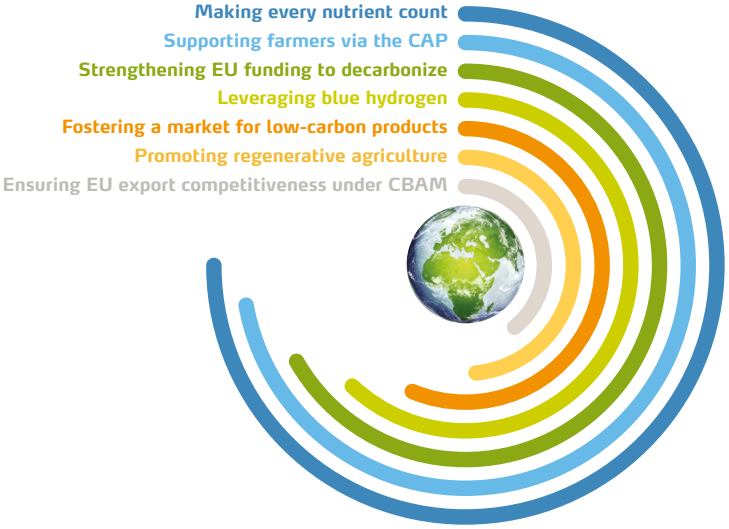
Knowledge grows



Fostering a market for lower-carbon footprint fertilizers

Introduction

Lower-carbon footprint fertilizers are essential for reducing greenhouse gas (GHG) emissions throughout the food value chain and are indispensable for the decarbonization of the sector. Despite their importance, current market demand for these fertilizers remains insufficient. To unlock their potential and bring them to market, favorable market conditions that drive demand and encourage their use are needed.

Lower-carbon footprint fertilizers are essential for decarbonizing food

Today mineral fertilizers feed around half of the world's population and are therefore essential in meeting the increasing demand for food. Without nitrogen-based fertilizers, crop yields could drop by over 40% in the first year of harvest[1]. Therefore, mineral fertilizers also play a key role in mitigating land use change, because more can be grown with less land.

Fertilizer production and use contributes to around 2.1% of global GHG emissions[2], of which production alone represents 39%. However, producing fertilizers using electrolysis or carbon capture and storage (CCS) combined with best-in-class emission abatement technologies can reduce the carbon footprint by around 60-90%[3].

Switching to lower-carbon footprint fertilizers, which farmers can apply in the same way as conventional mineral fertilizers, can also reduce the carbon footprint of certain crops by between 10% and 30% and the footprint of many food products by up to 20%.

Yara is partnering with agrifood players in Europe to supply them with lower-carbon footprint fertilizers. Our first customer was Lantmännen, northern Europe's leading agricultural cooperative; we have supplyed them with lower-carbon footprint fertilizers based on renewable ammonia[4]. Our most recent partnership is with PepsiCo Europe (see fact box).

Effective measures are needed to overcome implementation barriers

While we are seeing emerging demand for our lower-carbon footprint fertilizers as a way for food companies to decarbonize their value chains and reach their climate targets, the market is not mature enough to cover the full costs for producing at scale without support schemes.

Costs are high as hydrogen production is energy intensive; transitioning to renewable hydrogen could increase production costs by 50-140% for some fertilizers[5].

While the industry targets set out in the Renewable Energy Directive (RED) correctly reflect the need to rapidly decarbonize European industry, the targets alone do not create the required market conditions for achieving climate neutrality. Demand first needs to be created for industry to take on the higher transition costs. Today the upstream part of the value chain is unable to take on the increased production costs unless partnerships with downstream stakeholders that support farmers are established.

We need to find new business models to share costs and risks across the food value chain to realize the full potential of lower-carbon footprint fertilizers and food.

In the initial phase, public financial support and harmonized certification frameworks are the preferable tools to scale up the market: grants for lower-carbon projects and certification

Partnering with PepsiCo Europe to decarbonize crop production

Yara and PepsiCo Europe announced in July 2024 a long-term partnership aimed at decarbonizing the food value chain by equipping farmers with best-in-class crop nutrition products and advice as well as precision farming digital tools. This will allow them to increase nutrient use efficiency (NUE), boost yields and reduce the carbon footprint of their crops, such as potatoes, oats and corn.

Yara will supply PepsiCo with the services and products, including lower-carbon footprint fertilizers produced from renewable ammonia or lower-carbon ammonia via CCS. By 2030, the partnership is expected to support an up to 80% reduction of fertilizer production emissions and an up to 20% reduction of in-field fertilizer emissions.

[1]Broadbalk long term trial: Rothamsted UK Establishing long-term nitrogen response of global cereals to assess sustainable fertilizer rates - PMC (nih.gov)
[2]Greenhouse gas emissions from global production and use of nitrogen synthetic fertilisers in agriculture | Scientific Reports (nature.com)
[3]Reference values set at 50-60% reduction by Hoxha & Christensen (2019): The Carbon Footprint of Fertilizer Production: Regional Reference Values. International Fertiliser Society, 2-20.
[4]Yara and Lantmännen sign first commercial agreement for fossil free fertilizers | Yara International.
[5]50% green hydrogen for Dutch industry. Analysis of consequences draft RED3 - CE Delft – EN.

schemes for lower-carbon and renewable hydrogen/ammonia could help boost production. In addition, new support measures under the Common Agricultural Policy (CAP) could incentivize farmers to use lower-carbon footprint fertilizers.

Finally, once the market is mature, translating production targets into value chain targets could ensure cost distribution, fostering value chain collaboration.

The potential of renewable and lower-carbon ammonia to decarbonize food and shipping

Due to electrolysis and carbon capture and storage (CCS) technologies, hydrogen, and its derivative ammonia, can be manufactured already today with close to zero or significantly reduced GHG emissions.

Ammonia is a fuel that does not emit CO_2 when burned. It can therefore serve as a shipping fuel for the climate transition. Ammonia is also the main raw material for manufacturing mineral nitrogen fertilizers. When produced with renewable or lower-carbon ammonia, the carbon footprint of these fertilizers is reduced by around 60-90%, directly contributing to the reduction of the carbon footprint of crops and food.

Yara is producing renewable hydrogen at Herøya Industrial Park in Porsgrunn, Norway, the largest plant of its kind currently in operation in Europe. Here hydrogen is produced with electrolysis of water and renewable energy, replacing natural gas as a feedstock. We are also working towards reducing production emissions with a CCS facility currently under construction at Yara Sluiskil in the Netherlands.

OUR RECOMMENDATIONS

For the maritime sector, the recently introduced FuelEUMaritime regulation drives demand for low-emission shipping fuels, focusing on the greenhouse gas intensity of the fuel. Biofuels used in road transport are already incentivized by a comprehensive set of European and national regulations. For agriculture, no framework is yet in place to drive a shift to lower-carbon footprint fertilizers. We call for the following measures to generate a market pull:

1. **Foster the development of lower-carbon and renewable hydrogen production** in the fertilizer industry through investment support and predictable framework conditions.
2. **Promote certification mechanisms** to validate the lower-carbon footprint products, such as fertilizers, to ensure traceability and sustainability throughout the value chain.
3. **Establish financial incentives to encourage the uptake of lower-carbon footprint fertilizers by farmers**, such as through the Common Agricultural Policy (CAP).

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