewhere close to that of AN in our opinion. This would take away one of the main advantages of solid urea and encourage many farmers to switch to AN, with some also likely to begin using liquid urea instead.

Q13 At what concentrations should UI be applied to solid urea in order for there to be good efficacy? Please support your answer with evidence.

No comment.

Q14a With regards to the efficacy of UI in solid urea when blended/coated with other minerals (e.g. sulphur), do you have further evidence that might support this consideration? Yes/No .

No comment.

Q14b If Yes, please submit your further evidence.

N/A

Q15a As a supplier, when would sufficient volumes of treated urea be available to the UK market if there was a requirement to include UI in the melt? a. 0 to 6 months b. 7 to 12 months c. 1 to 2 years d. More than 2 years

No comment.

Q15b Would a requirement to include UI in the melt (as opposed to a coating) increase the price of UI treated urea? Yes/No/No view.

No comment.

Q15c If Yes, by how much?

N/A

Q16a Would this policy option impact any other specific sectors such as horticulture or other small-scale end-users? Yes/No/Don't know.

Yes

Q16b If yes, please indicate what sectors/which users.

Milling wheat producers, horticulture, and amenity sectors.

Q16c If yes, please provide further details including whether alternatives can be used.

As with a ban, we believe the availability and cost of urea for melting into liquid and suspension fertilisers could be affected, if a ban on the sale of uninhibited urea is taken forward. This would impact

milling wheat, horticulture, and amenity sectors, due to the feasibility of full vessels of urea coming into the UK if demand dropped substantially. This may cause regional variances and thus more unfairness.

Q17a If it is necessary to ban use rather than sale (and use) of uninhibited solid urea fertilisers, should farmers be required to hold and present when required, records of fertilisers purchased, such as receipts or invoices? Yes/No/No view.

Yes

Q17b Can invoices/receipts contain details of the name of the specific fertiliser product bought? Yes/No/Don't know.

No comment.

Q17c What other option(s) might be more effective for monitoring and enforcing the measure?

No comment.

Q18a Do you agree or disagree that UI-treated solid urea would be a better option to use than ammonium nitrate, should this policy option be chosen? Agree/Disagree.

It is not a case of pitting one against the other, it is a case of right product at the right time. AN delivers an immediately available source of nitrogen and, if urea is inhibited, the nitrogen may not be available as quickly, which may lead to application of AN instead of urea when conditions are unfavourable.

Q18b If you Disagree, why?

N/A

Q19a Are you aware of any evidence of negative health or other environmental impacts from use of UIs that are licensed for use in the EU or UK? Yes/No.

Yes

Q19b If Yes, please provide evidence/references.

An article on the Chemistry World website reports a nitrification inhibitor has been found in the milk of New Zealand cattle[4]. While the concentration seems to be low and well within EU safety standards, we believe there is potential for urease inhibitors to be found in the milk of England's cattle and cause concern. Even if concentrations are within safety limits, there is potential for the public perception to turn against such milk and for demand to fall. Obviously, this would be very problematic for dairy farmers at the base of the supply chain.

Furthermore, as the consultation makes clear, the long-term impact of inhibitors on soil health is unknown and there is potential for unintended consequences in this respect.

Question responses – restricted period

Q20 In your opinion, are farmers likely to apply more solid urea than needed during the open application window? Yes/No/No view.

Farmers would not apply more nitrogen than required. It is simply not in the interest of their businesses to do so as it would be wasteful and a wholly inefficient use of a very expensive resource. The issue of

[4] https://www.chemistryworld.com/news/dcd-in-new-zealand-milk/5847.article

an open period is that farmers may apply the right amount of N but in the wrong conditions, just to get an application on during a calendar date. This is something that needs to be very carefully considered in terms of unintended consequences, thereby potentially forcing farmers to apply urea to fit with an arbitrary date, rather than adapting to changing local optimal conditions which has a much stronger scientific basis for reducing emissions.

Q21a Do you think this policy aligns with Farming Rules for Water and the Code of Good Agricultural Practise in terms of nutrient management? Yes/No/Don't know.

The NFU believes this option offers the most alignment with FRFW as it allows a more suitable product (urea) to be used early in the season, rather than a total ban which would mean farmers used urea in early (often wet) season which would increase leaching. It would have minimal effect over option 2. All of the options put forward in the consultation contradict the COGAP (nutrient management) as they remove the agronomic flexibility which enables use of the right product at the right time.

Q21b If No, please explain why and note any potential conflicts.

- Please see our response to question 21a.

Q22 (To farmers currently using solid urea between April and December) What fertiliser(s) might you use to substitute solid urea from April to December under this option?

N/A

Q23 (To fertiliser suppliers) What fertiliser(s) might be in more demand to substitute solid urea from April to December under this option?

N/A

Q24a Do you have suggestions for more effective or less burdensome approaches to enforce this requirement? Yes/No.

Yes

Q24b If Yes, please provide details here.

As detailed in our response to question 5b, we believe a restricted period would be better enforced through a voluntary standard in a farm assurance scheme, particularly Red Tractor and/or a professional qualification scheme, FACTS. This approach would be far less burdensome for farmers while ensuring a sufficient emissions reduction is achieved when combined with the other measures in the industry-regulated option four.

Q25 Are there any other suggestions you would like to make that are not covered in this consultation document, or not covered by the previous questions?

No

Annex – farmer survey and case studies

In anticipation of this consultation, the NFU conducted a small survey of its members in order to get an indication of how and why farmers are using urea fertilisers. We received 42 responses in total, of

which 37 reported the use of urea in some form and 32 reported the use of solid urea. Although this is not a scientifically robust sample, the responses do provide some insight on broad patterns of use and the rationale for these as well as the value farmers place on retaining access to untreated urea.

Summary statistics

Of the 32 members who reported using solid urea:

- 32 (100%) said they regularly take soil samples, providing the data needed to apply no more urea than is required.
- 28 (88%) said they also use organic manures, indicating a healthy balance between manufactured and organic fertilisers.
- An average cost of £25 per hectare was estimated for switching to AN in the event of a urea ban.
- 27 (84%) said switching to AN would also have an impact on the storage, transport and handling of manufactured fertilisers, indicating the wider potential costs of a urea ban.
- Just 5 (16%) currently use inhibited urea and 5 others had used it in the past, demonstrating the limited number of situations where inhibitors are desirable.
- 26 (81%) said they use urea in the early season, autumn or when appropriate, showing farmers are wary of volatilisation in warmer months.

Key response points

On why they use solid urea, 22 (69%) of the 32 respondents said it was for both cost and agronomic reasons, with nine saying it was just for cost reasons and one saying it was just for agronomic reasons. However, some provided more detail on these as well as a range of other reasons for using solid urea, including:

- ‘ease of spreading and less hazardous’ – *practical and safety reasons.*
- ‘urea is used early on as less volatile than later applications and less prone to leaching than AN’ – *efficiency and environmental reasons.*
- ‘because we grow for a biogas plant, we have to use urea to reach the sustainability criteria set by OFGEM, they scored AN higher for CO2eq meaning it was unviable’ – *OFGEM does now allow AN use in this case but there is potential for this kind of situation to be replicated elsewhere.*
- ‘early N applications to arable and grassland are carried out using urea; later applications switch to AN to avoid risk of volatilisation and to speed up availability of N to crop’ – *environmental and agronomic reasons.*
- ‘applying urea is helpful as the crop takes the fertiliser up slower and does not become excessively lush at an early stage’ – *agronomic reasons*.
- ‘is Government still concerned about the explosive nature of AN? If we are only allowed to use AN, the price will likely rise as competition is reduced.’ – *safety and cost reasons*.
  ‘urea is usually cheaper, plus it has both agronomic and environmental benefits. It’s slower release characteristics mean it can be applied earlier (in cooler conditions)’.

Regarding the factors they consider before using solid urea, there was a common thread among the responses to avoid spreading in conditions that encourage volatilisation as well as meeting soil and crop needs:

- ‘in order to minimise losses, the following are avoided: windy conditions, waterlogged situations, very dry soils, hot weather, frozen soil. Application is timed according to crop need’.
- ‘would consider windspeed, temperature and rainfall at time of application and just after it as well’.
- ‘consider crop requirement, growth stage and weather conditions together with the requirement of the crop at that growth stage’.
- ‘crop conditions & requirement, soil conditions and weather - both current and forecasted’.
- ‘we apply urea throughout the season, untreated then inhibited, and our first application is driven by soil temperature in the middle of the day – you can come and see our thermometers! We are looking for 6 degrees centigrade, and reasonably dry weather’.
- ‘we always try to plan applications of urea before rain is forecast or when there is plenty of moisture in the soil to dissolve and absorb the urea’.
- ‘ground conditions, weather forecast. active growth’.
- ‘when crop requires nutrient. Temperature, wind, and moisture’.
- ‘crop growth stage, soil conditions, air temp’.
- ‘if there is rain forecast and what the temperature is forecast to be for the week after application’.
- ‘I always consider a number of factors before applying fertilisers for example: the weather conditions at the time of application, crop requirement; ground conditions’.
- ‘weather – avoid hot and dry. Ideally before rain or when raining to avoid volatilisation.’

On the impact that an enforced switch from urea to AN would have on storage, transport, and handling, there was a strong consensus among the respondents that the impact would be significant, increasing storage, transport and handling costs as well as labour costs, plastic waste and the compliance burden:

- ‘volume and tonnage of fertiliser stored and handled would increase by about 21%’.
- ‘increase in storage costs, space and security. Volumes of fert to be transported also significantly increased – trailer load capacity etc a significant factor’.
- ‘it would have an impact as we would have to store more product and handle more product. We would reconsider transport and spreading logistics. Going back to Liquid UAN would be reconsidered too’.
- ‘storage would have to increase; urea is a less bulky product and if replaced entirely with AN we’d have to increase our storage capacity. It would also mean an extra delivery (so an extra lorry journey per year) onto the farm and it would inevitably compromise our spring work too as there would be more transporting of product around the farm or more running about on farm to keep refilling the machine’.
- ‘currently use bulk urea so a switch to AN would complicate storage (due to storage restrictions with AN & HSE law) and handling (currently use a bulk trailer so would have to switch to loader and bags), would lead to a massive increase in waste from empty bags (+350), would lead to an increase in product required (11.5%) and increased spreading cost’.
- ‘AN is very corrosive by comparison, which would degrade the £115,000 spreading machine’.

- ‘the impact would be small but irritating because of the increased risk due to the nature of the product’.
- ‘there would be a large extra cost of storage, handling, transport and application, estimated at +33%’.
- ‘the only storage issue would be a greater fire hazard as AN is an oxidising agent’.
- ‘greater cost and higher fuel cost’.
- ‘little difference except spreader would corrode at lot faster’.
- ‘massive implications in machinery costs as well as labour and buildings’.
- ‘extra storage needed would cost £6000 per year’.
- ‘for a start, the same amount of nitrogen, as AN rather than urea, would need 33% more bags of fertiliser. Secondly, AN is an oxidising agent and this has the unfortunate feature of devouring objects made from steel (like fertiliser spreaders and tractors). Thirdly, we live next to a road, and as AN can be readily used to make bombs, it would require extremely diligent store monitoring’.
- ‘182t Urea (7 x 26t loads) would be replaced by 242.6t AN (9.33 loads). We would need extra storage space. Although AN is denser, the bottom of 1t bags cover a similar floor area and we are advised to only stack 3 high in a pyramid shape by HSE’.
- ‘on farm transport would increase. There is a 10t limit for transport of AN under agricultural exemption. We can get 14 x 1t bags of Urea on our trailer and still be under the 18.29t weight limit. Urea is not classified as a hazardous material (EC No. 1272/2008). 14t of Urea contains 6440kgs N. We would need 2 trips to move the 18.66t on AN required to get same kgs of N’.
- ‘filling the spinner would take longer as our current model comfortably fits 2t of Urea whereas it would need 2.66t of AN for same amount of N. We would switch to 600kg bags therefore more waste plastic to be disposed of’.
- ‘we can buy urea in bulk and store it safely, so there are no bags to recycle or dispose of. If forced to use AN, we would need to comply with more onerous safe storage legislation and handle a lot more material and dispose of the bags’.
- ‘we would need to purchase, transport and store an extra 20 tonnes, 33.33% more of fertiliser’.
- ‘storage area would have to increase. Due to amount of AN stored, fire regs would kick in. More plastic wrappers to dispose of’.
- ‘I would have to buy and store more bags of fertiliser as there is less N in each bag of AN compared with urea. This would mean two lorries coming to the farm instead of one. I would also have to spend more on diesel driving back to fill up the fertiliser box as I wouldn’t be able to spread as far with each box of fertiliser. I also don’t like the fire risk posed by AN, urea is much safer to store’.

On why they do not use inhibited urea, the 27 (84%) respondents cited a variety of reasons, including lack of effectiveness, poor compatibility with spreading equipment, high cost and early urea applications rendering it redundant:

- ‘we have trialled it and found it made no difference’.
- ‘I have never been persuaded of the benefits’.
- ‘no need because the amount of urea applied is sufficient for one application e.g., 80kg/ha of N, and it is applied early in season when conditions are cooler.’
- ‘we used it previously, but the urease coating covered the veins on the spreader discs, which affected the spread pattern and caused striping in the crop and affected the end yield as the crop lodged in strips’.

- ‘not seen as effective. pH maintained at recommended levels to maximise nitrogen efficiency’.
- ‘it’s more expensive than normal urea and I don’t believe we use normal urea irresponsibly at the moment. The last thing I want is to pay for fertiliser, apply it then lose it to the atmosphere regardless of whether it’s inhibited or not’.
- ‘do not see it as good value as I apply urea early in the season with cool and moist conditions’.
- ‘I don't think the extra cost is justified or that the losses due to volatilisation are anything like published figures suggest on my soil, especially if application is timed to match rain events. With 56 years of experience growing milling wheat, I would not get the results I do if there were large losses of N due to volatilisation’.
- ‘used previously but no great difference in performance to either untreated urea or AN, but cost was similar to AN’.
- ‘don’t use inhibited urea anymore as it led to residue building up on spreading vanes & the machine which affected the spread pattern. Cost is usually close to AN as they know what they can charge so no benefit to us’.
- ‘in the 1980s and 1990s we tried it and saw no difference. Independent (NIAB TAG) trials confirm that there is no significant benefit’.
- ‘we tried but couldn’t see any benefit’.
- ‘too expensive. Are the benefits clear?’.
- ‘more expensive and we still don’t know its effects/effectiveness – NIAB TAG trials ongoing in this area’.
- ‘price too high - may as well use AN rather than inhibited urea’.
- ‘no difference to normal urea’.

Case studies

We selected five of the survey responses to explore in more depth and the resulting case studies can be read below.

1. Jim & Mark Meadows

Jim and Mark grow a range of combinable crops on their farm in Warwickshire, incorporating grass/clover leys and a small area of permanent pasture/river meadows. They are both members of NIAB TAG, which allows them to keep up-to-date and informed on the latest best practice. Mark is also on the BASIS Professional Register and a FACTS Qualified Adviser.

Jim and Mark mainly use urea on their farm but do use AN later in the year as the weather gets warmer. Urea is applied in two applications to minimise volatilisation around the end of February and then again before the end of March. This can vary each year depending on the seasonal weather conditions. One of the main reasons they use urea at this time of year is due to the greater risk of leaching that would arise if AN was used. As they approach summer and the weather gets warmer, Mark will switch to AN as leaching risk is minimised and volatilisation risk is higher.

Jim and Mark choose to use urea on their maize crop, partly due to the risk of scorch presented by the use of ammonium nitrate (AN). Granular urea is typically applied to the seedbed when drilling, which not only eliminates the risk of scorching but also minimises the risk of volatilisation. Using urea in this way means they do not have to use AN after emergence, which risks scorch to plants if application is delayed by the weather.

Alongside manufactured fertilisers, Jim and Mark also use organic materials to help build soil organic matter, including chicken manure in the spring when there is sufficient demand for nitrogen. They are careful to apply chicken manure in the right conditions in order to avoid potash loss as it tends to leach. FYM and imported slurry are also used in the rotation, though distance of travel limits how much slurry can be imported.

When I asked Mark if he had ever considered using urease inhibitors, he said: ‘I have used them in the past but had some difficulty with the handling. Due to their design of being more hydroscopic, it tends to stick more to the spinner and come out in clumps.’ Mark found that he would have to get in and out of the tractor more to separate the granules and generally it meant that there was a much less even spread pattern.

I asked Mark what he would do if policy were brought in which meant that you could only buy urea that was inhibited. Mark said: ‘Although the cost would be higher – around £23/ha for winter wheat – I would have to switch purely to AN. This would cause me a number of issues, all related to the greater bulk of fertiliser I would need to buy for the same amount of nitrogen. We would need an extra three lorry loads of fertiliser deliveries, costing both time and money, as well as extra storage space on farm. In fact, the additional AN may push us into the next tier of regulatory control for storing AN, which would add further burden and challenges.’ Furthermore, Mark would have to carry a greater bulk of AN than urea to spread the same amount of nitrogen, putting additional pressure on his soils in the spring when they are wet.

2. Michael Hambly

Michael Hambly farms 185ha in Callington, Cornwall, producing cereals, oilseed rape and beef. Having previously worked as an agronomist he is FACTS and BASIS qualified. Michael is a past member of the

AHDB Cereals and Oilseeds Board, past Chairman of the British Cereals Export Committee, Vice Chairman of Copa Cogeca Cereals and Oilseed Group and Vice Chairman of the European Oilseed Alliance.

Michael explains that for early season nitrogen applications urea is used when temperature is lower and there is a risk of leaching due to high rainfall from applications of AN. Although later in the season when temperature start to climb there is a switch to AN as the source of nitrogen to reduce potential losses of N from urea applications in warmer conditions, Michael goes on to explain there is an additional cost of £25.52/ha when using AN. However, without Urea offering competition in the Nitrogen fertiliser market the additional cost would likely be much higher.

Michael highlighted the importance of soil sampling which he does every 4 years through SOYL and considers crop requirement, growth stage and weather conditions together with the requirement of the crop at that growth stage. These considerations make nutrient management much more efficient especially when applying organic manures to cereal stubbles, rotationally, in autumn prior to cultivation, meaning full allowance for nutrient value can be accounted for when planning fertiliser applications. Applications of FYM are also made to grassland during winter/early spring.

When asked for his key messages Michael said ‘Judicious use of Urea fertiliser products saves us considerable expense. However, we understand the limitations and choose to use both Urea and AN to control cost in the most efficient manner. Early applications are all based on Urea based products. Risk of ammonia losses are minimised at these timings and the risk of leaching from AN application avoided. Depending on weather conditions we switch to using AN based products around mid-end April when the risk of volatilisation losses from Urea applied in warm dry conditions is higher. Being able to make sensible decisions on the choice of nitrogen source ensures we contain costs, reduce environmental risk from leaching, and maximise our efficiency.’

3. John Haynes

John Haynes farms on the Hertfordshire Essex Border with around 1000 hectares currently fertilised to grow Wheat, Sugar Beet and Beans.

John utilises soil sampling through SOYL every 5 years, and also samples before sugar beet, he also takes tissue samples. John also considers crop conditions and requirement, soil condition along with weather both current and forecasted.

Sugar beet is a biennial crop and yield is determined in the first year of growth, for producers it is critical to ensure a rapid, early establishment, which minimises the time from emergence to full canopy closure, while maximising the time from canopy closure to senescence. John explained one of the main benefits to using Urea in his system was its resistance to leaching in the early parts of the spreading season – compared to AN, which all contributes to good early establishment.

John also spreads sewage sludge and compost on his land, he explained these are used in conjunction with Urea and, DAP & Piamon to ensure Sulphur and Phosphate requirements of cereals are met, the small amount of nitrogen supplied by the by-products is deducted from the total N requirement of the crop.

When asked about efficiency and spreading techniques John said ‘we use a 36m boomed pneumatic spreader which allows me to use urea with the added benefits of accurate and consistent spreading that you would not normally expect with a spinning disc type spreader. This uses GPS section control

to eliminate over-laps and spreading outside of the field boundary. I also use variable rate application in cereals.'

John explained he currently uses bulk urea and says that switching to AN would increase costs dramatically especially considering storage restrictions with AN and HSE law, when I asked John about other concerns with AN he highlighted the corrosive nature of the product and indicated the potential costs implicated to machinery maintenance.

John says 'I appreciate that urea is prone to volatilisation and this is a concern for its use in farming. However, if managed correctly, I feel that it can be a sustainable product for UK agriculture. Although inhibitors are an added cost, I would rather utilise them in a way that allows a continued use of urea than a complete change product.'

4. Andrew Watts

Andrew Watts farms 2400ha in Hertfordshire on variable soil types ranging from sandy loam/chalk to clay loam. The rotation consists of cereals, combinable pulses and OSR with an average rainfall of 657mm/year.

Andrew uses a combination of both urea and AN for his nutrient management, applying urea for first N applications and AN for later doses. Andrew does this for both cost and agronomic reasons and finds that urea works very well as an early season nitrogen source. Urea is only used early in the season when it is least likely to volatilise and it is also less prone to leaching that AN in early season, often moist soils.

If Andrew had to switch his nitrogen applications from a mix of urea and AN to straight AN then this would mean for a 200kg/ha product urea application, he would have to instead apply 270kg/ha of AN product to match the nitrogen provided. This would increase fertiliser costs by at least 15%.

When asked about splitting nitrogen applications, Andrew said that it will vary between crops and seasons but generally all OSR N application will consist of urea, with barley being 50/50 split urea and AN, with wheat splitting 30/70 and spring crops 20/80. Having an AD plant provides digestate for use on the land Andrew farms, which reduces the need for bagged fertiliser by 75% across the farmed area that is suitable for digestate application (approx. half the total farmed acreage). Often, the early season urea applications will form a blend and include a sulphur application, as this offers a more concentrated source of sulphur.

Andrew expanded on his nutrient management strategy, saying 'crop requirements are calculated, looking at yield potential, soil type and previous crop all considered. Digestate applications and available nutrients are worked in against the crop need. The fertiliser programme on farm aims to utilise the benefits of all the various sources of N and the way they respond and behave to optimise crop performance at best value. This would include using urea early and always AN later in the season'. Soil samples are taken on a five-year basis.

All nitrogen fertilisers are applied at a nominal flat rate per field, though adjustments are made with regards to soil type, sheltered areas and other field considerations. Andrew does not use urea with an inhibitor due to isolating its use too early in the season, however they would be considered as part of a nutrient management plan.

If Andrew were required to switch from urea to pure AN as a nitrogen source, there would be a big increase in storage costs due to more space being needed to store AN and increased security due to

the risks posed by AN. The volume of fertiliser to be transported would increase, and the number of loads taken on public roads would also increase and these would be a significant factor for him.

Andrew stresses that they have successfully used urea as part of a complete fertiliser programme for many years and the fully understands the importance of using the appropriate products at the appropriate time of year.