Decarbonising Europe’s fertiliser production on the path to sustainable food
The European Union has set a goal to increase the production and utilisation of renewable hydrogen in the fertiliser industry but like other sectors, there is no quick fix for achieving climate neutrality and the key to advancing decarbonisation is to use a combination of low-carbon technologies.

The European Fertilizer Industry has proposed a Roadmap to Climate Neutrality, which explores two main pathways for decarbonising the production of nitrogen-based fertilisers, which are essential for food security and strategic autonomy in Europe.

This event report looks at how Europe can find pathways to sustainable food while decarbonising fertiliser production.
Decarbonising fertiliser production: Pathways to sustainable food

By Brian Maguire | Euractiv's Advocacy Lab

The production and use of renewable hydrogen, alongside harmonising regulatory frameworks, will be key to decarbonising the fertiliser sector, stakeholders argued at a recent event.

“The European Union will be climate neutral,” Antoine Hoxha, Director General of Fertilizers Europe, said to open the Euractiv Media Partnership with Fertilizers Europe.

The event, according to Hoxha, aimed to present the European Neutrality, which explores two main pathways for decarbonising the production of nitrogen-based fertilisers, which are essential for food security and strategic autonomy in Europe.

**Innovation and net-zero**

Christian Holzleitner, Head of Unit for Low Carbon Solutions at DG CLIMA, spoke about setting a storage target and a framework for harmful emissions in industry and agriculture (NZIA) while promoting a more sustainable use of fertilisers by supporting the development and adoption of nitrification inhibitors, which reduce nitrous oxide emissions, and by providing better services and incentives for farmers, such as certification of emissions reductions and carbon removals.

He said Europe aims to create markets for high-value products, such as low-carbon and renewable fertilisers, and to mobilise the willingness to pay of consumers, who are increasingly demanding sustainable food.

Holzleitner highlighted a new study on how to price agricultural emissions and reward climate action in the agriculture value chain, which provides insights on how the agriculture and land use sectors can reduce greenhouse gas emissions and contribute to the EU’s climate neutrality goal by 2050. The study will inform the policy debate on the EU’s 2040 climate target, which will be proposed in the first quarter of 2024.

**Decarbonisation roadmap**

In his presentation of the Decarbonisation Roadmap, Michiel Stork, Associate Director at Guidehouse, highlighted the challenges and opportunities for decarbonising the fertiliser industry.

He stressed the importance of having profitable and attractive business cases for investors, scaling up and operating new technologies efficiently, dealing with long lead times and uncertainty, and balancing the intermittency of renewable electricity generation.

He also offered some recommendations for policymakers and stakeholders to support the decarbonisation process.

Stork urged policymakers to create frameworks that support the development of adequate and future-proof infrastructure, stimulate the demand for low-carbon fertilisers, and adjust the carbon borders to prevent unfair competition.

He advised stakeholders to focus on building the necessary infrastructure and renewable energy sources and to cooperate with the authorities to speed up the public funding and permitting processes.

**No magic wand**

Following Stork’s presentation, panellists shared their views on the challenges and opportunities for decarbonising fertiliser production in the EU, which is essential for food security and strategic autonomy.

They agreed that the current situation needs improvements, as the sector faces financing issues, it’s missing elements in the toolbox, and Europe is at a competitive disadvantage compared to other regions that rely on cheaper and more polluting sources of energy and raw materials.

They acknowledged the efforts of the EU to create a green hydrogen alliance, which aims to support the production and use of renewable hydrogen as a low-carbon alternative to natural gas, the primary feedstock for nitrogen-based fertilisers.

However, they also pointed out the diverging realities and needs in different countries, such as the availability of renewable energy sources, the hydrogen transport and storage infrastructure, and the regulatory and market conditions.

The panel stressed that there is no magic wand or one-size-fits-all solution for the transition to climate neutrality and that combining low-carbon technologies is key to advancing decarbonisation in the fertiliser sector.

They also called for streamlining and harmonising the regulatory framework to avoid a patchwork of laws that create uncertainty and complexity and for ensuring a level playing field with third countries that do not have the same environmental standards. They advocated for changing the mindset of the stakeholders and the public to embrace the opportunities and benefits of low-carbon and renewable fertilisers, such as reducing greenhouse gas emissions, improving air quality, and enhancing soil health.

The panel emphasised the need to ensure a fair distribution of costs and benefits among the actors along the value chain, especially the farmers who are the end-users of the fertilisers and who face the challenge of maintaining yields while reducing nutrient losses.

They concluded that the decarbonisation of fertiliser production is a complex but achievable and rewarding goal and that the European fertiliser industry is committed to playing its part by accelerating the decarbonisation of fertiliser production and supporting the farmers in their transition to more sustainable practices.
How renewable hydrogen can help decarbonise fertiliser production

By Brian Maguire | Euractiv's Advocacy Lab

The EU is taking steps to boost the production and use of renewable hydrogen, a low-carbon alternative to natural gas, in the fertiliser sector and beyond, according to Christian Holzleitner, Head of Unit for Low Carbon Solutions at DG CLIMA.

Holzleitner delivered the keynote address at the recent Euractiv Media Partnership with Fertilizers Europe. The "Decarbonising fertiliser production: Pathways to sustainable food" event brought together industry experts to chart a holistic path towards net zero.

Euractiv spoke with Holzleitner during Hydrogen Week, just as European Commission President Ursula von der Leyen announced that the Commission is launching a second auction for green hydrogen projects with €2.2 billion in spring 2023.

The first European Hydrogen Bank auction, with €800 million in pilot tender bids, is now underway and offers a fixed premium to lower the hydrogen price. Von der Leyen said the aim is to create “a one-stop-shop under the European Hydrogen Bank” and directly link hydrogen producers and consumers.

Funding innovation

In addition to von der Leyen’s announcement, Holzleitner said the EU is also launching a new call under the Innovation Fund, with a budget of €4 billion, to fund projects along the entire hydrogen value chain, including the manufacturing of electrolyserys and the production of hydrogen.

He said Europe is strong on carbon capture, utilisation, and storage (CCUS), and the EU has already funded the first two ammonia projects in Austria and Norway under the Innovation Fund—ammonia being a key component of fertilisers, with a growing market potential.

Noting that the EU is also working on a Commission Communication on Industrial Carbon Management, Holzleitner spoke about setting a storage target (NZIA) and a framework for negative emissions in industry and agriculture while promoting a more sustainable use of fertilisers—in part, by supporting the development and adoption of nitrification inhibitors, which reduce nitrous oxide emissions; and by providing better services and incentives for farmers, such as certification of emissions reductions and carbon removals.

He said Europe aims to create markets for high-value products, such as low-carbon and renewable fertilisers, and to mobilise the willingness of consumers to pay for sustainable food.

Holzleitner highlighted a new study on how to price agricultural emissions and reward climate action in the agriculture and land use sectors can reduce greenhouse gas emissions and contribute to the EU’s climate neutrality goal by 2050.

The study will inform the policy debate on the EU’s climate ambition for 2040. The Commission is scheduled to adopt a Communication on the 2040 ambition in Q1 2024, but the Climate Law proposal will be for the next Commission.

Farmers and food

“Internationally, we are currently a net exporter,” said Holzleitner. “It’s one of our strong competitive industries. We are exporting many high-value products…the drinks sector…champagne, for example, but also like cheese, fruit juices, you could also think about perfumes, which have had their fair share of agricultural inputs.”

Holzleitner said he’s not concerned about the prospects for agriculture: “There’s a lot of demand for land. For me, it’s more asking, ‘How do we want to use agricultural land in the future?’ If meat demand is decreasing, for example, as we’ve seen—the demand for certain animal meat is decreasing at about two, three, 4% per year—what do we do with this land on which we currently produce the feed for the animals?”

“Extra points” could finance that transition period like all low-carbon farming. However, would Europe finance it publicly, or do the big food processors take their share of the responsibility and help finance that transition? he asked.

Asked which levers exist to incentivise carbon reduction, Holzleitner points to the potential for carbon removal certification and a system like Emissions Trading Scheme (ETS) pricing, which could deliver improved payments to farmers.

Service providers

Fertiliser companies, he says, could come to be viewed more as service providers to farmers, advising farmers on how to use products effectively and profitably. For more innovative farmers and fertiliser companies, there could be a reward system where they gain “extra points” if they use fertiliser produced from renewable hydrogen and enzymes.

On the question of using public funds to bring about the net-zero transition, Holzleitner is unequivocally in the “yes” camp.

He said farmers should be supported in their transition to more sustainable management practices, including for transitional risks, such as a possible dip in soil fertility for a limited period.

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There could be options to use the land to produce feedstock for our chemical industry, producing fibres and other products, which could be an attractive proposition for farmers compared to an international market for meat with highly fluctuating prices. Essentially, it’s a discussion about the
The domestic fertilizer sector is crucial for food security and for enhancing a resilient and sustainable food systems in Europe and beyond. The industry is committed to play its part in Europe's objective of becoming climate-neutral by 2050.

Antoine Hoxha is the Director General at Fertilizers Europe.

By transitioning to more sustainable, efficient fertilizer production using renewable energy and recycling nutrients we will get us closer to a sustainable food chain.

From 2005 to 2020, the EU fertilizers industry already reduced its scope 1 and 2 emissions by 49%, mainly due to N₂O abatement in nitric acid. Such changes have placed European Industry as the lowest emitter of the global sector. To go beyond this level of efficiency and achieving the Green Deal objectives, a drastic change in the production process and huge investments are required together with a combination of policy solutions and access to affordable, low-carbon and renewable energy.

Ambitious Milestones Ahead

The European fertilizer industry has outlined clear milestones:

• By 2026, all Fertilizers member companies will adopt a master plan for decarbonisation.

• By 2040, a commitment to reduce scope 1 and 2 GHG emissions by 70% compared to 2020 levels.

• By 2050, the vision is for European fertilizer production to be climate-neutral.

The European fertilizer industry collaborated with Guidehouse consultancy to develop a decarbonisation plan for the industry, outlining the journey to net-zero and the steps needed to turn this vision into reality.

Exploring Pathways to Decarbonisation

The fertilizer industry decarbonisation Roadmap explores two main transitional pathways for the sector in Europe. While diverse in their approach, both these pathways converge on the common goal of eliminating CO₂ emissions by 2050.

The Technology Neutral Pathway: This approach envisions decarbonisation using various available technologies: electrolysis, carbon capture and utilisation (CCU), carbon capture and storage (CCS), and bio-methane. The choice of technology is tailored to regional infrastructure and energy resource availability. Employing the technologies from across what many call the “Hydrogen Rainbow” depending on geographical location is the goal of this pathway.

The Green Hydrogen Pathway: This pathway relies exclusively on using renewable fuels of non-biological origin (RFNBO) to replace hydrogen derived from natural gas. Its success hinges deeply on the availability and cost-effectiveness of renewable energy sources and the necessary infrastructure for producing and distributing green hydrogen, hydrogen produced from the...
electrolysis of water using renewable energy for power.

**Challenges and Considerations**

The industry’s transition towards decarbonisation is not without its challenges. As important national assets, fertilizer plants are strategically located across EU Member States based on factors such as the availability of natural gas, raw materials, logistics infrastructure, and proximity to agricultural markets. To ensure a successful transition, there must be a dependable supply of competitively priced low-carbon and renewable electricity, biomethane, hydrogen, and CO₂ infrastructure.

The choice between these decarbonisation scenarios will depend on individual plant needs and the varying availability and cost of energy carriers across Europe. The implementation of a sustainable, climate-neutral nitrogen fertilizer economy will be region-specific and product-specific, necessitating adaptable policies which consider the different circumstances of sectoral players across the continent.

**The Investment Landscape**

Decarbonising the industry demands significant investment. As an example, if all hydrogen used in ammonia production was produced with offshore wind-driven electrolyzers this would entail an investment of €64 billion for the wind parks, €17 billion for the electrolyzers, and €3 billion for a hydrogen pipeline network. This greatly overshadows the current average annual sectoral investment of €1.2 billion. Furthermore, the industry’s lead time for such investments can extend to seven years or more.

**Future Markets and Opportunities**

As a producer and consumer of roughly 40% of the total European hydrogen, the fertilizer industry has a unique role to play in the EU Green Deal and the development of a hydrogen economy in Europe. The potential for low-carbon and renewable ammonia extends beyond purely fertilizer producers for agriculture. Ammonia, a hydrogen-dense molecule, opens up possibilities for decarbonisation by replacing fossil fuels in applications such as power and heat generation, for high temperature heat in industrial process, as a transport vector for hydrogen and as an alternative shipping fuel. Indeed, the IEA Net Zero Roadmap forecasts that the share of ammonia as a shipping fuel will reach 44% by 2050 (Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach – Analysis – IEA).

As such a strategic product for agriculture and beyond, it is essential that the policy landscape ensures the continued production of ammonia in Europe.

**Prerequisites for Success**

While the production of renewable and low-carbon fertilizers is attainable and promising, several challenges must be addressed.

A supportive regulatory and funding framework should envisage:

**Access to Low-Carbon and Renewable Energy and Feedstock**

Affordable green and low-carbon energy access is essential to bridge the competitive gap between Europe and competing regions. Europe should continue to expand its renewable energy capabilities, with attention to regional variations on efficiency.

**Demand for Climate-Neutral Fertilizers**

The demand for climate-neutral EU-produced fertilizers must be supported through mechanisms like a labelling system accompanied by a mandatory purchasing target for all EU nitrogen fertilizer purchasers.

**Targeted Investment**

Measures to ‘de-risk’ early investments are required to close the cost gap between low-carbon and renewable routes and current production processes including accelerating the procedures for public funding. For example, a carbon contract for difference, where governments cover the difference in low-carbon and renewable and the traditional cost of production for a limited time, would de-risk investments.

**Prevention of Unfair Competition**

The timely and effective development and implementation of the Carbon Border Adjustment Mechanism (CBAM) will be crucial to prevent unfair competitive advantages for non-EU producers importing to Europe. However, there is currently no agreement on an export solution. Concrete safeguards will be required to ensure the continuous competitiveness of the European export-oriented production.

**Conclusion**

The journey of the European fertilizer industry toward a climate-neutral future is ambitious but necessary to keep the targets of the Green Deal, reaching net-zero emissions by 2050. With the appropriate legislative framework, investment landscape, and collaborative efforts, this vision can become a reality, ensuring Europe’s food security and strategic autonomy for generations to come.

For a deeper dive into the European fertilizer industry’s journey towards climate-neutrality, please visit: https://www.fertilizerseurope.com/decarbonising-fertilizers-by-2050/.

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