

Fertilizer Focus



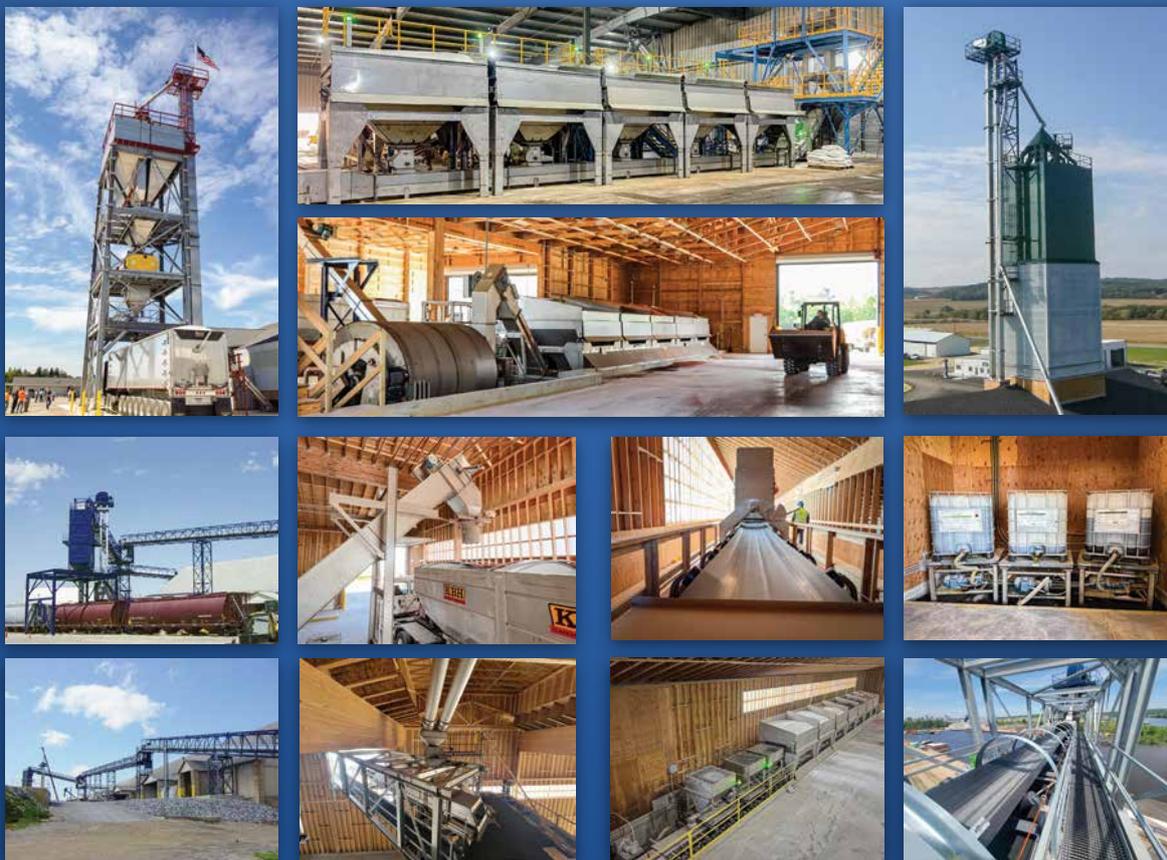
Canada: Keeping the supply chain rolling

- Enhanced Efficiency Fertilizers
- NPK processing technology
- Clean ammonia



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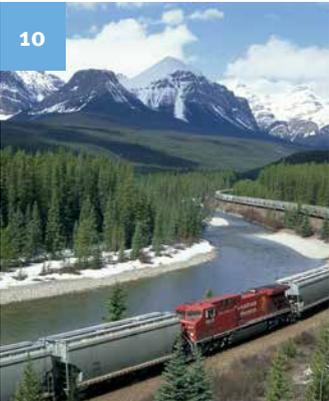


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Using nutrients more effectively



Written by

**Stef Worsley, Editor, Fertilizer Focus Magazine,
Argus Media, UK**

Welcome to the November/December 2024 edition of Fertilizer Focus! In this issue, Michael Freeman continues his series on the on the history of modern fertilizers. He highlights that the upward trend of fertilizer nutrient consumption continued through the 1950s with the world total doubling over the course of the decade. Statistics show that there was also a big jump in fertilizer nutrient consumption in the 1960s.

The main feature article in this edition is from Fertilizer Canada and focuses on Canada's fertilizer supply chain and how bottlenecks can be avoided. Canada's rail network is essential in transporting goods across the country and beyond, especially for the fertilizer industry. As fertilizer plays a fundamental role in global food security, Canada plays an important role as one of the world's leading producers.

Meanwhile, the European Biostimulants Industry Council (EBIC) looks at ways to harness biostimulants to improve nutrient use efficiency. By helping plants use nutrients more effectively, biostimulants are becoming essential to the future of sustainable farming and are a logical complement to fertilizers.

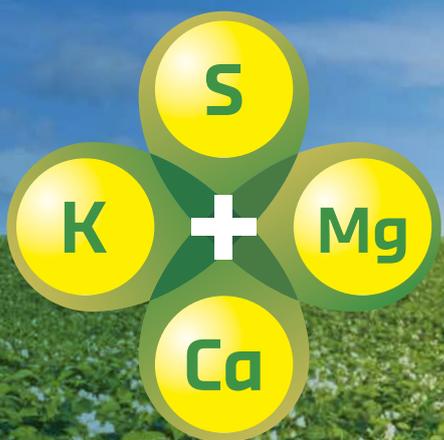
We have a special focus section on "Enhanced Efficiency Fertilizers". Firstly, Fertiplant discusses new technology methods for urea based NPK granulation.

We then have a piece on revolutionary nano-technology for fertilizer formulations from Netzsch, who explain that research is being conducted around the world to better understand the effects of nano-particles on people and the environment. Nano-technology – the design and production of extremely small particles with structure sizes below 100 nano-metres – is met with interest and, at the same time, scepticism. One of the new research approaches is the nano-grinding of liquid fertilizer for foliar and soil application.

Brandon Bioscience then looks at maximising nitrogen use efficiency with new precision technology. Nitrogen is the most important macronutrient used in agricultural systems to enhance crop yields. At the policy level, farmers across Europe are being called to reduce nitrogen usage on their farms. In response, they are rising to the challenge by actively working to decrease nitrogen inputs in line with regulations aimed at preserving water quality and reducing emissions. However, concerns remain regarding how limited nitrogen use will impact crop yields. It is critical to address this issue while still maintaining and maximising crop yields to feed the growing global population.

Please also take time to peruse the new 2025 Media Pack, which is at the back of this edition. We have put together an engaging editorial schedule for next year, so please let me know if you would like to submit an article on any of the suggested topics or any other subject. Also please take time to consider the advertising opportunities in the magazine – we are now reaching over 15,000 readers per edition!

I hope you enjoy the issue. ■



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History of the modern mineral fertilizer industry Volume 3: 1950-2000 (Part 2)

Industry evolution in the 1950s and 1960s

This is the third and final volume of the history of the modern mineral fertilizer industry by Michael Freeman, which takes a look at the evolution of fertilizers over the past two centuries (Please refer to all editions of Fertilizer Focus in 2022 for volume 1 and editions in 2023/24 for volume 2).

The upward trend of fertilizer nutrient consumption continued through the 1950s with the world total doubling over the course of the decade, equivalent to 7% annual compound growth. Most of the increase took place in Europe, North America and Japan, as the influence of the Green Revolution had not yet started to spread across the rest of Asia and Latin America. For the first time the demand for nitrogen (N) grew faster than that of the other two primary nutrients, accounting for 45% of the 14 mn t increase in nutrient use, compared with 30% for potash and 25% for phosphates, which resulted

in nitrogen use in 1960 reaching 10.3 mn t, marginally ahead of phosphates. This was a significant change to the situation in previous decades when phosphates had been dominant.

The surge of nitrogen demand in the 1950s stimulated the construction of new ammonia capacity in the big consuming regions. Historically the ammonia industry had been based on coal, which in 1940 still supported one half of all capacity, but it was already starting to be displaced by natural gas in the United States during the 1940s and in Europe a decade later, with the result that by 1960 natural gas accounted for 50% of

ammonia production, while coal had fallen back to less than 10%. Natural gas continued to grow in relative importance in the following decades to become the raw material for three quarters of the world's ammonia supply. Coal recovered some of its share in the final decades of the 20th century as China's expanding fertilizer industry depended on it to support much of its new ammonia capacity.

Two thirds of the world's natural gas reserves are located in Russia (25%) and the Middle East (40%), supplying the raw material for industries that were built up to produce ammonia and urea for export.

Nitrogen projects

In the early 1950s, ammonium sulphate was still the most important nitrogen fertilizer, accounting for one third of all N consumption, followed by ammonium nitrates (20-25%). At this point urea was insignificant, but change was under way with many nitrogen projects that included urea in their range of products, part of a trend towards the provision of more concentrated fertilizers. By the end of the decade solid urea represented 8% of N fertilizer supply, and there was a further quantity contained in solutions.

Phosphate fertilizer use was dominated by SSP and basic slag, both relatively low-grade products that together met two-thirds of P₂O₅ demand in the early 1950s. Concentrated phosphates in the form of triple superphosphate (TSP) and ammonium phosphates (DAP and MAP) had been available since the 1930s, but there had been little interest from end-users at that time. This began to change in the 1950s when more phosphate projects included capacity for phosphoric acid to make concentrated phosphate fertilizers and/or high-grade NPK compounds.

In the United States, the phosphate fertilizer industry was being developed at or near the phosphate rock mine sites in central Florida, and its concentrated phosphate products could be moved by rail to customers in the Mid-West states where arable farming was growing rapidly. The availability of prilled urea and of granular TSP and DAP provided raw materials for the bulk blending operations that were appearing at fertilizer retailing outlets in the Mid-West and elsewhere. By the end of the 1950s there were 200 active blending units supply NPK mixtures to growers in the US.

In Europe, phosphate fertilizer plants were being built at port sites where cargoes of phosphate rock and sulphur raw materials from overseas suppliers could be brought in by sea.

Table 1. Decennial data for major Ammonia Feedstocks 1950-2000 (% of total)

	1950	1960	1970	1980	1990	2000
Natural Gas	29%	50%	62%	73%	74%	72%
Coal	24%	8%	8%	7%	13%	19%
Oil	41%	38%	28%	19%	13%	9%

Data: Calculated by author from data in Rouwenhout et al., Sustain. Chem. 2022, 3(2)

The main source of phosphate rock was the industry in North Africa that had been built up in the French colonial era. Decolonization began in the mid-1950s in Morocco and Tunisia, followed in 1962 by Algeria. The French-controlled Comptoir des Phosphates de l'Afrique du Nord, which handled the exports of phosphate rock for these producers, was dissolved in 1960 after Morocco's OCP withdrew from it in order to handle its own sales. Eventually the Tunisian and Algerian producers followed its example, and all three countries became responsible for their own marketing strategies that led them in the following decades towards the production of phosphoric acid and concentrated phosphate fertilizers for export.

The 1960s

Statistics show that there was a big jump in fertilizer nutrient consumption in the 1960s, from 29 mn t at the start of the decade to 68 mn t at the end of it, thus adding some 39 mn t, of which 27 mn t were in the more developed regions and 11 mn t in the developing regions. This surge of interest in using mineral fertilizers in Asia and, to a lesser extent, in Latin America was linked to the introduction of the new high-yielding seed varieties for wheat and maize that had been developed in Mexico, as well as those for rice that originated from the work of the International Rice Research Institute in the Philippines, after it was opened in 1960. Both India and China established their

own research centres to build up and apply knowledge of high-yielding varieties.

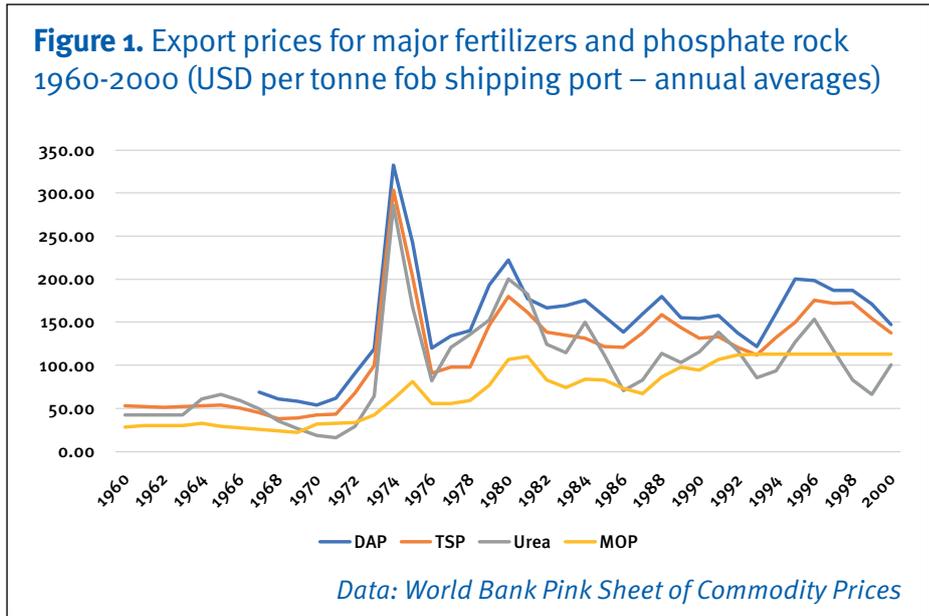
In the early 1960s there was not much production capacity for N and phosphorus (P) fertilizers in the developing regions, and so the surge in demand had to be met with imports from the United States and West Europe. This expansion of international fertilizer trade led to the emergence of merchants dealing in fertilizers and sulphur, initially based in the United States, and then in West Europe, Japan and, eventually, in other regions. These merchants moved into speculative trading in the main fertilizer products, generating a demand for accurate price information. In the absence of terminal markets for these fertilizers, these prices were supplied in the publications of British Sulphur Corp. (1966), Green Markets (1977), Fertecon (1980), FMB (1982), The Market (1998) and Profercy (2003) who published regular reports that recorded the current sales export prices of urea, DAP, TSP and other fertilizer products. The prices shown in figure 1 originated from these sources, having been collated by the World Bank for its Pink Sheets.

Over the course of the 1960s, the reported prices for most traded fertilizers fell by 15-20%, and even more for urea which was experiencing a supply surplus as a result of the amount of new capacities that were built during the decade. The price collapse in the 1970s was part of the background to the huge jump in international fertilizer prices that occurred in the next decade.

Strong growth

Collaboration between producers to sell their fertilizer products, which had been a characteristic of the pre-war industry, re-emerged in the 1960s in a modified form that was focussed on export trade. In 1961 the US phosphate industry set up the Concentrated Phosphate Export Association (Phoschem), under the provisions of the Webb-Pomerene act, to market its products outside North America. In 1962 ten European nitrogen producers formed Nitrex to sell their products in other regions, in particular to be able to negotiate with the consolidated buying agencies that had been set up in big Asian import markets. The European potash producers had been continuing their historic collaboration on sales, but were coming under increasing pressure from the EEC's Competition Authority to break up their relationships, eventually doing so in 1972 and setting up Kali Export Gesellschaft to handle potash sales outside Europe for the industry. At around the same time the government of Saskatchewan in Canada set up Canpotex to handle off-shore sales for the Province's newly-established potash industry, with the intention of avoiding harmful inter-producer competition in their overseas markets.

When it had become clear at the start of the 1960s that mineral fertilizers were entering a period of strong growth that was likely to continue for a long time, the industry attracted attention from potential investors, in particular the big players in the international oil industry who saw advantages in owning fertilizer production assets. The trend of oil industry investment started to become evident in 1963 when three oil companies (Mobil, Continental and Cities Service) bought phosphate operations in central Florida and another oil company (Occidental) decided to fund the construction of a phosphates complex in northern Florida. Investment in ammonia capacity could be justified because



Tønseth, Erik (1941-2022)



Born in Drøbak in southern Norway, Erik Tønseth studied for a degree in law and joined the legal department of Norsk Hydro in 1971. At that time Norsk Hydro's main fertilizer production interests were its two big sites in Norway where the capacity was geared towards NPK compounds and nitrate fertilizers. This started to change at the end of the decade when Tønseth became the head of the company's agricultural division and the decision was made to build up a dominant position in the European fertilizer industry through a series of acquisitions. The first of these - Nederlandse Stikstof Maatschappij (NSM) in 1979 - was followed in the following decade by the takeover of fertilizer factories in Sweden, Germany, France and the UK. Tønseth left Norsk Hydro in 1989 and joined the shipbuilding and engineering group Kvaerner Industrier as chief executive. His successors at Norsk Hydro extended the acquisition strategy outside Europe building up the company's position as a world leader in fertilizer supply. It was able to report sales of 21 mn t fertilizers in 2000 of which 15 mn t originated from the company's own production.

there could be options to supply feedstock, and Shell had been one of the earliest producers in the US. There were sporadic investments elsewhere, then in the 1960s Gulf Oil bought Spencer Chemical, which had three US ammonia production sites, and made investments in Korea and Kuwait. In addition, Union Oil as Collier Carbon built a big ammonia/urea complex in Alaska, Esso built nitrogen plants in Canada, Pakistan and the Netherlands, as well as a

number of small NPK mixing plants in the Central America/Caribbean region, and Shell built ammonia capacity in the UK. This list, which is by no means complete, indicates the extent to which oil companies were moving into fertilizers. However, in the following decades it became clear that the benefits of links between these industries were illusory and the oil companies largely withdrew, accepting buy-out offers from partners or from fertilizer majors wanting to expand. ■

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Keeping Canada's supply chains on track

Rail networks and fertilizer transportation

Written by

Kayla FitzPatrick, Senior Director of Communications, Fertilizer Canada, Canada

Canada's rail network is essential in transporting goods across the country and beyond, especially for the fertilizer industry. As fertilizer plays a fundamental role in global food security, Canada plays an important role as one of the world's leading producers. Canadian fertilizer serves more than 70 countries each year. The unique geography of Canada and the supply chains needed to get product

to market pose a challenge, which has been amplified recently with an increase in disruptions.

Fertilizer and Canada's supply chains

Canada is the second-largest country in the world, featuring diverse landscapes such as pristine lakes,

winding rivers, towering mountain ranges, vast plains, and forested valleys. While the geography is awe-inspiring, it also presents logistical challenges for shipping products across such a vast country. Canada's reliance on rail makes the railway system the backbone of the nation's transportation infrastructure, especially for the fertilizer industry. A staggering 75% of Canadian fertilizer

Canada plays an important role as one of the world's leading producers

moves by rail, making it the third-largest commodity shipped by this mode.

Production is primarily concentrated in the Prairies, in the heart of the country, which means the product is landlocked and needs to be transported over long distances. Fertilizer destined for domestic use is transported by rail to strategically located terminals, where it is distributed to retail service sites that blend and supply the product to farmers. The export process is similar, with large trainsets transporting fertilizer to coastal ports for shipment overseas. Given the complexity of this operation, extensive planning is required, and these plans are often subject to changes driven by environmental or economic conditions.

Imports of fertilizer from the United States look like the reverse of exports, with product travelling by rail, and sometimes vessel, into Canada to distribution terminals. International imports also follow a similar flow of vessel to rail to distribution terminal.

Adding to the complexity of the supply chain is the limited competition in Canada's rail system. The country is serviced by two Class 1 railways, meaning that during a labour disruption, the options for alternative transportation are extremely limited.

The seasonality of the global agriculture fertilizer demand, with variations between the two hemispheres for seeding crops and harvesting also compounds the complexities of supply chain



(above) Underground potash mine in Canada; (left) Rail cars transporting potash fertilizer

planning and the placement of inventory around the world. With precise timing needed to apply fertilizer there is very little room for delays in supply chains. Any disruptions to this flow can have cascading effects.

Increases in supply chain disruptions

In recent years, rail and port labour disruptions have posed challenges to the industry in Canada. Since 2018, there have been seven significant supply chain disruptions, costing the fertilizer industry close to CAD1 bn in lost sales revenue. Rail disruptions alone can cost the industry CAD55-63 mn per day, delaying the movement of approximately 69,000 t of fertilizer, the equivalent to four to five full trains of product.

The Canadian fertilizer industry has been working hard to mitigate these disruptions and advocate for long-

term solutions. Industry players are quick to adapt by using strategic stockpiling, diversifying distribution channels, and working closely with farmers to reduce the impact of potential delays.

Impacts of rail disruptions on the fertilizer industry

Labour disruptions have far-reaching consequences beyond just financial losses. In many cases, rail service slows down even before a strike or stoppage is officially declared, as railways begin halting shipments in anticipation of labour actions. This causes bottlenecks throughout the supply chain, affecting the movement of essential fertilizer products, which is compounded during peak demand periods like spring and fall.

With the tight application window for fertilizer farmers cannot afford to wait for shipments to arrive after the planting season.



(above) Canadian fertilizer storage facility; (right) Distribution and fertilizer storage facility in Canada

Moreover, rail service does not immediately resume at full capacity after a disruption ends. Often, it takes several days to restore normal operations, and the backlog created during the stoppage can take weeks to clear. This lag is particularly concerning for ammonia, which requires careful handling and has stricter shipping regulations.

The Canadian fertilizer industry is always forward looking

Industry resilience

While delays can be challenging and unpredictable, the Canadian fertilizer industry has looked for opportunities to adapt and overcome them. Producers, distributors, and retailers keep a close eye on the fertilizer market. Producers have diversified their trade routes to ensure they are not solely reliant on one option. Distributors and retailers have expanded storage and work closely with their farmer customers to provide them updates, intel and advice. In Canada the movement of fertilizer happens all year. Our industry is always forward looking, doing our best to anticipate and make plans to protect the flow and access of product.

A global challenge

Supply chain challenges are not limited to Canada. Fertilizer, like many other globally traded commodities, depends on the smooth functioning of supply chains around the world. Similar struggles are being faced by industries reliant on complex logistics networks - including energy, agriculture, and manufacturing - due to rail, port, and trucking disruptions. Labour issues, lagging infrastructure and geopolitical tensions are also adding pressure to the global movement of goods, impacting both food production and international trade.

The recent strike at West and Gulf Coast ports in the United States is a stark reminder that no country



is insulated from these types of disruptions. The COVID-19 pandemic further highlighted vulnerabilities in logistics systems across North America and Europe, leading to backlogs and delays that are still being felt today.

Advocating for solutions

Fertilizer Canada is working closely with federal and provincial governments in Canada to address the root causes of supply chain disruptions and to strengthen their overall resilience. One of the industry's key priorities is the recognition of fertilizer as an

essential good, ensuring that it continues to move even during work stoppages by updating Canada's Labour Code. This initiative has strong public support - nearly 80% of Canadians agree that products critical to food security, such as fertilizer, should continue to be transported during labour disruptions.

Moreover, Fertilizer Canada is advocating for enhancements to the collective bargaining process. By amending the Canada Labour Code to include pre-negotiation of binding arbitration terms and more structured cooling-off periods, the government can help reduce the frequency and unpredictability of work stoppages. These proactive measures will protect the industry from future disruptions and safeguard its crucial role in both domestic and global food security.

The association has also worked closely with government to

Fertilizer Canada is working closely with federal and provincial governments

recommend and advocate for continued investment in Canada's transportation infrastructure. Ensuring the supply chains Canada's economy and our trading partners rely on is being invested in, including trade corridors, railway enhancements, and port infrastructure.

Protecting Canada's vital rail network

As global demand for food continues to grow, the need for reliable, efficient, and responsible fertilizer production is more important than ever. Canada is

well-positioned to meet this demand. However, it is critical to invest in the infrastructure and reforms necessary to ensure that the fertilizer industry continues to thrive, both domestically and internationally.

The Canadian rail network is not just a transportation system; it is the lifeline for industries that are critical to feeding the world. Protecting this lifeline through proactive government action, stronger collective bargaining frameworks, and industry resilience measures will ensure that Canada continues to be an important player in the global fertilizer market. ■



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Harnessing biostimulants to improve nutrient use efficiency

Written by

David Barton, Senior Consultant, Prospero & Partners, Secretariat to European Biostimulants Industry Council (EBIC), Belgium

In recent years, the agricultural sector has increasingly focused on sustainability, cost efficiency, and reducing environmental impact, largely driven by the European Union's Green Deal and the Farm to Fork Strategy. These initiatives, which aim to create a more sustainable food system, including reducing fertilizer use and nutrient losses by 20% by 2030, remain central to EU policy despite ongoing political debate and challenges. An important part of this transformation is the growing use of biostimulants, which have emerged as a key tool for enhancing Nutrient Use Efficiency (NUE). By helping plants use nutrients more effectively, biostimulants are becoming essential

to the future of sustainable farming and are a logical complement to fertilizers.

Over the past 18 months, the European Biostimulants Industry Council (EBIC) has been gathering data to substantiate NUE claims for plant biostimulants. The survey conducted by EBIC revealed that the biostimulant trials assessed the impact on a range of different nutrients. The majority of trials focused on nitrogen, with others targeting phosphorus, potassium, and combinations of macro and micronutrients. Specifically, the data indicated that manufacturers used various agronomic indices to demonstrate NUE benefits not only for nitrogen but also for phosphorus,

potassium, and broader evaluations of all macronutrients and select micronutrients. This diversity in nutrient focus underscores the broad potential for biostimulants to enhance the efficiency of multiple fertilizer inputs.

Nutrient uptake and use efficiency claims have historically been challenging to validate, especially in open field trials, due to the complexity of the traits and the variability in environmental conditions. However, since the European Committee for Standardisation (CEN) published its Technical Specifications in 2022 for conducting trials to show NUE benefits, there has been a significant increase in the number of trials across the industry aimed at proving NUE claims.

Figure 1. Various types of biostimulants shown to enhance NUE

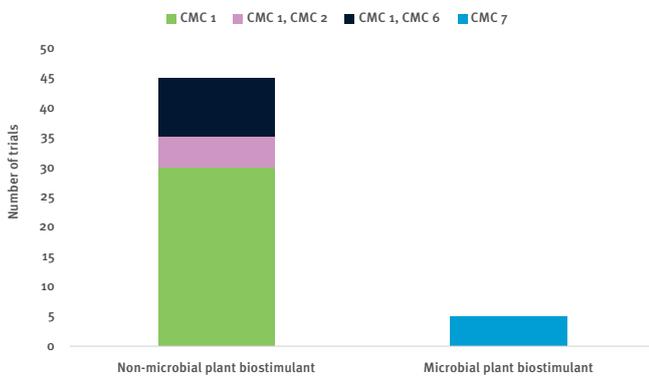
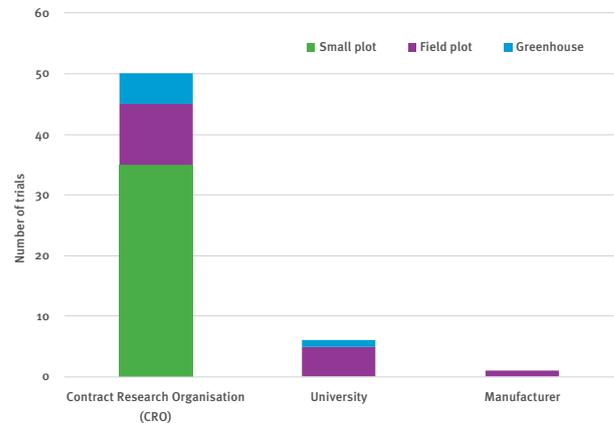


Figure 2. Majority of trials conducted by independent third parties



(left) Oilseed rape in full bloom, benefiting from fertilizer and biostimulants to improve Nutrient Use Efficiency (NUE). Photo by AVTG

Robust trial design

In 2023, EBIC conducted an anonymous survey among its members to characterise the use cases of plant biostimulants. A total of 57 trials were submitted, of these 41 fully compliant with CEN Technical Specifications and four partially compliant. The rapid increase in the number of these trials highlights how quickly the industry is adapting best practices and actively working to gather the necessary data to support NUE claims.

A significant portion of these trials - over 50% - were conducted on cereals, a critical crop group for NUE research due to their role as staple foods and their heavy fertilizer use. Improving NUE in cereals carries large-scale sustainability and economic, and it reinforces the relevance of biostimulants for large-scale farming. Additionally, the inclusion of fruit and vegetable trials broadens the relevance of biostimulants to multiple

crop types, appealing to a wider agricultural audience.

Of the 57 trials analysed, 23 reported a statistically significant difference between the treatment and control groups, while 34 showed effects on NUE that, while not statistically significant, were still agronomically meaningful. Achieving statistical significance in open field trials is particularly challenging due to the multivariate nature of these environments, where factors such as soil variability, weather conditions, and crop management practices can influence results. This highlights the importance of robust trial design with appropriate parameters to measure NUE effectively. The CE mark and conformity assessment, supported by CEN standards, provide a reliable framework to ensure the validity of biostimulant claims. This offers a strong foundation for further research and validation of NUE claims, even in the complexity of open field conditions.

EBIC’s analysis: 25% Increase in NUE

According to EBIC’s analysis, trials reported so far suggest that biostimulants can, on average, improve NUE by 25%. This is a significant finding, as improving nutrient use efficiency has the

potential to impact both agricultural productivity and environmental sustainability. For growers, this 25% improvement in efficiency could offer several tangible benefits, including reducing nutrient losses and increasing the effectiveness of applied fertilizers higher income due to reduced input costs and improved crop yields.

However, while the 25% average increase is a positive indicator, it is important to note that improving NUE does not automatically translate into a 25% reduction in fertilizer use or a 25% increase in yield. The relationship between NUE, fertilizer inputs, and yield is complex and depends on factors such as environmental conditions, crop type, soil type, and farming practices. In some cases, improved NUE may lead to better nutrient absorption without necessarily increasing yields, while in others, it may allow for modest reductions in fertilizer application without compromising productivity.

The real value lies in understanding how this efficiency increase can be translated into practical benefits for farmers. While improved NUE can reduce the use of fertilizers, lower input costs, and improve profitability, these outcomes are not guaranteed across all scenarios. For example, reducing fertilizer by 25% might not always be feasible without affecting

The potential economic benefits of improved NUE are clear

yield, depending on soil fertility and other growing conditions.

The trials conducted so far have relied on several agronomic indices to measure improvements in NUE. Nutrient Exports (NE) was the most popular index, used in 10 trials with statistically significant results. NE directly links to yield, providing tangible, real-world outcomes that resonate with farmers focused on productivity. However, NE alone does not provide the full picture. Other indices like Internal Utilisation Efficiency (IE) (used in five significant trials) and Partial Factor Productivity (PFP) (used in four significant trials) offer complementary insights into how efficiently plants absorb and utilize nutrients. Together, these indices provide a holistic view of NUE, ensuring that biostimulants are assessed across the entire nutrient cycle.

More research is required to translate this headline figure into consistent, tangible impacts for farmers across different environments and crop systems. EBIC will continue to aggregate data from its members across a wide range of crops, biostimulant classes, soil types, and farming conditions to deepen understanding and further validate these findings.

This is especially relevant for cereal farmers, given the high volume of fertilizer typically applied to these crops. The ability to improve NUE by 25% in cereals could potentially result in significant economic benefits, either by making nutrient use more efficient or by reducing fertilizer inputs while maintaining yields. At



Fertilizer prills supporting wheat seedlings, with biostimulants enhancing Nutrient Use Efficiency (NUE). *Photo by Fotokostic*

the same time, it offers farmers a way to lower input costs and reduce the environmental footprint of farming by reducing nutrient runoff and greenhouse gas emissions. The CE mark on biostimulant products, under the FPR, provides growers with the assurance that these products have passed rigorous testing and can deliver on these claims.

Economic and environmental benefits of improved NUE

The potential economic benefits of improved NUE are clear. For farmers, fertilizers represent a significant

proportion of agricultural input costs, and improving their efficient use will help maintain farm profitability. With fertilizer prices fluctuating due to global supply chain issues and geopolitical tensions, biostimulants that enhance NUE help reduce risk for growers.

From an environmental standpoint, improved NUE has critical benefits as well. By making crops more efficient at using the nutrients available in the soil, biostimulants help reduce nutrient runoff and leaching, significantly decreasing the environmental impact of farming. Increasingly, food companies are looking to track and reduce the

greenhouse gas emissions associated with their supply chains, known as 'Scope 3 Emissions'. Farmers who can demonstrate reduced nutrient losses, particularly nitrogen, can strengthen their position in negotiations with buyers by showing they have contributed to lowering the overall emissions of food production.

In addition, better nutrient uptake can lead to improved crop quality, potentially increasing the nutritional value of produce or enhancing its marketability, thus offering farmers a double benefit: economic savings and enhanced product value.

Biostimulants benefit fertilizer manufacturers too

The use of biostimulants brings opportunities for fertilizer manufacturers too. It is estimated that up to 50% of nitrogen applied as fertilizer is lost through leaching or volatilisation, which contributes to water pollution and greenhouse gas emissions. Incorporating biostimulants into fertilizer formulations can improve NUE, helping more nitrogen to be absorbed by plants and reducing environmental losses.

Additionally, biostimulants can be integrated into fertilizer recommendations and agronomy programmes, working alongside fertilizer applications at key stages of the crop cycle. This integrated approach enhances nutrient uptake and efficiency, ensuring that both fertilizers and biostimulants are used optimally to achieve better economic and environmental outcomes. By combining biostimulants with fertilizers in a coordinated manner, manufacturers can provide a comprehensive solution that supports crop growth, reduces input costs, and mitigates environmental impacts.

A further option for fertilizer companies is to maintain volume and margins by integrating biostimulants into their fertilizer prills or granules and lowering the nitrogen content



Fertilizer prills supporting wheat seedlings, with biostimulants enhancing Nutrient Use Efficiency (NUE). *Photo by Vitalii Petrushenko*

per unit. In this way, manufacturers can maintain product volume while offering better performance and sustainability benefits because the farmer receives the same fertilizer effect. This approach allows companies to protect margins by creating a premium product that farmers will value for its efficiency. From the grower's perspective, it is a plug-and-play solution, requiring no change in standard practice, which facilitates adoption. Of course, as all biostimulants differ, technical work is necessary to integrate them into product formulations effectively - whether through coating or granulation - and delivering a win-win-win for farmers, manufacturers, and the environment.

Additionally, co-application of biostimulants alongside fertilizers is another effective method, allowing growers the flexibility to apply biostimulants in liquid or granular form at different stages of the growing season. This co-application approach offers versatility, as biostimulants can be applied directly to the soil, as foliar sprays, or through fertigation, providing farmers with multiple options to suit their specific crop needs and practices.

Challenges in proving NUE: open field trials and the role of standards

Achieving statistical significance in open field trials can be difficult due to variability in soil type, climate, and crop management practices. The CEN standards aim to mitigate these challenges by providing a standardised framework for trial methodologies, improving the likelihood of obtaining statistically significant results, helping manufacturers substantiate NUE claims, and making it easier to compare results of trials conducted by different people.

EBIC helps its members navigate the CEN standards, ensure compliance and demonstrate claims. This guidance not only enhances the credibility of biostimulant trials but also strengthens the industry's ability to meet regulatory demands and build trust among farmers and other stakeholders.

In addition to compliance trials, manufacturers often conduct supplementary trials to explore how biostimulants can be used alongside fertilizers to optimise input



Biostimulants and fertilizer supporting potato crop development by enhancing nutrient uptake and soil health. *Photo by Brian Brown*

requirements while maintaining or improving yield. These trials help assess whether combining biostimulants with reduced fertilizer inputs (for example, reducing fertilizer by 20%) can maintain production levels, providing both economic and environmental benefits. These trials offer a more detailed view of how biostimulants function in real-world scenarios and further solidify their practical value for growers.

Interestingly, the majority of trials so far have focused on non-microbial biostimulants. This is partly due to the limitations in the positive list of microorganisms allowed under the Fertilizing Products Regulation (FPR). EBIC is advocating for expanding this list to include more microbial strains, many of which have shown strong potential to enhance NUE. As regulations evolve, more trials on microbial biostimulants could present exciting opportunities for innovation in

Nutrient use efficiency claims are often challenging to validate

NUE, especially since microbial plant biostimulants include the sub-group that some people call ‘biofertilizers’ because they fix nitrogen or solubilise other nutrient present in the soil in forms that plants cannot use.

As the final CEN standards are published at the end of 2024, they will provide a uniform and reliable framework for proving NUE claims, giving manufacturers a clear path to compliance. Although released by the European Committee for Standardisation, the methodologies are relevant for trials conducted anywhere in the world. For growers, CE-marked biostimulants that have been tested according to the trial methodologies in the CEN standards

offer the assurance that these products have undergone rigorous testing and can improve farm efficiency, optimise fertilizer use, and reduce costs.

The trials reported since the introduction of Technical Specifications in 2022 highlights the significant progress made in demonstrating the efficacy of biostimulants for improving NUE. As more data is collected and research expands into different crop types and regions, the biostimulant industry will play a key role in sustainable agriculture, helping to reduce the food chain’s Scope 3 emissions, enhance nutrient efficiency, and create economic opportunities for growers. ■

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News in brief

EUROPE

Belgian ammonia cracking facility starts operations

Industrial gas firm Air Liquide's ammonia cracking pilot plant at the Belgian port of Antwerp has started operations, the port's chief commercial officer Tom Hautekiet has said.

The plant has a nameplate capacity of around 15,000 t/yr ammonia that can be cracked back into hydrogen, Hautekiet told Argus on the sidelines of the World Power-to-X Summit in Marrakesh this week. This would allow for 2,500 t/yr of hydrogen output and arguably makes the plant the biggest operational facility of its kind globally.

The facility cracks conventional 'grey' ammonia from German chemicals firm BASF's Antwerp plant back into hydrogen, Hautekiet said. Air Liquide did not respond to a request for comment on whether this is for testing or other purposes.

A final investment decision (FID) for a second stage expansion is due to be taken next year, Hautekiet said. The plant's capacity could then be expanded to over 70,000 t/yr of capacity by 2026, he said.

The Antwerp facility's start on schedule - with Air Liquide having targeted a 2024 start-up when it first announced the plans last year - can be seen as an encouraging sign for the development of cracking plants in Europe, even as it is still a comparatively small facility compared with other plans. Seaborne imports of clean ammonia feature heavily in European plans to use hydrogen as a means of decarbonising industry and transport.

Argus is currently tracking 17 planned or operational ammonia cracking facilities in Europe, but there had been few signs of tangible progress recently. Some developers have already pushed back targeted commissioning dates for their facilities and uncertainties over European regulations related to third-party access have complicated plans for some.

Yara plans long-term shift to US NH₃ production

Norway-based global fertilizer producer Yara plans to shift its focus towards cheaper production of ammonia in the US and away from Europe, where volatile gas prices

and high carbon costs are weakening the profitability of assets.

Yara is actively "scaling back non-core and lower return activities" after embarking on capital and cost expenditure reduction plans of USD150mn each in July. The firm is reviewing its asset portfolio and has already announced its intention to shutter ammonia production in Tertre, Belgium. And last year Yara disclosed plans to stop downstream NPK and nitrate production at Montoir-de-Bretagne.

Now the fertilizer producer is evaluating "switching to upstream production in the US, where we get competitive gas pricing and well-advanced carbon capture and storage [CCS]", Yara chief financial officer Thor Giaever said.

Yara has also paused expansion activities at its 24MW renewable ammonia pilot in Heroya and shelved plans for a 100MW electrolyser at its 1.8mn t/yr Sluiskil ammonia plant in the Netherlands. The company has vowed to only "move ahead with projects that make economic sense".

But the company is continuing to evaluate its two CCS-based projects in the US Gulf, with final investment decisions on track for the second half of 2025. "The US is our focus in terms of growth," Giaever said.

Yara's jointly owned 750,000 t/yr Freeport facility in the US opened in 2019 and reached nameplate capacity the following year. Yara estimates an underlying cash cost of USD190/t for production in the US, assuming an efficiency rate of 35mn Btu and a Henry Hub benchmark gas cost of USD4/mn Btu.

The implementation of CCS with a 95% capture rate could earn a USD100/t ammonia saving once the 45Q tax credit is applied in the US, reducing production costs to just USD90/t.

Meanwhile, Yara estimates its European cash cost at about USD400/t, with plants with an assumed average efficiency rate of 37/mn Btu, a TTF benchmark gas cost of USD8/mn Btu and an EU emissions trading system cost of USD100/t of carbon dioxide equivalent.

"We expect to need to source more ammonia from outside of Europe," Giaever said. The focus will be on high-margin nitrate and NPK products, which will continue to be produced in Europe. "As long as we run on imports, we will achieve margins."

NORTH AMERICA

OCI completes sale of Texan CCS ammonia plant

Fertilizer producer OCI has completed the USD2.35bn sale of its under construction 1.1mn t/yr clean ammonia project in Beaumont, Texas, to Australian oil and gas producer Woodside.

OCI will continue to facilitate the construction and commissioning of the project, which is on target to produce its first ammonia in 2025, with reduced carbon ammonia production to start in 2026.

The plant will use hydrogen made from natural gas with carbon capture and storage (CCS), provided from industrial gas firm Linde's facility on the same site.

Production of reduced carbon ammonia at the Beaumont plant is conditional on supply of carbon abated hydrogen and ExxonMobil's CCS facility becoming operational.

Once the CCS-based hydrogen feedstock is available, the plant could produce ammonia with a carbon intensity of 0.8t of CO₂ equivalent/t, or a 70% carbon reduction, according to the firms. This would meet the greenhouse gas emission reduction threshold established by the EU's renewable fuel of non-biological definition, which has been set at 70%.

The completion of the sale follows a series of divestments by OCI. Earlier, OCI announced sale of its methanol and ammonia complex, also in Beaumont. OCI also completed the sale of its Iowa nitrogen plant in August and in December last year announced the divestment from its 50% stake in trading firm Fertiglobe.

OCI's remaining ammonia assets are its 550,000 t/yr Geleen plant in the Netherlands and an import terminal in Rotterdam, which is currently undergoing an expansion to 1.2mn t/yr throughput.

Nutrien restarts operations at White Springs

Canadian fertilizer producer Nutrien has confirmed the restart of the company's White Springs, Florida, phosphate fertilizer facility, which was shut by Hurricane Helene.

Production at the plant is ramping up, the company said without responding to a question on how much production was lost during the outage.

The plant was shut by storm-induced power outages as Hurricane Helene made landfall on 26 September, so the plant was off line for at least three weeks. The plant produced 1.27mn t of phosphate rock in 2023, according to Nutrien's annual report, so three weeks of production would equate to roughly 800,000t of phosphate rock.

Helene also shut operations at rival fertilizer producer Mosaic's phosphate facility in Riverview, Florida, which is expected to return to normal operations later this week.

SOUTH AMERICA

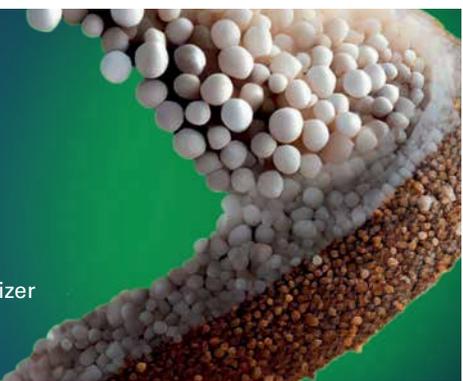
Positive progress on Villeta project finance process

ATOME is pleased to report material progress with the ongoing project finance processes for Villeta which is being conducted by the company's international financial advisers.

After substantive discussions and presentations, an encouraging number of written detailed non-binding offers (NBOs) have now been received in respect of each of the equity and debt project finance portions from reputable international entities including multi-laterals, commercial banks, strategic investors and specialised investment funds.

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The debt portion of the funding, as anticipated, is substantially oversubscribed on the basis of these NBOs. Furthermore, there has been a positive response to the equity portion from credible, international parties with equity funding interest being shown in ATOME's wider portfolio of projects, alongside Villeta.

ATOME is delighted by the extent and seriousness of the NBOs received and looks forward to progressing and finalising the funding as soon as possible, with the aim of commencing on-site work before the end of this year.

The next stage is to analyse and shortlist the proposals before moving to mandate the lead debt arrangers and select the preferred equity partners. As is normal in such processes, the company reminds shareholders that there is no certainty or guarantee as to timing at this stage nor that any of the proposals received will ultimately progress to completion.

In the meantime, the company's preferred EPC (Engineering, Procurement, and Construction) contractors are working on final costings for the construction of the Villeta Project. The Company's estimate of these costings has, however, already been prudently taken into account and reflected in the NBOs received.

Brazil's Heringer to halt fertilizer units

Brazilian fertilizer producer Fertilizantes Heringer will begin halting operations in two producing units to reduce operational costs.

The units are in Dourados, in Brazil's central-western Mato Grosso do Sul state, and in Rosario do Catete, in northeastern Sergipe state.

The process will be gradual, as the units will reduce operational rate over the next months, Heringer said. The decision came because of the units' low financial performance and economic viability in the current market, aiming at reducing capital expenditure (capex) and other operating costs, according to the company.

The volume of the units will be supplied by other plants belonging to the company, lowering fixed costs and increasing profitability. Heringer did not disclose the production capacity of the halted units.

The firm will evaluate the use of the units, studying alternatives to improve the company's results, including the possibility of reactivation according to market conditions or the sale of the assets.

Both units had halted previously for unknown times in early 2019, when the company closed nine of its units during its judicial reorganization, equivalent to a Chapter 11 bankruptcy filing in the US.

The company has 14 production, sales and fertilizer distribution units throughout Brazil.

Fertilizantes Heringer has been a part of Eurochem since March 2022, when the Russia-based fertilizer company bought a 51.48% stake in the company. Eurochem acquired an additional 28.5% share in a June 2023 tender offer to buy up to all common shares, with 20% of shares still outstanding.

Brazil proposes gas tax cut for fertilizers

The Mines and Energy Committee of the Brazilian lower house of congress has approved a bill to eliminate VAT-like taxes PIS/Cofins on natural gas for fertilizer factories under firm supply contracts.

The initiative is part of the Fertilizer Industry Development Program (Profert), which aims to reduce the production costs of fertilizers in Brazil, where natural gas is the primary raw material.

Currently Brazil imports about 90% of its fertilizers. The proposal is being addressed as a priority but is subject to final approval by eight different congressional committees.

PIS/Cofins are federal taxes applied on the gross revenue of companies under two regimes. In a cumulative regime, percentages are 0.65% and 3% for PIS and Cofins, respectively, while under a non-cumulative regime, figures are 1.65% and 7.6pc. The regime adopted leads to more or less credit options.

AFRICA

OCP considering return to US phosphate market

Moroccan fertilizer producer OCP signalled its readiness to export more phosphate to the US following Mosaic's request to the US government to withdraw its review of countervailing import duties on OCP for 2023.

"As soon as the conditions allow, we are ready to resume our critical role as a reliable, high-quality provider of sustainable phosphate fertilizers and a trusted partner to US farmers," OCP said.

OCP noted it was made aware of Mosaic rescinding its request for a third annual administrative review of Moroccan imports to the US Department of Commerce. OCP is evaluating the impact the request could have on the 2023 duties.

The 2023 tariffs were initially set at 19.95% earlier this year but have been provisionally reduced to 7.42% and

could come down further as the US Court of International Trade (CIT) considers an appeal, OCP added.

The finalized countervailing duties on OCP phosphate shipments can be determined by any administrative reviews requested by Mosaic or others for 2024 and onward, and are also subject to change by the CIT.

Mosaic in 2020 initially filed a petition with US authorities seeking import duties on Moroccan and Russian phosphates after alleging the imports materially injured the domestic fertilizer industry.

The US International Trade Commission in 2021 agreed that the imports were oversupplying the US phosphate market and imposed countervailing duties that have been the subject of legal exchanges disputes since then.

Though Mosaic has not rescinded its request for a review into Russian phosphate import duties, the potential return of Moroccan phosphate could help bring high US fertilizer prices back to pre-duty levels.

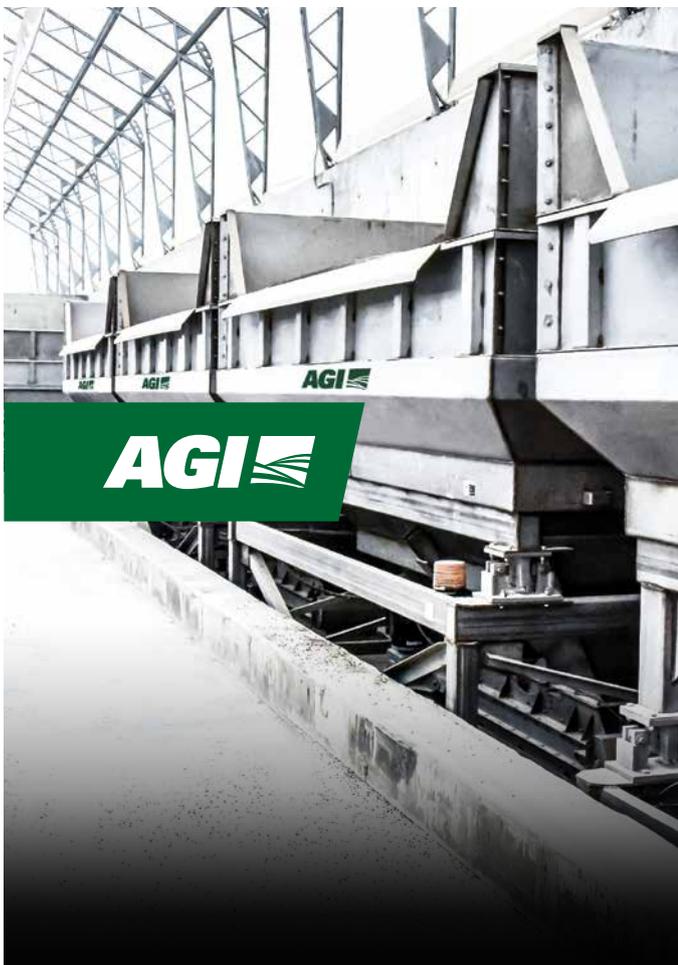
ASIA

Sri Lanka lifts fertilizer cash subsidy, demand to rise

Sri Lanka's domestic fertilizer demand is likely to increase in the upcoming 2024-25 Maha crop cultivation season, as the government has raised cash subsidies, largely targeted at paddy farmers. The Sri Lankan government raised the fertilizer cash subsidy from INR15,000 (USD51) per hectare (ha) to INR25,000 (USD85) for the upcoming season according to a statement from the president's media division.

As part of the cash subsidy programme, government funds will be transferred directly to farmers' bank accounts to ensure efficient delivery of fertilizers, the statement added.

Fertilizer intake in Sri Lanka for the corn and paddy season mainly occurs from mid-September to mid-November for urea, September to October for TSP fertilizers, and November to December for MOP fertilizer application.



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Fertilizer demand was slightly delayed this year owing to the late arrival of rainfall. Farmers also stepped into the market later than usual, as they were previously awaiting the government's announcement on fertilizer subsidies, minimum prices for paddy, and water release dates for irrigation this season.

The upcoming Maha cultivation season is expected to be good because of the high rainfall and the increases in subsidies. With most Sri Lankan importers also having high fertilizer stock inventories, farmers' demand would be catered sufficiently.

Japan's Idemitsu to join ExxonMobil's low carbon project

Japanese refiner Idemitsu is considering joining ExxonMobil's planned low-carbon hydrogen and ammonia production project in Baytown, US, and buying low-carbon ammonia from the project.

This is in line with the firm's decarbonisation aims and as it seeks to enhance its Shunan plant's competitiveness. Idemitsu has agreed with domestic trading house Mitsubishi, another offtaker of the project, to explore enhancing operational efficiency of clean ammonia carriers and import terminals, Idemitsu's participation in ExxonMobil's project as well as Idemitsu's low-carbon ammonia offtake.

The companies have not decided on details such as a timeline, Idemitsu's investment value and shares in the project and Idemitsu's offtake low-carbon ammonia volumes.

The project could make around 860,000 t/yr hydrogen from gas using autothermal reforming technology, ExxonMobil said. ExxonMobil aims to take a final investment decision (FID) on the project in 2025 and to start operations by 2029.

Mitsubishi aims to co-operate with Idemitsu by retrofitting and using its Namikata LPG import terminal in Ehime prefecture, located near Tokuyama complex, to realise efficient low-carbon ammonia receipt.

Idemitsu has attempted to set up an ammonia import base using the existing infrastructure of its Tokuyama complex at Shunan in western Japan's Yamaguchi prefecture, after scrapping its 120,000 b/d Yamaguchi refinery in March. It aims to supply over 1mn t/yr of low-carbon ammonia by 2030 to industry consumers, such as in the chemical and steel sectors, in the Tokuyama complex and nearby areas.

Idemitsu and Mitsubishi also joined a planned low-carbon ammonia production project at Lake Charles in the US state of Louisiana, the US, in the aim to export the fuel to Japan. The project is targeting to manufacture around 1.2mn t/yr of low-carbon ammonia by the April 2030-March 2031 fiscal year, using natural gas and carbon capture and storage technology.

AUSTRALASIA

Australian urea import record surpassed again

Australian imports of urea surpassed last year's record levels by the end of August, GTT data shows.

Urea imports into Australia reached 3.35mn t in the first eight months of the year, breaking the record of 3.18mn t of imports in 2023. Urea imports were notably 768,800t in June, up 66% compared to the same month of 2023 when 463,200t was imported.

Market participants have attributed the large increase to exceptional grains output across Australia, especially in New South Wales and Queensland, which has been supported by favourable rainfall.

One urea importer noted imports could have been higher last year but because an El Nino forecast, which failed to materialise, many farmers put off their urea purchases and this slowed imports.

Saudi Arabia has been Australia's largest supplier so far this year, exporting 597,000t, followed by the United Arab Emirates, Indonesia, Qatar, Oman and Malaysia with 571,400t, 539,200t, 497,300t, 493,500t and 309,600t respectively.

Imports from Indonesia have been notably much higher this year, up 212% already from 172,900t in the whole of 2023 while imports from China dropped significantly from 118,000t to just 17,000t on the back of export controls.

Australian urea imports typically peak in the middle of the year before trailing off until January and then picking up again. Australia imported 625,200t of urea from September to the end of the year in 2023. Assuming imports stay at that level or are surpassed, as has been the case for most months this year, total imports could reach 4mn t, double the 1.99mn t of urea imported in 2019.

Australia became entirely dependent on imports for urea in December 2022 after fertilizers and chemicals producer Incitec Pivot (IPL) shut down its Gibson Island fertilizer plant in Brisbane, Queensland.

Market participants expect urea imports to remain strong until Perdaman's AUD6bn (USD4bn) urea project at Burrup Peninsula, Karratha Western Australia project is completed. Construction of the project started in late April this year and is expected start producing around 2.3mn t/yr of urea in 2026. The plant has a 20-year agreement with Woodside's Scarborough Gas Project to utilise its natural gas as feedstock while the plant also has a 20-year urea offtake agreement with IPL with urea expected to be marketed to domestic as well as international export destinations. ■



MARKET ANALYSIS >

Commodity updates • Shipping news • Price watch

Soft commodities: Subdued wheat demand from China

Information from Agritel – An Argus Media company

Wheat summary

Demand from China and other major wheat importers is still uncertain, but the outlook for global wheat supply is also tightening. Argus lowered its 2024-25 ending stocks estimate for the top eight exporting regions by 2mn t to 58mn t, driven by a drop in production in both hemispheres. Argus has cut its 2024-25 EU+UK wheat production estimate by 2mn t to 132.4mn t on lower areas. The US Department of Agriculture (USDA) may also reduce its estimate in its upcoming report from the 134.9mn t cited in its September World Agricultural Supply and Demand Estimates (Wasde) report.

The European Commission has been reporting partial wheat exports for a few EU member states, driven by under-reported Bulgarian exports. Overall, we estimated cumulative EU wheat exports at 6mn t in early September, and current cumulative exports are likely to be close to 8mn t. Given the lower availability of wheat in the EU this season, this rate is higher than expected and already represents 20% of the 2024-25 export forecast from early September. We expect this pace to slow in the coming months, with EU wheat prices already uncompetitive for export. We have

lowered our expectations for the region’s feed and industrial demand, and cut our 2024-25 EU import forecast because of lower availability from Ukraine.

We have further reduced our 2024-25 wheat output projection for Russia to 81.3mn t from 82.6mn t to reflect ongoing weather concerns in Siberia and the Urals, with an increased probability that some spring wheat areas will not be harvested. Russian wheat exports are now projected at 46mn t in 2024-25, 1mn t below the previous Argus estimate, and down from USDA’s 48mn t. But the Russian export pace is expected to slow because of the lower supply for the second half of the marketing year. Russian wheat prices could be supported in the coming months, given the strong export pace so far and because the origin is still able to compete for destination markets.

In the southern hemisphere, weather risks in Argentina and Australia could also constrain 2024-25 production potential. We have lowered the wheat production outlook for Argentina by 1mn t to 19.2mn t because of the drought, but this is still above the five-year average. In Australia, we estimate production of 29.1mn t, compared with

32mn t for USDA, following late frosts and persistent dry conditions in several wheat-producing areas. While the overall level of wheat supply is tighter globally, lower demand, particularly in China, is helping keep the market balanced.

For the 2025-26 season, supply risks are already present, with the lack of rain in Russia raising concern about winter sowing in the central and Volga regions, as well as in southern Russia.

Feed grains Summary

The outlook for China’s grain imports remains a key driver for prices in the months ahead. With Chinese prices falling, imports are becoming less competitive. Argus has lowered its forecast for China’s grain imports in 2024-25 - to 11mn t of corn from 14mn t, and to 8mn t of wheat from 9mn t. We note that figures for Chinese imports of all feed grains have the potential to move lower still. USDA has revised up China’s barley imports to 10.5mn t, despite the government introducing a ban on imports of barley and sorghum some weeks earlier.

The US corn harvest is progressing apace, with yields confirming an above-average crop. Despite this, Argus still

Figure 1. Wheat price (USD/t)

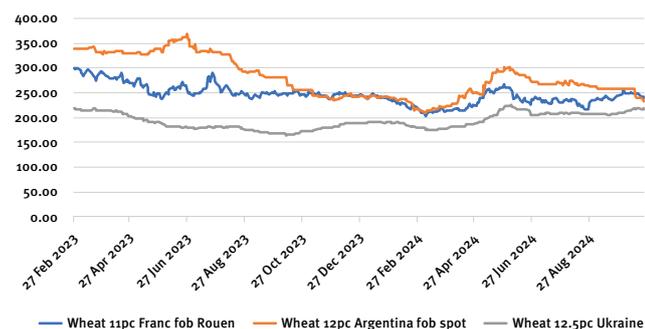


Figure 2. Corn price (USD/t)

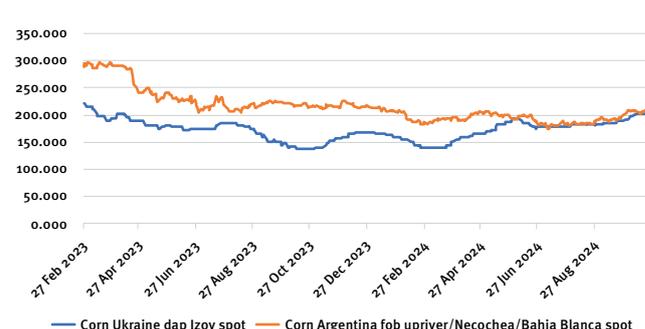
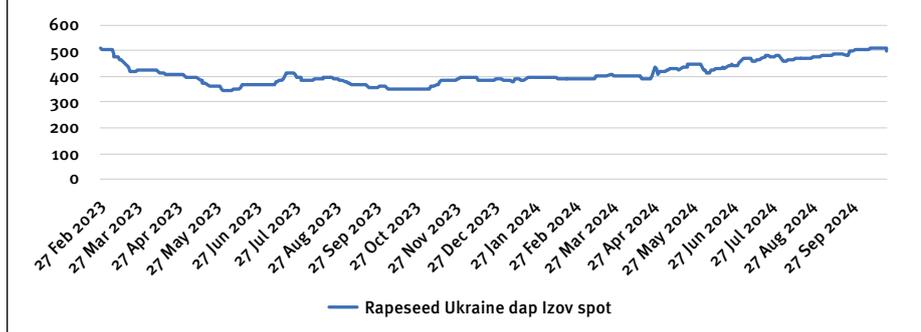


Figure 3. Rapeseed price (USD/t)

estimates yields slightly below USDA. Argus lifted its projection for US corn production in 2024-25 to 384.8mn t, up from 383.4mn t last month. But corn ending stocks in 2023-24 are down to 44.7mn t, according to the latest USDA report, which cited strong demand from the ethanol and feed sectors. This put carryover stocks back at their highest in four years, contrary to what the market had been expecting. US corn supply in 2024-25 is expected to be above the previous year.

The situation is different in South America and the Black Sea region. Conditions in South America in the run-up to sowing have raised concerns and acreages are expected lower in Argentina. Argus has kept its projection for Argentina's corn production in 2024-25 at 48.4mn t, up from 45.9mn t in 2023-24 and against USDA's 51mn t.

Argus expects Brazil's 2024-25 corn supply to be stable compared with the 2023-24 marketing year. Corn beginning stocks for 2024-25 should fall to 4.9mn t from 10mn t in 2023-24, based on rising food, seed and industrial (FSI) demand. Strong demand for ethanol is set to push FSI demand to 20mn t in 2024-25, up from 16.5mn t in 2023-24. An almost 4mn t rise in 2024-25 production to 125mn t from last marketing year will partially offset the fall in stocks. But the rise in FSI demand could reduce corn export potential to 42mn t in 2024-25, down from 4mn t the previous marketing year.

Meanwhile, a drop in Ukrainian supply and doubts surrounding corn quality in central Europe could prompt higher demand for French corn later in the marketing year. Argus estimates French

corn production at 14.2mn t in 2024-25, compared with 12.6mn t in 2023-24. That said, France's corn harvest is currently advancing at its slowest pace since 2013-14, so yields and quality could well change.

In the Black Sea region, drought continues to affect the end of the corn crop cycle, particularly in Russia. We have cut our forecast for Russia's 2024-25 crop to 12.3mn t, compared with 16.8mn t in 2023-24. With domestic demand stable, we expect exports of 2.4mn t in 2024-25, down from 6mn t in 2023-24.

Argus has cut its estimate for Australia's 2024-25 barley output to 10.7mn t, from 12.2mn t forecast by USDA, because of unfavourable weather.

Oilseeds summary

Argus has lowered its US soybean production estimate for 2024-25 by 4mn t to 124.3mn t, compared with 124.8mn t for USDA, on dry conditions at the end of the cycle. Stocks at the start of 2024-25, on the other hand, have been revised up to 9.3mn t to reflect lower crushing activity since late June. Total US soybean supplies in 2024-25 therefore remain high, exceeding the 2018-19 record. Stocks at the end of 2024-25 of 16mn t would be the third-highest in history.

The Argus 2024-25 Canadian canola production forecast was cut by 1.2mn t to 18.4mn t, following the release of lower-than-expected yield figures in Saskatchewan. At the same time, we have raised the canola 2024-25 beginning stocks projection by almost the same amount to 3.1mn t, in line

with the recent Statcan report. As a result, total Canadian canola supply is still set to be up from 2023-24. But a competitive Canadian canola market has been supporting a strong export pace. Some 1.7mn t of canola was exported in August-September, 1mn t above the five-year average for the period. Canola ending stocks 2024-25 are therefore forecast at 2.44mn t, down from 3.1mn t last marketing year.

In Australia, we have lowered the production outlook by 500,000t to 5.1mn t amid dry conditions that have prevailed in almost all the canola-growing regions. Total Australian canola supply for 2024-25 would therefore be 1.6mn t lower than for the 2023-24 season and almost 1mn t down on the five-year average. But this tighter supply will be largely offset by an expected drop in Chinese demand.

The rapeseed crushing pace remains strong in the EU, with volumes crushed in the first two months of the 2024-25 season at a record 4.77mn t. But we have lowered our forecast for rapeseed crushing in 2024-25 to 25.4mn t from 26.2mn t in 2023-24 because of lower global supply and poor crush margins in EU. The EU market has required rapeseed imports in recent years to meet crushers' needs. Argus estimates rapeseed imports to meet crushing demand for 2024-25 season at 7.4mn t, the highest since 2020-21.

On the sunflower market, the harvest is progressing well in Ukraine, with yields stabilizing. We estimate 2024-25 sunflower yields in Ukraine at 2.15 t/hectare (ha), compared with 2.45 t/ha last year. Production for 2024-25 is estimated at 12.28mn t. With beginning stocks down on last year, total sunflower seed supply is also down, by 2mn t to 12.9mn t.

In France, heavy rain has slowed the progress of the sunflower harvest, which is one of the latest in history. After late sowing, an unseasonably cold summer and rainy end to the crop development cycle, the risk of non-harvested areas is high. Argus therefore estimates French sunflower production 2024-25 at 1.6mn t, compared with 1.8mn t in 2023-24, with some major uncertainties going forward. ■

Hard commodities: US election energy impacts may be cushioned by political realities

Written by David Fyfe, Chief Economist, Argus Media, UK

At the time of writing, the US Presidential and Congressional elections due on 5 November look too close to call. That said, the two Presidential candidates have polarised approaches towards energy and climate policy in addition to their broader differences regarding the economy, trade and foreign relations. Much will depend on whether the winning Presidential candidate also obtains a sweep of Congress, enabling a clear run at some of their policy priorities, or if a split Congress (which currently appears more likely) acts as a restraint on more contentious policy proposals.

Trump and US energy flows

Given free rein, a Trump-2 Presidency would doubtless seek to accelerate oil and gas permitting, potentially opening up access to environmentally sensitive areas such as Alaska's Arctic National Wildlife Refuge (ANWR). Regulations designed to reduce methane emissions associated with oil and gas production and carbon dioxide emissions from power plants would likely be shelved, while the further opening-up of Federal areas for oil and gas leasing (notably offshore Gulf of Mexico) would doubtless be a priority. The Biden Administration (and presumably also an incoming Harris Administration) has, in contrast, sharply slowed, though not stopped entirely, leasing on Federal Lands.

However, although Trump has flagged his approach to US hydrocarbon production as "drill, baby, drill", seeking to lower domestic energy prices by stimulating supply growth via liberalisation of hydrocarbon permitting

and operating regimes, it remains to be seen whether this would actually move the needle in terms of US oil and gas production and exports. It is worth noting that US production of oil and gas has already hit record levels under the reputedly less supportive Biden Administration at 13.3 mb/d for crude and 125 bcf/d for natural gas.

Moreover, consolidation in the 8 mb/d US shale patch has seen financial returns take on greater importance than volumetric growth, while the presence of fewer but larger operators suggests less production response to short-term shifts in prices or marginal changes in operating regime. We would expect US shale oil supply to continue to show steady, though moderating, growth this decade under either a Democrat or Republican Administration, albeit the latter might see slightly more rapid expansion overall. But we would not anticipate step-change differences in oil production between the two political outcomes.

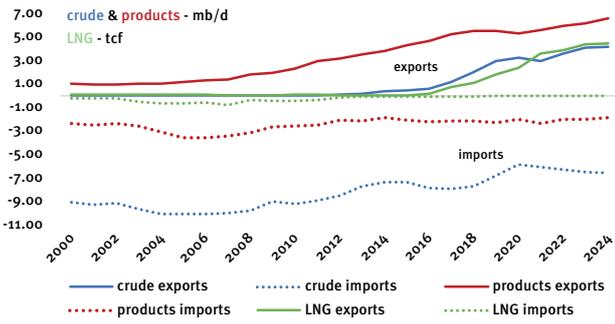
Arguably, there could be more upside potential for US natural gas production under a Trump Presidency than there is for oil. The Biden Administration implemented a licensing pause on new-build LNG export terminals while the Department of Energy studies whether incremental exports are in the public interest from an environmental sustainability or domestic pricing standpoint. However, this summer saw Federal courts block the Biden Administration's moratorium and any moves by a Trump Administration to resuscitate plans for new LNG export facilities could support domestic natural gas prices, thereby stimulating domestic production.

Harris would prioritise IRA provisions encouraging EVs and renewables

Kamala Harris has toned down her former outright opposition to the hydraulic fracturing techniques that have underpinned the development of 8 mb/d of US shale oil and 80 bcf/d of shale gas production over the last 15 years. It seems more likely that she would uphold the Biden Administration's priority of promoting renewable energy uptake in power generation and transport rather than dismantling traditional hydrocarbon energy systems per se. There may be trade-offs to be had under a Harris Administration, for example, allowing more Federal oil and gas leasing alongside fast-tracking the build-out of new electric transmission capacity to support incremental renewable generation capacity.

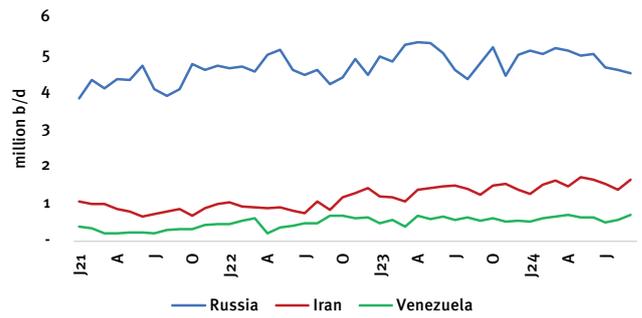
Harris, unlike Trump, stands firmly behind Biden's Inflation Reduction Act (IRA) which, together with the 2021 infrastructure law, was designed to encourage USD1 trillion of clean energy spending over 10 years, with the Biden White House claiming that some USD265 bn has already been spent. She has gone on record to firmly support reductions in red tape surrounding clean energy investment and existing tax incentives, credits and rebates enshrined in IRA, including USD7,500 per vehicle electric vehicle (EV) tax credits and the associated EPA tailpipe emission standards proposed for 2027-2032 model vehicles. While Harris might struggle to re-impose an LNG permitting moratorium, she could

Figure 1. The evolution of US petroleum trade



Source: EIA

Figure 2. Crude and condensate exports



Source: EIA

potentially toughen environmental standards for new terminal approvals.

During the electoral campaign, candidate Trump pledged to rescind all un-spent IRA funding and end electric vehicle tax credits, presumably to release money for some of his proposed corporate and personal tax cuts. However, aside from potential constraints in doing so if there is a split Congress, he may be further constrained by oil industry backing for certain tax credits such as those for hydrogen production and carbon capture, and by the significant clean energy funding already allocated to Republican-led districts.

In short, if the US Congress continues under split control, then the more ambitious segments of Harris and Trump’s domestic climate and energy policies may struggle to be enacted. This potentially leaves their broader trade, economic and foreign policy priorities as potentially having greater impact on global energy markets than domestic energy measures themselves.

Tariffs potentially have greatest macroeconomic impact

A second Trump administration could potentially impose 20% across-the-board import tariffs on merchandise goods, reaching as high as 60% for imports from China. Previous episodes of tariff increases by the US have coincided with an appreciation of the US dollar, which if repeated would be a headwind for US energy exports. The dollar is already considered by

many observers (including Mr Trump himself) as over-valued, and given potentially widening differentials between central bank policy rates in the months ahead, and what looks like a fairly robust US economy, attempts to drive down the value of the dollar look unlikely to succeed in the short term at least. The prospect for higher domestic inflation, renewed monetary tightening and the drag of elevated dollar valuation on exports potentially represent unintended consequences from a Trump Administration that might depress overall levels of US GDP over the medium term. Modelling by Oxford Economics has shown these to potentially have a steeper depressant effect on the US economy than that caused by signature Harris policies to raise taxes on corporate and capital income. Needless to say, such a broad application of tariffs would have a profound, and potentially negative impact on the broader global economy, not least on China which is already struggling against deflationary pressures and weak consumer demand.

International sanctions with one eye on US gasoline prices

Likely changes to international sanctions policy as related to energy remain unclear. Given that Russian oil and gas revenues in the first nine months of 2024 are reported some 50% higher than the corresponding period of 2023, a tightening of G7 oil price cap provisions and enforcement might be a priority for a Harris administration. It is much less certain that an incoming

President Trump would accord stiffer sanctions on Russian hydrocarbon exports the same degree of priority.

Crude and condensate exports from Iran and Venezuela have also risen in the last two years, with much of this oil destined for China. In his first term, President Trump terminated the JCPOA nuclear deal with Iran and pivoted Middle East policy efforts away from Israeli-Palestinian peace deals and towards greater rapprochement between Israel and Gulf States such as Saudi Arabia and the United Arab Emirates. Both Harris and Trump might try to more strictly enforce existing US sanctions on Iran, thereby curbing a flourishing RMB-denominated oil trade that has sprung up with China’s independent refiners. Whether the Chinese government or buyers would be sufficiently concerned so as to staunch this trade is another matter.

One further limitation on tighter sanctions-based restrictions on crude exports from Russia, Iran or Venezuela is the potential impact on crude prices. At the time of writing in late-October the threat of Israeli attacks on Iranian energy infrastructure, and any subsequent Iranian moves to restrict cargo flows via the Straits of Hormuz, is lending Brent crude a fairly solid USD75/bbl floor. Average US retail gasoline prices are currently below USD3.30/gallon and well below their USD5 peak in 2022. Nonetheless, US policy makers will remain cautious about enacting any measures that risk propelling fuel prices higher, as gasoline pump prices remain a clear bell-weather of consumer sentiment for the US economy. ■

Argus Market Insight Paper:

Spain poised for firmer cross-Atlantic corn imports

Exporters in North and South America could take the opportunity to grow their share in Spain's feed grain market in 2024-25, capitalising on lower exportable supply from the EU and the Black Sea region.

Spain is the largest grain importer in the EU, accounting for 40pc of the bloc's imports over the 2023-24 season (October-September), according to data from the US Department of Agriculture (USDA).

Cuts in Spain's traditional suppliers' feed grain output have pressured buyers to purchase unusually high amounts of US corn to fill the gaps left by diminished exports from Ukraine, Romania and France.

The US exported 590,900t of corn to Spain in the 2023-24 US marketing year, which ended on 29 August, USDA data show. This is more than five times the US average yearly exports to Spain across the previous five seasons, according to customs data. And US export pace to Spain shows little sign of slowing, with 53,900t already sold for shipment to Spain in the first week of 2024-25.

The US has historically exported little-to-no corn to Spain, with a notable exception of the spring of 2022, when US exporters stepped in to replace severely constricted flows from Ukraine. In contrast, Spanish buyers have opted for US product this season because of competitive pricing, rather than logistical problems in other exporting countries.

Demand for US corn ramped up following Ukraine's seasonal reduction of exportable corn supply. But rather than filling the gap with Brazilian crop as usual, Spain has turned to US product instead.

Spanish buyers could continue to seek both US and Brazilian corn cargoes

This switch from typical seasonal flows was a result of US corn exporters offering more competitive prices on a cif Spanish Mediterranean ports basis, compared with those of Brazilian suppliers. The unusual spread between the two origins comes as favourable weather in the US has lifted forecasts for the country's corn output this season, while firm demand from domestic crushers in Brazil has pushed up corn export prices and drawn product away from the international market.

Ukraine leaves gap in Spanish import market

Looking ahead, Spanish buyers could continue to seek both US and Brazilian corn cargoes even after November-December, when Spain typically switches back to Ukrainian new-crop supply.

Ukraine's corn harvest could be just 22.85mn t in the 2024-25 season, according to Argus forecasts. This would be the country's lowest output since 2012-13 and more than 10mn t below the previous five-year average.

And ending stocks for the 2023-24 marketing year were below-average relative to the previous five seasons,

which means carry-over volumes will not be sufficient to offset Ukraine's multi-year low production. Reflecting this, Argus forecasts that Ukraine's corn exports will fall to a seven-year low of 18mn t in 2024-25.

US and Brazil could compete for market share

Lower supply from Ukraine has pushed buyers to seek out other options, opening opportunities for US and Brazilian corn exporters. Increased supply of US corn has brought down prices for cif Mediterranean cargoes enough to out-compete more conventional origins. This trend is likely to let the US continue to take market share from origins in the EU and Black Sea region in 2024-25.

Total US corn stocks are set to rise on the year in 2024-25, owing to above-average production and beginning stocks, according to the USDA.

Brazil's corn exports to Spain could begin to ramp up in the coming months, despite a slower Spain-bound export campaign so far this season. Sellers have been choosing to sell to Brazil's industrial ethanol crushers this year so far, as they have been bidding above fob prices

Figure 1. Major corn exporters to Spain (mn t)

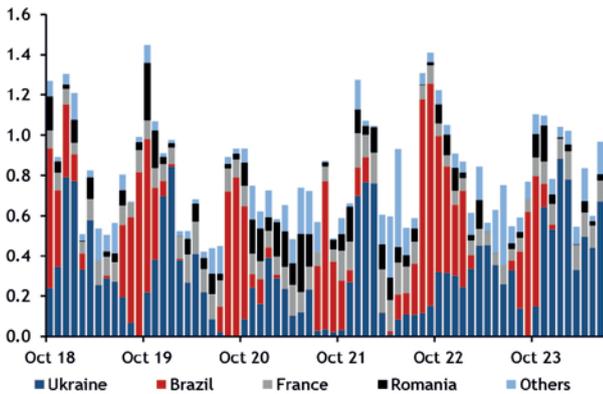


Figure 2. US corn exports to Spain ('000t)

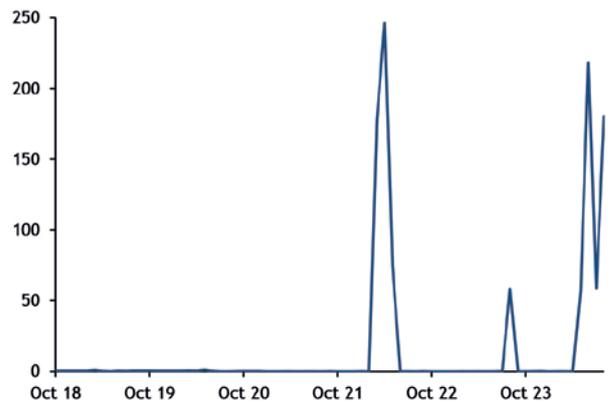


Figure 3. Ukraine vs Brazil corn exports to Spain ('000t)

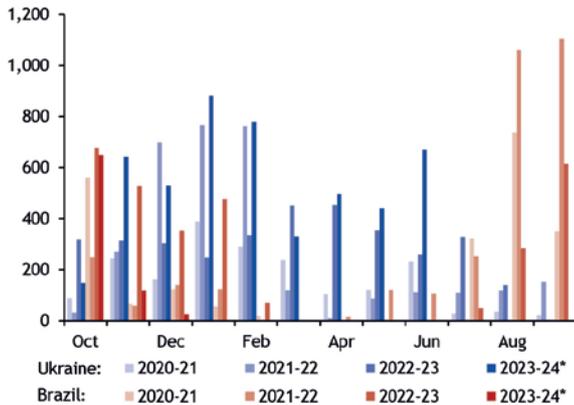
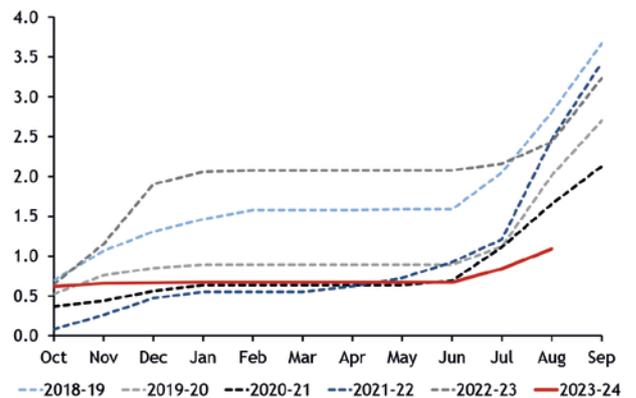


Figure 4. Brazil corn exports to Spain (mn t)



and diverting volumes away from the export market.

But despite this competition from Brazil’s domestic market, demand for cif Spanish Mediterranean cargoes has persisted, according to market participants. And exports of Brazilian corn are likely to trend higher across the board in the coming months. Brazil would need to export an average of 4.5mn t/month in September-January to reach national supply company Conab’s projected 36mn t of exports in 2024-25 (February-January), based on year-to-date export data from Brazil’s National Association of Cereal exporters.

Limited alternatives to Americas corn

As for Spain’s alternative feed grains sources in the EU, sellers may struggle to meet demand. French grain production is forecast to fall significantly in 2024-25, with a small rebound in corn production more than offset by drops in winter feed grain output, according to Argus forecasts.

Argus projects French wheat production will fall to its lowest in 41 years, drastically curbing exportable supply of feed-grade wheat. And France’s barley production is expected to decline to its lowest since 2020-21.

Romania’s corn production is set to fall to its lowest since 2012-13.

Meanwhile, wheat quality parameters, including protein content, are expected to increase on the year in Romania and Ukraine in 2024-25. Around half of Ukraine’s 2024-25 wheat harvest is expected to be feed-grade product, compared with a 70pc share a year earlier, according to market participants. This will further thin the country’s exportable feed grain supply.

This paper draws market intelligence from the Argus AgriMarkets daily and AgriMarkets Outlook services. For more information contact agriculture-m@argusmedia.com ■



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Shipping and trade news

EU ETS to fund zero-carbon fuels premium: ECSA

EU emission trading system (ETS) revenues should be used to reduce the price gap between conventional and alternative marine fuels, recommends the European Community Shipowners' Association (ECSA).

The shipping sector is one of the most difficult to decarbonize and requires public and private funding, according to ECSA. The EU ETS generates revenues which are fed into EU budgets and individual countries' budgets. These revenues should be used to support the uptake of low and zero carbon fuels, ECSA suggests. The EU should also use other mechanisms such as carbon auctions and "carbon contracts for difference" (CCfD) to scale up production of low and zero carbon fuels. CCfDs is a form of insurance, where a government agrees to pay a company the difference between the current market price of carbon emissions and a predetermined strike price if the market price falls below that level.

The EU's ETS for marine shipping commenced this year and requires that ship operators pay for 40% of their GHG generated on voyages within, in and out of the EU. Next year, the EU ETS emissions limit will increase to 70%, and jump to 100% in 2026.

The ECSA recently published another list of recommendations, which asked

that at least 40% of the clean fuels needed for FuelEU targets are be produced in Europe. The EU's FuelEU maritime regulation will require ship operators traveling in, out and within EU territorial waters to gradually reduce their greenhouse gas (GHG) intensity on a lifecycle basis, starting with a 2% reduction in 2025, 6% in 2030 and so on until getting to an 80% drop, compared with 2020 base year levels.

First global ammonia transfer at anchorage

The world's first ship-to-ship transfer of ammonia using vessels at anchorage in a working port environment has been completed. The transfer is a significant step towards realizing ammonia as a shipping fuel and enable bunkering worldwide. Yara contributed with their experience and knowledge on safe handling of ammonia, nominated an ammonia vessel from their Time Charter fleet, and the ammonia used in the transfers.

"This demonstrates that ammonia transfer can be done with the highest safety standards and efficiency in a working port environment. The transfer is a major milestone to decarbonize shipping using low-emission ammonia as fuel," says Murali Srinivasan, SVP Commercial Yara Clean Ammonia.

The operation is a result of the collaborative relationship between

Yara Clean Ammonia, Pilbara Ports Authority and the Global Centre for Maritime Decarbonisation (GCMD). It was conducted in Port Dampier in Western Australia's Pilbara region, as part of the work to enhance the Pilbara's potential as a bunkering hub to fuel ships with low-emission ammonia. Low-emission ammonia is produced with renewable energy and electrolysis of water or with carbon capture and storage. Ammonia does not emit CO₂ when burned.

The Pilbara Ports Authority and Yara Clean Ammonia have been working together for more than two years investigating the potential demand for ammonia as a fuel, required bunker infrastructure, safety guidelines and the required regulatory framework. To develop the transfer, this partnership was expanded with GCMD, who successfully attracted additional partners to help ensure a safe and efficient execution of the transfer operation. Port Dampier has ongoing experience with ammonia cargoes with Yara Pilbara's nearby operations shipping an incident free 11.8 mn t to date.

The two ship-to-ship transfers were undertaken between the Green Pioneer, 35,000 cubic metres (cbm) ammonia carrier (owner MOL), and the Navigator Global, a 22,500 cbm ammonia carrier (owner Navigator Gas). The trial involved a dual transfer of 4,000 cbm (approximately 2,715

FREIGHT RATES

POTASH	Price type	Units	Timing	Low	High	Date
Dry potash Vancouver - China 60-65kt	outright	USD/t	prompt	26	28	17-Oct-24
Dry potash Red Sea - WC India 25-30kt	outright	USD/t	prompt	26	33	17-Oct-24
Dry potash Baltic Sea - Brazil 30-40kt	outright	USD/t	prompt	30	45	17-Oct-24
Dry potash Baltic Sea - SE Asia 25-30kt	outright	USD/t	prompt	75	90	17-Oct-24
Dry potash Vancouver - SE Asia 25-30kt	outright	USD/t	prompt	64	66	17-Oct-24
Dry potash Baltic Sea - China 60-65kt	outright	USD/t	prompt	60	70	17-Oct-24
Dry potash Baltic Sea - US Nola 50-55kt	outright	USD/t	prompt	30	45	17-Oct-24
Dry potash Vancouver - Brazil 30-35kt	outright	USD/t	prompt	47	49	17-Oct-24
Dry potash Hamburg - Brazil 30-35kt	outright	USD/t	prompt	20	22	17-Oct-24

SULPHUR	Units	Low	High	Date
50-60kt - Vancouver-China	USD/t	28	31	17-Oct-24
Below all 30-35kt				
Mid East - EC India	USD/t	20	22	17-Oct-24
Mid east - North/River China	USD/t	25	27	17-Oct-24
Mid East - South China	USD/t	22	23	17-Oct-24
Mid East - Brazil	USD/t	26	28	17-Oct-24
Mid East - North Africa	USD/t	40	46	17-Oct-24
Mid East - South Africa	USD/t	25	27	17-Oct-24
Black Sea - North Africa	USD/t	45	60	17-Oct-24
Black Sea - Brazil	USD/t	55	65	17-Oct-24
Baltic - Brazil	USD/t	60	70	17-Oct-24
Baltic - North Africa	USD/t	45	55	17-Oct-24
35-40kt - US Gulf - Brazil	USD/t	26	27	17-Oct-24

t) of ammonia, first from the Green Pioneer to the Navigator Global, and then back to the Green Pioneer.

Murali Srinivasan, SVP Commercial Yara Clean Ammonia said collaboration on safety is innate to our thinking and we are very proud to be part of this tripartite project and active collaboration and contributions to the positive outcome of the trials.

Large shipment of donated fertilizer leaves Latvia for Sri Lanka

A cargo of donated mineral fertilizer has been shipped from Latvia to Sri Lanka on behalf of the UN World Food Program. The vessel 'Asian Majesty' departed from the Gulf of Riga en route to Sri Lanka, carrying a load of 55,000 t of mineral fertilizers.

This is the fourth shipment of mineral fertilizers of Russian origin that were

being stored in Latvia and belong to companies subject to the European Union's sanctions. The previous three shipments, totalling 75,000 t, were delivered to Kenya, Zimbabwe and Nigeria in 2023.

The Latvian government passed a decision on 6 December 2022 to support the donation, through the UN World Food Program, of mineral fertilizers owned by companies subject to EU sanctions. The United Nations World Food Program continues to organize the removal of approximately 72,000 t of sanctioned mineral fertilizer remaining in the territory of Latvia so as to help the country's most in need of those products.

Consortium makes progress on US NH₃ bunker vessel

A group of companies continue to make progress on developing a ship-to-ship ammonia bunkering vessel for

the US east coast, targeting to begin commercial operations by 2030.

The consortium received in principle approval in August for their ammonia bunker vessel from US classification society the American Bureau of Shipping (ABS). The seven companies comprise Japanese trading house Sumitomo, ABS, Hong Kong-based shipping firm Fleet Management, American ship management company TOTE Services, Danish shipping firm AP Moller Maresk, Maresk's decarbonisation research institute Maersk Mc-Kinney Moller Center for Zero Carbon Shipping (MMMCZCS) and the US' Georgia Ports Authority. US marine engineering firm Vard Marine US also took part in barge design and engineering.

The bunker vessel is designed to be capable of supplying fuel ammonia to Norwegian shipping company Hoegh Autoliners' car carriers, as well as an ammonia-fuelled container vessels developed by MMMCZCS. This will be

the first ammonia bunkering vessel in the US, Sumitomo said.

The partners expect to operate the ship on the east coast of the US such as Jacksonville port in Florida and Brunswick and Savannah ports in Georgia. These ports are increasingly receiving container ships and car carriers, with Sumitomo expecting demand for fuel ammonia for such vessels to grow in the future.

Sumitomo is in charge of building a supply chain of green or blue ammonia for bunkering. It now plans to buy blue ammonia from the US Gulf of Mexico region, without specifying volumes.

The company aims to enhance its carbon neutral marine fuel and ammonia bunkering businesses with the US project. It has also participated in an ammonia bunkering project in Singapore, aiming to commercialise it by the mid-2020s.

Yara drives hydrogen economy with new ammonia import terminal

Yara International officially opened its new ammonia import terminal in Brunsbüttel, Germany. Brunsbüttel is located on the North Sea and Kiel Canal, making it an ideal hub for enabling the hydrogen economy in Germany. With the new terminal, Yara has the infrastructure to enable imports of up to 3.0mn t of low-emission ammonia to Europe annually.

The terminal is part of Yara's strategy to strengthen its core nitrogen business while generating value-accretive growth in a low-carbon future.

“As the world’s largest shipper and distributor of ammonia, Yara Clean Ammonia is in a pole position to secure low-emission ammonia supply to Germany, at competitive prices. With its leading global ammonia position, Yara can help kick-start the German hydrogen economy, laying the ground for a net zero future,” says Hans Olav Raen, CEO Yara Clean Ammonia. Up to 3 million t of low-CO₂ ammonia can be imported annually

NITROGEN/UREA		Units	Low	High	Date
Middle East - US Gulf	45kt	USD/t	31	33	17-Oct-24
Middle East - Thailand	30kt	USD/t	29	32	17-Oct-24
Middle East - Brazil	40kt	USD/t	22	24	17-Oct-24
Baltic - Brazil	30kt	USD/t	30	39	17-Oct-24
China - India	60kt	USD/t	18	22	17-Oct-24
Algeria - Brazil	30kt	USD/t	20	22	17-Oct-24
Algeria - French bay	12kt	USD/t	19	21	17-Oct-24
Baltic - EC Mexico	30kt	USD/t	35	40	17-Oct-24
Baltic - WC Mexico	25kt	USD/t	52	59	17-Oct-24

PHOSPHATES		Units	Low	High	Date
Morocco – Brazil	30kt	USD/t	20	22	17-Oct-24
Tampa – Brazil	30kt	USD/t	29	31	17-Oct-24
Saudi Arabia – EC India	30kt	USD/t	21	23	17-Oct-24

AMMONIA		Units	Latest	Date
Ras al Khair - Ulsan, 23kt		USD/t	75	22-Oct-24
Ras al Khair - Kakinada, 23kt		USD/t	42	22-Oct-24
Ras al Khair - Kandla, 23kt		USD/t	21	22-Oct-24
Point Lisas - Ulsan, 23kt		USD/t	121	22-Oct-24
Point Lisas - Houston, 23kt		USD/t	32	22-Oct-24
Point Lisas - NW Europe, 23kt		USD/t	52	22-Oct-24
Bontang - Ulsan, 23kt		USD/t	33	22-Oct-24

via the terminal in Brunsbüttel. This would correspond to 530,000 t of hydrogen or around 5% of the total European hydrogen target for 2030.

CSX forecasts softer 4Q rail demand

Eastern US railroad CSX said it expects that fourth quarter commodity market conditions will be mixed, limiting some freight demand.

"Going into the fourth quarter, near-term conditions look modestly more challenging," chief executive Joe Hinrichs said.

But the railroad expects "modest volume growth", supported by a few segments including chemicals and agriculture. But lower locomotive fuel prices and the impact of international coking coal prices, which are linked to export rail contracts, could drive a decrease in total revenue during the fourth quarter. He estimated that impact at roughly USD200mn compared with last year's fourth quarter revenue of USD3.68bn.

CSX expects to see a carryover of year-over-year momentum in chemicals, agriculture and food, forest products and minerals, while metals and automotive will continue to be challenged.

The outlook for fertilizer shipments is mixed following the third quarter as a decline in long-haul phosphates shipments persisted. Volume was negative, but the railroad was able to haul some profitable spot shipments.

Shipments of fertilizer fell to 45,000 carloads in the third quarter, down by 4% from a year earlier. Fertilizer revenue dropped to USD118mn, down by 5% from a year earlier.

CSX expects growth in some market segments. Chemicals freight demand is expected to continue growing following "consistent, broad strength across plastics, industrial chemicals, LPGs, and waste.

That demand helped boost chemicals volume by 9% compared with a year earlier. Chemicals revenue rose to USD727mn in the second quarter, up by 13% compared with a year earlier. ■

Price watch

These market insights are provided by **Argus Fertilizer Analytics team**

AMMONIA

Bullish pricing across all major benchmarks for Q4

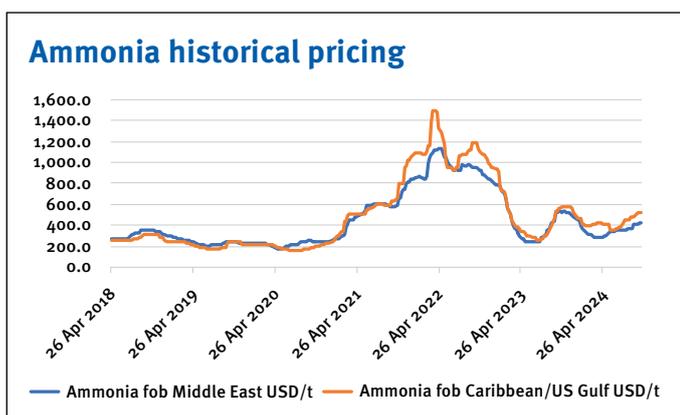
Global sentiment has realigned after months of differing price movements on either side of the Suez Canal. The tightness affecting markets around the Atlantic basin over the past few months persists, but is now being matched by markets east of Suez after a stagnant third quarter for regional prices. An unexpected Saudi Arabian outage prompted the sentiment switch, adding to a now delayed planned maintenance at a time when Indian buyers are actively seeking spot cargoes. Ma'aden was forced to halt production at its 1.1mn t/yr MWSPC unit in early September for a month following a fault and will proceed with planned maintenance on another 1.1mn t/yr unit for a month from early October. With much less ammonia available to buyers in India during the peak purchasing period for rabi, delivered prices have responded. Compounding the tighter market scenario is the lack of spot availability from Indonesia as producers increasingly turn their attention to the domestic market. In the west, production rates in Trinidad are on the rise after a series of gas cuts over the summer months, but the fall fertilizer demand season in the US is approaching, with pre-pay deliveries expected from mid-October. Buyers in Morocco and Europe remain active, keeping west of Suez markets short.

The fourth quarter of this year will be characterized by bullish pricing across all major benchmarks as production struggles to keep up with seasonal demand requirements, further amplified by production outages and lower merchant supplies. We expect a peak to be reached in late November or December in most regions, at which point fertilizer demand in the US, Europe, and India typically begins to weaken. New supply in the US Gulf and potentially from the Taman terminal

project in Russia will shift the fundamentals into oversupply by the turn of the year, which will be especially apparent in the US and Europe. We currently assume Gulf Coast Ammonia's 1.3mn t/yr merchant unit will produce test volumes before the end of the year, with commercial operations beginning in earnest in late 2024. However, with regards to Taman, exports have been delayed due to the Russian government's unwillingness to grant export licenses for dangerous products via the port, which is within striking distance of Ukraine's military. When the government will deem it safe enough to allow exports to begin is uncertain, and there is a growing risk that no exports will be possible while the conflict persists. For now, we are accounting for a 23,000t shipment per month in our balance forecast starting in January.

If our supply assumptions hold, the ammonia market should begin its transition back towards the price stability of 2015-20 in 2025. Prices will still follow seasonal fluctuations, but sudden price shifts caused by unplanned supply shocks should be softened by additional market supplies. The global market should be well-supplied in the first quarter as demand pulls back, with sharp downward price corrections occurring. However, some resistance from the US spring application season will slow west of Suez price declines over the second quarter. A nadir will be reached in August at USD285/t fob Middle East and USD300/t fob Caribbean on a midpoint basis, when demand is weakest. Stronger prices will return in the fourth quarter as European gas prices build, and buyers return to the market ahead of crop seasons in several major demand hubs towards the end of the year. Improved supply options to west of Suez markets should prevent prices from reaching similar levels to this year in the region — Tampa cfr is expected to reach USD370/t by the end of the year — but there remains a risk that poorly timed outages could drive prices up rapidly.

While we still expect price movements in the ammonia market in 2025 to be less volatile, geopolitical developments have brought into focus fresh risks to our price forecast that could change this narrative. We are monitoring the situation in the Middle East to assess the threat to merchant ammonia supply from the region, with a particular concern being a scenario in which Iran forces the closure of the Strait of Hormuz, a critical passage linking Mideast Gulf states to the Indian Ocean. Such an event could potentially strand 2.9mn-3.4mn t/yr of merchant volumes from other nations that traverse the strait. We do not forecast political decisions such as this, and it is our policy to update forecasts only when such factors are enacted. Therefore, there will be no change to our balance or pricing as a result of this threat, but it does add more risk to our forecast, with potentially dramatic consequences for ammonia prices if Middle Eastern supply is impacted.



PHOSPHATES

Southeast Asia demand wanes

Major phosphate markets are beginning to move into the off-season, and upwards price momentum for prompt demand will soon run out of steam. Looking east of Suez, India remains the only major active DAP market as Pakistan and Southeast Asia are largely satisfied, removing them as price support factors in the near term. Given how much India has delayed its buying, there is still substantial appetite for imports. And because the Indian government has committed to covering import losses, we anticipate still room for DAP supplier prices to firm during the final push for Rabi tonnes. As Chinese suppliers are avoiding direct sales into India, this is adding some additional support, but overall pricing will be tempered by limited alternative outlets for sellers of DAP.

We expect Indian buyers to remain more active than usual in the off-season to improve stock positions heading into 2025. This will prevent prices from dropping materially, despite a global DAP surplus forecast in November and December. China is expected to curtail export volumes as it prioritizes the domestic season, but we anticipate that the exports will not be as severely dampened over the first quarter of 2025 compared with the beginning of this year. As with this year, the reintroduction of more normalized exports in the second quarter will weigh on fob levels, but we anticipate a more gradual ramp-up of availability, with nearby regions absorbing tonnes first, limiting the softening effects. The Australian import season is expected to pick up soon and will benefit from improved availability from China during its domestic season, pushing some of Australia's import demand into early next year, as there is less urgency to secure tonnes before the Chinese season is in full swing.

Looking west of Suez, supplier prices to European markets will rise gradually as we approach the spring season. But volatile weather has made fertilizer demand more reactionary than proactive in 2024, meaning it is still underapplying versus historical levels, particularly in West and North Europe, despite being an improvement from last year. We expect more of a recovery in 2025.

In Brazil, it is widely thought that MAP prices have peaked. Given poor barter rates and limited supply, we anticipate trade

will slow as demand eases, allowing prices to soften. However, a MAP premium in the US and the need to replenish stocks relatively early next year will prevent prices from declining significantly during the off-season. A sustained global MAP surplus across the first half of 2025 will gradually erode MAP cfr Brazil, but a quickly developing deficit and notable firming in the third quarter will offset a significant portion of the price decline in our forecast period. In Argentina, demand could improve as a result of a heavier portion of crop planting being soybean, which will add to phosphate demand, but this is not expected to materially impact our forecast.

The US has been battered by hurricanes recently, affecting fertilizer production and port logistics, and this has extended some end-of-season price support for buyers looking for final autumn application tonnes. But this will soon subside, and DAP fob barge prices will soften as demand ticks lower and farmers focus on the harvest and application. Although Mosaic has withdrawn its legal proceeding for the 2023 duty on Moroccan ammoniated phosphates, there is still uncertainty over whether trade between the two partners will return to historical levels. For now, although we expect a slight improvement, we still assume that the US will continue to face supply challenges in at least the first half of 2025, particularly for MAP. This is reflected in our larger spreads developing ahead and during the spring buying window.

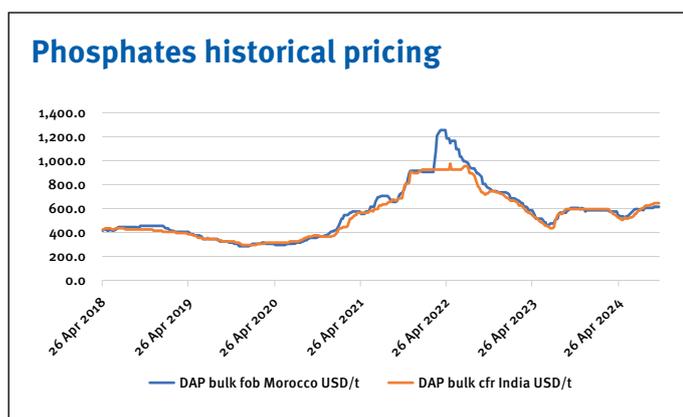
POTASH

Slow demand puts pressure on pricing

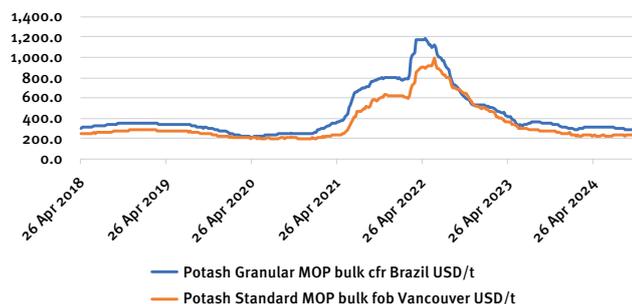
The market outlook is generally soft to stable as MOP availability is considered to be high globally and demand has weakened because of poor weather or high prices of other fertilizers. Although overall affordability is higher than in recent years, falling crop prices are leading to farmers limiting purchasing. China agreed imports until year-end at USD273/t. Chinese imports in the first half of this year were at record levels, and contract shipments, railed volumes from Belarus and Russia and imports from Laos should all support Chinese imports for the rest of the year. Domestic demand is slow, and most product will be used to rebuild inventories ahead of spring application.

After a considerable delay, India finally settled its MOP contract for 2024 at USD279-283/t cfr. The delay in contract signing, combined with low government financial support, means that Indian MOP consumption will show little increase this year, even with favourable monsoon rainfall. Contract settlements may have established a floor price in southeast Asia but there is little upward momentum on price because of good product availability and poor weather limiting demand. Tenders for plantation needs should emerge in October, for shipments into 2025, at prices similar to current levels, which should hold to year-end. The granular MOP market globally is well supplied, and prices are trending generally downwards. In Brazil, record imports in the first half of the year have raised stocks on hand ahead of the main application season.

Prices in Brazil have been softening as demand has not kept pace with supply, as high phosphate prices have reduced



Potash historical pricing



buying for NPK production. The outlook is for price movement to slow as market liquidity declines after the main demand window closes. Seasonal demand in the US brought some stability to prices recently, but this was probably only temporary, as domestic supplies are high and threatened disruption to Canada’s rail shipments owing to strike action failed to materialise. Prices are expected stable to soft in the near term. The European market faces a similarly soft outlook, as poor weather has truncated the agricultural season, and declining crop prices dampen affordability. Weather has had a similarly negative effect on the southeast Asian granular market, where high stocks will limit import demand and price movement until the end of the year.

A main driver behind the well-supplied MOP market is Belarus, which averaged 967,000 t/month of MOP shipments on the Russian railway network in April-August and is expected to maintain this level to year-end, giving total exports for the year of 10mn t. Combined with Russian exports recovering to over 12mn t this year, we expect year-on-year growth of almost 4mn t from the region this year. These suppliers are selling globally apart from to Europe, resulting in this market holding a consistent price premium.

With such growth from the CIS, production ramp-up forecast for other producers this year is limited. Laos’ exports continue to increase but capacity growth has slowed after water inflow issues for Asia potash, so the year-on-year change will be smaller in 2024 than previous years. Canadian exports are forecast near flat year on year. Mosaic’s decision to return Colonsay to commercial production is only planned to offset maintenance downtime at the larger Esterhazy site rather than increase production.

Middle Eastern exports will be likely to decline on 2023 because of difficulties in shipping through the Red Sea, particularly for ICL. German MOP exports are also likely to fall year on year as K+S focuses on SOP production. The SOP market is almost exactly opposite to the MOP market, which has resulted in an unusually wide premium for SOP over MOP. SOP supply is exceptionally tight, with China not exporting and European Mannheim producers limited in their ability to raise operating rates because of short sulphuric acid supply. Other producers are operating at high rates with limited capability to increase. As such, there is no obvious supply-side relief in the near term, which should support current price

levels, but buyers are aware of the unusual premium and may start to withdraw from the market if it widens further.

Canada’s rail strike in August was resolved quickly without significant market impact, but a similar event at Vancouver port has more disruptive potential. Given the current market balance, it is unlikely to have a significant price impact. Elsewhere, shipping freight rates through the Panama Canal are normalising after rainfall replenished water levels, but the cost for Red Sea transit remains elevated because of attack risk. Some vessels are choosing to avoid the region, but the alternative route around Africa causes high shipping costs between Europe, the Middle East and Asia.

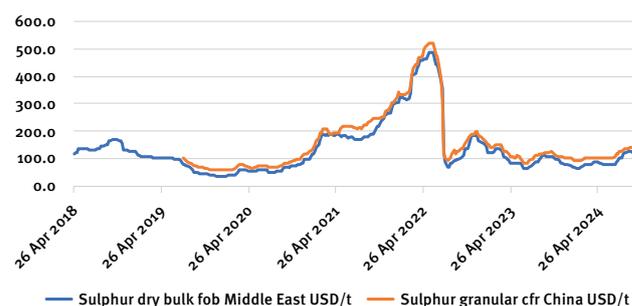
SULPHUR

Import demand expected from Brazil

Global sulphur pricing for the fourth quarter is forecast to remain broadly stable to soft, with a slight uplift in some markets expected to continue. This is based on firming fundamentals as fourth quarter contracts are settled, and demand emerges from key markets and projects. From November, we expect a slowdown in activity amid market reservations on both buyer and trader-side perspectives, before softening into the end of the year and into the first quarter of 2025. This is based on seasonal demand tailing off and refinery maintenance schedules. The global spot market is currently facing significant uncertainties, with activity stalling over recent geopolitical developments, the split market sentiment in China, and the potential rising of freight rates with the escalation of the conflict in the Middle East.

Firming factors for the short term include expected import demand from Brazil, with Eurochem’s sulphur burner needing tonnes following the start-up of its Serra do Salitre processed phosphates project earlier in the year. CMOC may also enter the market, further supporting the short-term view. Tonnes will likely be sourced from the US, where pricing has now stabilised following the initial disruption and concern surrounding Hurricane Milton. Elsewhere there is also regular and growing demand from the Indonesian nickel sector, keeping prices firm from the Middle East, with consumption for nickel HPAL projects expected to rise by over 600,000 t/yr between 2024 and 2025 as existing projects ramp up or come online. One possible factor

Sulphur historical pricing



which could influence sulphur imports to the country is the start-up of new copper smelters in the short term, expected to add significant by-product sulphuric acid capacity.

Price stabilising factors include muted demand expected from India across the rest of the year, as previously high imports for domestic DAP production are dropping and DAP is being sourced from other destinations. A boost to Indian sulphur supply growth is also expected in the short term as new refining capacity is slated to come online, adding to the domestic Indian balance.

In the US, market uncertainty led to muted demand as downstream distribution of both phosphates and sulphur, and production out of Mosaic was disrupted by Hurricane Helene, followed by Hurricane Milton. This has now settled and the market has resumed activity, with operating rates returning and trade flows settling into regular routes, contributing to the stable-to-softening outlook for the rest of the year.

The key risks to stability in the short term are the escalating conflict in the Middle East, which is expected to lift freight rates and increase the gap between fob and cfr pricing. Buyers may be willing to pay premiums to ensure availability of supply, but traders are apprehensive to take the risk of higher offers in case they are left unmet. This may cause offers to be kept to the low end, but November pricing and the materialisation of higher freight rates will determine market direction for the rest of the quarter. The split market sentiment in China is also adding to market uncertainty, with questions around the availability of Iranian product. Chinese importers could be willing to settle for higher-priced tonnes to secure supply, but also could turn to stocks and domestic supply as consumers weather the current market ambiguity.

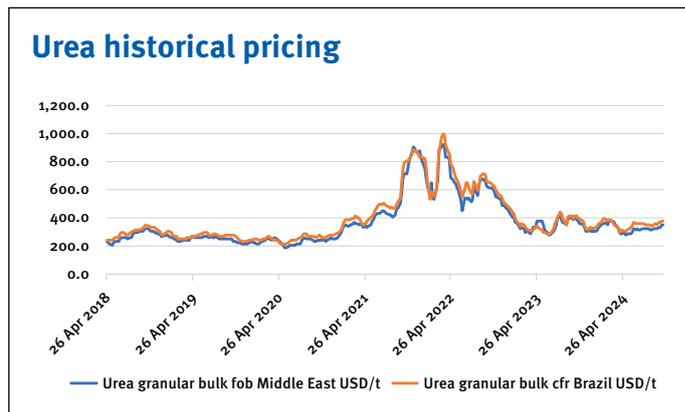
NITROGEN/UREA

Buyers take long positions

Prices have risen globally recently in the urea market and at a slightly faster rate than forecast in our last report. This was mainly the result of the early announcement of a new Indian tender, which prompted traders to take long positions and pushed some buyers to cover requirements. The trend was more pronounced east of Suez, where the influence of India is greatest, and less apparent in the Americas, although Brazilian prices have risen by about USD20/t recently after a long period of stagnation.

With other markets moving into season, urea prices are forecast to rise further. Egyptian urea has already moved back above USD400/t fob in sales for November shipment to Europe and the US market has strengthened on the back of international price movements. Middle East prices rose to USD360-365/t fob prior to the Indian tender recently. Brazilian prices are rising rapidly, heading for USD400/t cfr, a USD50/t increase over the past month.

The tender is still in process and its outcome has been clouded by a very wide spread of offers between the west and east coasts: USD24.50/t rather than the more normal USD5-10/t. The low west coast offer is equivalent to about USD350/t



fob Middle East and the import agency, RCF, may well only secure 50,000t of urea at that price. All other offers were more than USD24/t higher. The lowest east coast offer is equivalent to USD365-370/t fob Middle East and will secure significant tonnage should RCF agree to buy at that level. Irrespective of the tender's outcome, India still needs to buy more than 2mn t of urea for shipment in 2024 and, given the absence of Chinese urea from the market, this will keep prices firm in the east through to December.

China exported 245,000t in January-August 2024, around 1.4mn t less than in the same period of 2023. In the four months September-December 2023, China exported 2.6mn t of urea, but it is expected to export only small quantities each month through to the end of this year. The loss of this tonnage from the traded urea market will be keenly felt. Prices for urea from north Africa have risen above USD400/t fob in the early days of October, an increase of USD50/t over the previous month and reaching levels last seen in February. There appears to be limited upside to the price. The sales made for November loading from Egypt are equivalent to over EUR400/t fca in northwest Europe, which is EUR25-30/t above recent selling prices in the region. Nitrates prices have not shown the same increase and buyers will take some time to adjust to the rapid rise in fob levels. Further ahead, our trade balance shows a supply deficit for the months of October and November, mainly owing to the absence of Chinese exports, followed by a period of equilibrium in December-January, implying rising prices over the next 30 days and then stability or a small correction.

The market falls back into deficit in February-March, which could see further upward pressure on price. For 2025, there are conflicting factors at play. Supply growth is limited to new plants in Iran and Russia. A 3,000 t/day unit at Hengam in Iran is expected to start exporting in March-April. In Russia, a new plant at Schekino will add about 700,000 t/yr of capacity, also potentially all for export. Cost pressures on European producers could ease in the first quarter because of a predicted glut of natural gas, provided the trend of warm winters persists. European gas storage is already over 90% full for the winter and LNG supply is seen as more than adequate, implying gas prices lower than the current level around USD12/mn Btu. Corn and wheat prices have strengthened and are now at more attractive levels, but farmers in several regions are suffering from reduced incomes on account of disappointing yields from the 2024 crop. ■



Special focus

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New technology for urea based NPK granulation

Written by

Sanjeev Doshi, Senior Director, Fertiplant Engineering Company, India

There are two main issues with urea-based NPK granulation. First, the material is highly hygroscopic, attracting water during the process, which makes it impossible to reduce the final product's moisture content below 1.2%. This leads to faster deterioration of the product during storage. Second, the granulometry is slightly irregular.

Several of the process design changes suggested in this article could be implemented in existing plants.

Changes in process design

There are two main areas in the process flow that require attention. But first, let's understand CRH. CRH stands for Critical Relative Humidity, a material characteristic that reflects its tendency to absorb moisture from the atmosphere. If the atmospheric

Heat in the granulator is essential because it increases the solubility of fertilizer salts

humidity exceeds the material's CRH, the material absorbs moisture.

For example, if the CRH of a material is 65% at a specific temperature, and the ambient humidity is 75%, the material will absorb moisture from the air. In the case of urea-based NPK, the CRH is as low as 55% at 30°C, which poses a significant challenge, particularly in high-humidity regions and coastal areas.

The International Fertilizer Development Center (IFDC) has conducted numerous studies on the CRH of various fertilizer salts. One

interesting study shows how the addition of just 2% urea to an NPK mix can drastically alter the CRH value. Table 1, published by the IFDC, highlights the effect of adding urea.

Incidentally, the CRH of ammonium sulphate-based NPKs, where the nitrogen source is ammonium sulphate, is around 75%, which is relatively stable.

Moisture absorption in the cooler

Urea-based NPKs absorb moisture throughout the granulation process, but the main issue arises in the cooler. Figure 1 specifies typical process parameters around the cooler, and the following graphs visually depict what happens during cooling.

If you examine the second graph in Figure 1, you will notice that in the last third of the cooler, the material begins absorbing moisture. Typically, in the first part of the cooler, moisture evaporates due to the inherent heat in the material. However, toward the later part, it starts absorbing moisture again. It is estimated, though not

Table 1. Effect of urea on the CRH

Portion of each ingredient in the mixture			Critical Relative Humidity at 30°C (%)
Urea (%)	DAP (%)	KCl (%)	
0.0	50.0	50.0	65-70
2.0	49.0	49.0	55-65
5.0	47.5	47.5	50-60
10.0	45.0	45.0	50-55
20.0	40.0	40.0	45-50
40.0	30.0	30.0	45-50

Urea-based NPKs absorb moisture throughout the granulation process

proven, that the material loses about 0.1% to 0.2% moisture in the first part of the cooler, but then absorbs 0.2% to 0.3% in the latter part, resulting in a net moisture gain of 0.0% to 0.2%.

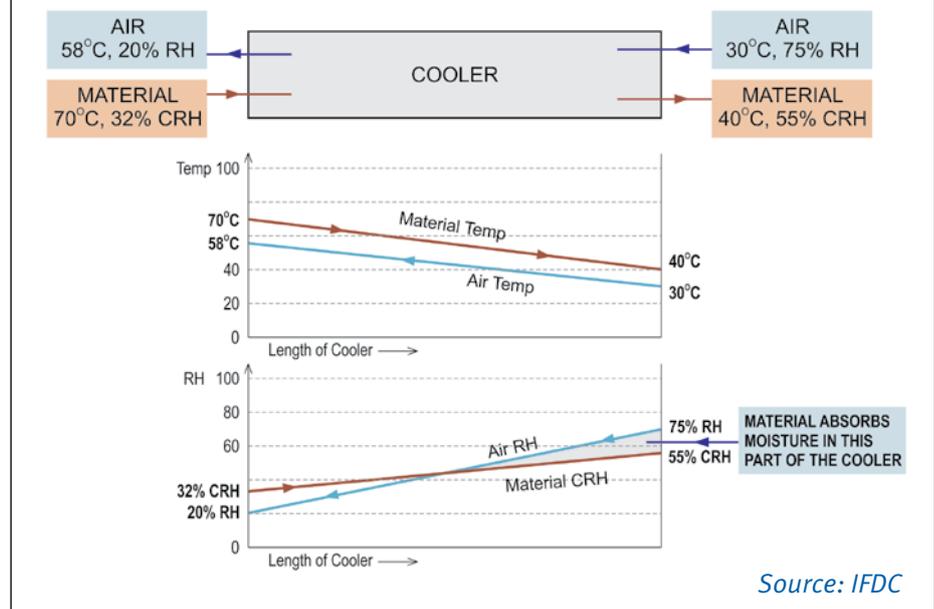
Moisture absorption also occurs outside the cooler, on screens and conveyors, but the issue is more pronounced in the cooler due to the airflow across the material, which increases the rate of heat and humidity transfer. The solution is to use dehumidified air in the cooler instead of ambient air.

Although dehumidifying the air is energy-intensive, it is necessary. Energy costs can be reduced if your system includes a product cooler in addition to a process cooler, a topic discussed further on.

What about limiting moisture absorption after the cooler, on screens and conveyors? One solution is to dehumidify the entire plant room, but is this really necessary? Although some moisture pickup occurs, it is less than 0.1%, as there is no airflow across the material and the process time after the cooler is short. Therefore, we do not recommend this costly approach.

Over time, the air in the plant room naturally becomes dehumidified as it transfers its moisture to the material on the belt and screens, reducing further absorption. However, it is important to keep the windows closed, especially in the area after the cooler, to prevent fresh ambient air with higher moisture content from entering the plant room.

Figure 1. RH and CRH across length of cooler



Source: IFDC

Improving granulometry

To achieve better granulometry - meaning rounder granules - two coolers can be used to reduce the heat in the granulator.

Ideally, designers aim to place the screening and crushing section after the dryer, so that the recycled material is returned hot to the granulator.

Granulation is primarily a process of agglomerating various small particles, some soluble and some insoluble.

Heat in the granulator is essential because it increases the solubility of fertilizer salts, allowing binding to occur more quickly. The soluble bonds between the different particles are then solidified when dried in the dryer. Therefore, heat in the granulator is necessary for effective granulation.

Unfortunately, at the end of the dryer, urea-based NPKs tend to be a bit sticky and cannot be screened or crushed at that stage. The material needs to be cooled before crushing, which means cold recycled material is sent to the granulator.

The solution is to split the cooling process into two stages: the first is the

'process cooler', where the material is cooled from around 70°C to 55°C - sufficiently cool and hard enough for screening and crushing. After screening and crushing, the second stage is the 'product cooler', which cools the product further from 55°C to 40°C.

By doing this, dehumidified air is only required in the product cooler, which handles about one-third of the material volume of the process cooler, reducing energy costs by two-thirds. With the addition of a product cooler after the process cooler, two key benefits are achieved: preventing moisture absorption during cooling and sending hotter recycled material back to the granulator.

Additionally, the product is dried further in the presence of dehumidified air in the product cooler, which improves the product's shelf life - a significant advantage.

As an extra benefit, the exhaust air from the product cooler can be routed to the inlet of the process cooler. Although this exhaust air has picked up some moisture, its relative humidity (RH) will still be lower than that of ambient air.

A valuable tip: use urea if you want to achieve almost zero emissions

The right formulation

The industry has long suspected that ammonium sulphate (AS) not only aids in granulation but also helps make the granules rounder. However, Fertiplant have not had first-hand experience - AS is rarely used in India or Southeast Asia, where most of our engineered plants are located. In Kenya, though, we had the opportunity to test this.

During commissioning, AS was unavailable in the first few days, so the formulation was made entirely with urea. When AS was later included in the same grade formulation, the granules suddenly became rounder. The exact reason for this is unclear, but I can now confidently recommend using 7-8% AS in any formulation for rounder granule formation.

Additionally, ensure all input raw materials, such as urea, DAP, AS, and MOP crystals, are crushed.

Insufficient drying

After adding 2-3% water or steam in the granulator, it must be evaporated in the dryer. Drying urea presents a challenge because the material temperature cannot exceed 73-74°C. Beyond this point, the material forms an adduct - an extremely sticky mass. With this limitation, it is nearly impossible to dry the NPK mix to less than 1.2% moisture.

Another issue arises at the end of the dryer when the hot air becomes saturated with moisture and approaches the CRH of the material at 70°C, causing the drying process to practically stop.

The solution is either to introduce dehumidified air through the dilution air of the hot air generator or to add a second dryer. However, these solutions may be more problematic

than the issue itself. Still, if top-quality products with long shelf lives are the goal, this aspect must be addressed. Perhaps, if prioritizing the implementation of various solutions, this could be considered towards the end.

Bottleneck areas

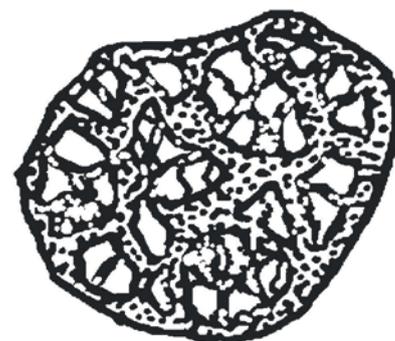
Here are some solutions to bottleneck areas in production:

- **Jamming of chutes:** The solution is to use polished stainless steel chutes for the inlets and outlets of all dryers, elevators, crushers and bin feeders.
- **Jamming of screen deck:** To prevent jamming, use single-deck screens only, so that the screen cloth is easily accessible for manual cleaning.
- **Jamming of crushers:** The solution is to install a standby crusher. If one crusher jams, you can divert the material to the other, which has been cleaned and is ready for use. Additionally, the crusher outlet chute should be straight or slightly flared outward, but definitely not sloped inward, as is common in most plants.
- **Jamming of fresh feed:** Jamming of bins containing raw materials disrupts both the continuous flow and the rate of material flow. The solution is to construct the bottom part of the bin with polished stainless steel and include a bin extractor.

Equipment design

Each piece of equipment should be analyzed from the perspective of handling slightly sticky and sluggish (non-free flowing) materials. While

Figure 2. Granule formed by agglomeration



most of these issues may only have a minor effect on overall plant efficiency, addressing them collectively can make a significant difference.

Two major issues have been discussed from the process design perspective, along with one from the formulation angle, and solutions have been proposed. If one also addresses equipment jamming issues - such as with crushers, hoppers, and chutes - alongside careful consideration of equipment design and layout, the problems associated with the manufacture of urea-based NPKs can certainly be managed.

Urea for low emissions

Finally, a valuable tip: use urea if you want to achieve almost zero emissions. During the commissioning of a recent plant in Kenya, we ran out of urea and had to produce the formulation entirely with AS. While the granules were good, we noticed a slight smoke coming from the chimney. When urea arrived and we conducted trials with both AS and urea, the emissions disappeared. The stickiness of the urea likely bound the finer particles of other raw materials. The stack emissions at the outlet of the cyclone were likely less than 50 mg/Nm³. Therefore, there is no need for a scrubber for particulate emission control when urea is part of the formulation. ■

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Revolutionary nano-technology for fertilizer formulations

Written by

Hans Kißwetter, Global Manager Agro Chemicals, *NETZSCH-Feinmahltechnik GmbH, Germany*

Research is being conducted around the world to better understand the effects of nano-particles on people and the environment. Modified formulations of traditional pesticides, growth regulators and seed treatments are among the first nano-chemicals that could be used in agriculture. The greatly reduced particle size compared with conventional pesticides and the associated increase in surface area cause a fundamental change in the physico-chemical properties of nano-pesticides. Compared with larger particles of the same chemical substance, nano-particles are more reactive, more biologically active and have a stronger catalytic effect.

The use of nano-particles could make pesticides more effective. Nano-capsules that release active ingredients in a targeted manner can also be used more sparingly with the same effect. That is why manufacturers of agrochemicals want to reduce the components of their products to nano-size or package the active ingredients in nano-capsules that only open under very specific conditions such as heat, sunlight or the alkaline environment inside an insect's stomach. Nano-particles are intended to ensure that pesticides and fertilizers can be used more effectively.

Liquid and foliar fertilizer

One of the new research approaches is the nano-grinding of liquid fertilizer for foliar and soil application. The manufacturer fondly hopes to get a better and faster supply of the macro and micronutrients to the plant, which are defined as following:

Macronutrients [kg/ha]

The key nutritive elements are nitrogen, phosphorous and potassium.

- Primary macronutrients: nitrogen (N), phosphorous (P), potassium (K)
- Secondary macronutrients: magnesium (Mg), calcium (Ca), sulphur (S)

Macronutrients are essential nutrients the body needs in large quantities to remain healthy. Macronutrients provide the body with energy, help prevent disease and allow the body to function correctly.

Micronutrients [g/ha]

Trace elements are Iron (Fe), Zinc (Zn), Manganese (Mn), Boron (B), Molybdenum (Mo), Copper (Cu).

Micronutrients are substances that are needed in much smaller amounts than the macronutrients, carbohydrates, protein and fat. Another difference between macro and micronutrients

is that micronutrients do not provide any energy. These products are highly concentrated suspension fertilizers with a balanced ratio of macro and micronutrients. The product prevents the deficiency of these elements in plants, supports their recovery from the adverse influence of several abiotic factors, provides crops with optimal growth, resistance, high yield and production quality.

Definition of nano-technology in agrochemicals

Nano-technology is the design and production of extremely small particles with structure sizes in general of up to 100 nano-metres.

For nano-suspension formulae, there is actually no specific definition of the particle size range. However, similar to pharmaceuticals, printing inks, coatings and materials for the microelectronics or battery industry (see Fig. 1), in most cases the nano-materials used for agrochemicals currently have particle sizes below one micrometre (d_{99}), while for a traditional agrochemical suspension concentrate formula, the particle size requirement is around $d_{90} = 5-10$ micrometre.

One of the new approaches is the nano-grinding of liquid fertilizer

Nano-particles in agriculture

Nano-technology is one of the most revolutionary technologies for the coming years, but why do we still not have practical results in agriculture with the use of this technology as we have in medicine, industry and other sectors?

Nano-technology is the synthesis and processing of structures and devices with control at the molecular level which can be used to improve and optimize the physical and chemical properties of any material.

We can use nano-technology in agriculture for many applications such as:

- Smart coatings that release fungicide/insecticide for seed care
- Nano-capsules for controlled release of agrochemicals, biologicals and fertilizers
- Nano-encapsulation of biologicals
- Intelligent sensors for soils, plants and zoonoses
- Antibacterial coatings for fruits and smart packaging

The use of nano-particles in agrochemical products is aimed at increasing the efficiency and sustainability of agricultural production by optimizing the use of chemicals while minimizing environmental impact.

The top-down process

The 'top-down synthesis process' is a process technology used to produce nano-particles for agrochemical products by breaking down larger structures into smaller ones. This technique offers several advantages

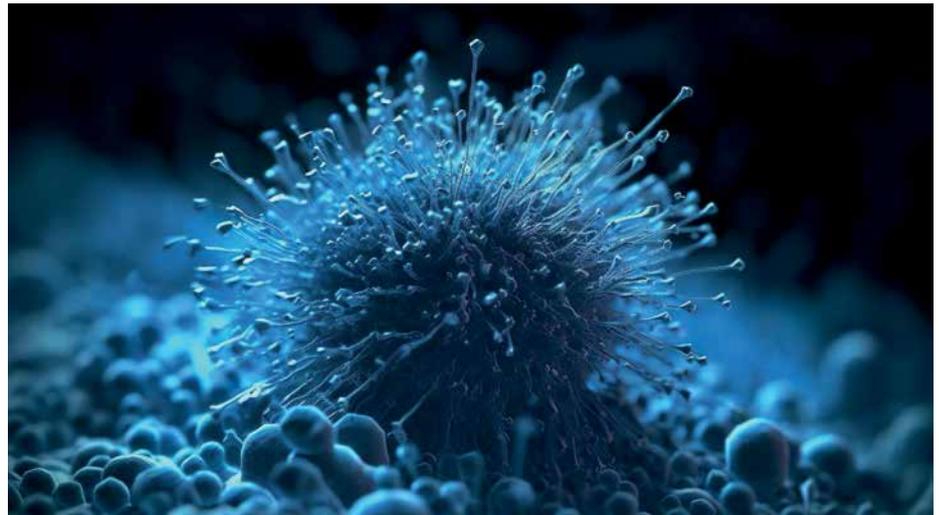


Figure 1. Nano-particle

for the production of nano-particles in agrochemicals, including:

- Control over size and shape
- Scalability
- Versatility
- Reduced impurities
- Energy efficiency

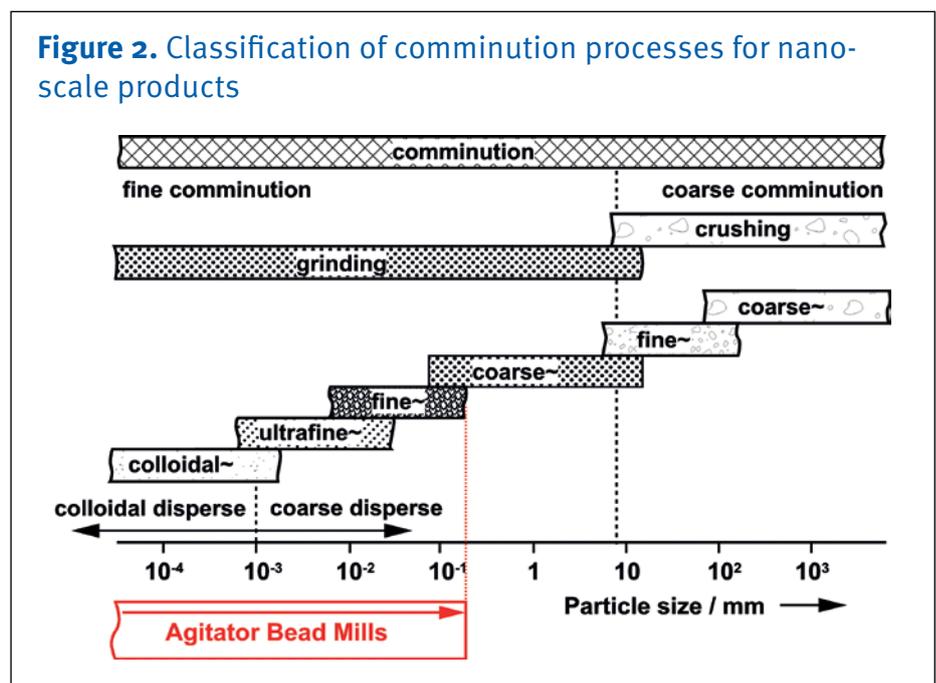
Wet grinding technology

As ultrafine dispersed powders are extremely reactive elements and consequently pose a very high risk

of dust explosion in dry fine grinding processes, very high safety standards must be established to ensure the safety of the process operator and the environment.

Therefore an elementary conclusion for further process design for the grinding of nano-formulations in agrochemicals is to proceed with wet processing technology (see figure 2).

Wet fine grinding processes consisting of a raw material feed station and mixing tank for preparation of the



product suspension and, in a parallel step, the thickening agent, with the grinding stage carried out in an agitator bead mill and various product containers, offer the following decisive advantages:

- **Particle size reduction:** Finer particles and better homogeneity
- **Cooling and reduced heat generation:** Heat dissipation and the prevention of decomposition
- **Less dust and improved safety:** Dust reduction, as well as fire and explosion hazards
- **Energy efficiency:** Lower energy consumption
- **Better material handling:** Flow properties and continuous processing
- **Chemical reactivity:** Enhanced chemical reactions
- **Surface chemistry and morphology:** Surface modification

In agrochemical applications, wet grinding is crucial for the preparation of nano-powders and dispersions, ensuring consistent formulations.

Agitator bead mill for nano-grinding

Media milling - or grinding - is the most well-established manufacturing method for nano-particle production. Stirred media mills are used in many different industries to reduce particle size and to develop higher-quality products because of this equipment.

Nano-grinding with a stirred media mill offers the key benefits:

- Excellent particle size control
- Comparative cost effectiveness
- Equipment scalability, from benchtop to production
- Process repeatability

Figure 3 shows the Netzsch Neos agitator bead mill, perfectly designed for grinding nano-particles in agrochemical applications. The system creates grinding and dispersion by agitating the beads with the pins or pegs on the agitator shaft.

Uniform compression throughout the chamber's length is key to this process. This concept results in total utilization of the media charge and mill capacity for greater efficiency in particle size reduction.

The agitator bead mill with the newly-developed NEOS grinding system stands for maximum performance, product quality and efficiency. Coupled with the reliable use of extremely small grinding media, you can achieve your required product quality with high production output and low specific energy consumption (see figure 4).

Particle size distributions of 500 nm are easily possible with the Netzsch Neos high performance mill. This is only one example of nano-

grinding in agrochem. This technique is applicable for types of liquid fertilizer.

Stable formulations

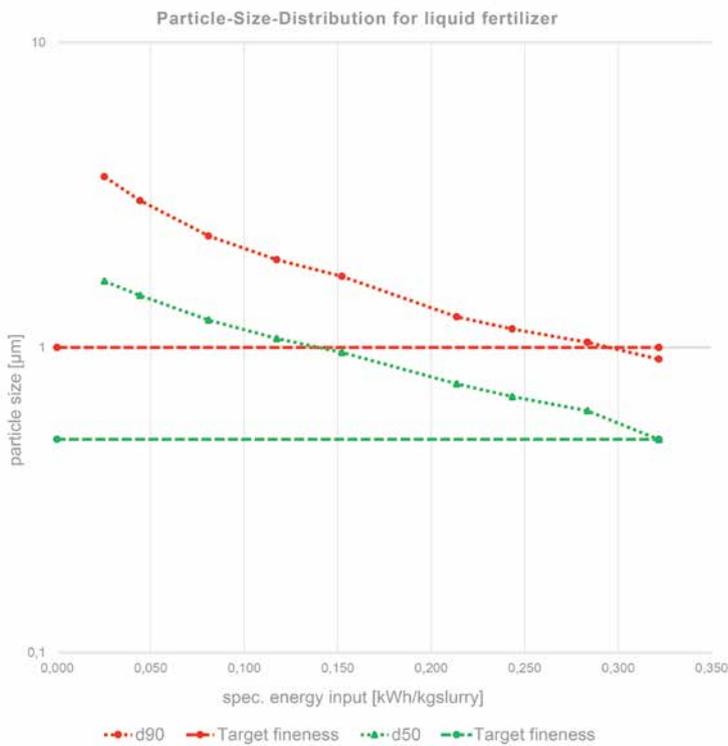
Reagglomerated nano-particles can cause significant problems in agrochemical applications, affecting product efficacy and handling. The most common stabilization method in the production of agrochemical nano-particles is surface modification using polymers or surfactants (see figure 5).

This method often combines steric stabilization with electrostatic stabilization. Nano-particles can be coated with a layer of polymers, surfactants or other stabilizing

Figure 3. Design of Netzsch Neos agitator bead mill



Figure 4. Progress in PSD related to specific energy input for a nano-fertilizer



E [kWh/kg _{Slurry}]	d ₅₀ [µm]	d ₉₀ [µm]	d ₉₅ [µm]
0.025	1.62	3.63	4.42
0.044	1.48	3.03	3.61
0.081	1.23	2.32	2.7
0.117	1.07	1.94	2.27
0.152	0.963	1.71	1.98
0.214	0.76	1.26	1.42
0.243	0.69	1.15	1.29
0.284	0.62	1.04	1.17
0.322	0.499	0.915	1.04

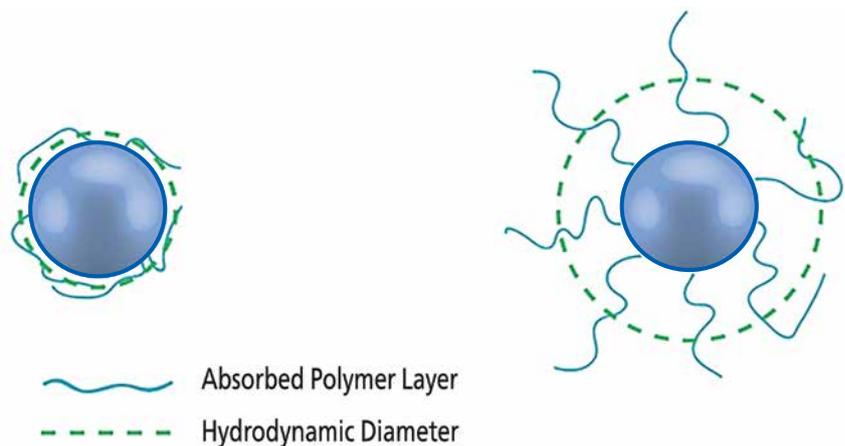
Achieving product quality with high production output

molecules. This layer prevents the nano-particles from clumping together through steric hindrance or electrostatic repulsion and is often used to keep the nano-particles stable and optimize their properties for specific agricultural use.

Potential applications

Nano-technology – the design and production of extremely small particles with structure sizes below 100 nano-metres – is met with interest and, at the same time, scepticism. Research is being conducted around the world to better understand the effects of nano-particles on people and the environment. The potential applications of nano-particles are diverse - for example in electrical and energy technology, in consumer goods such as textiles, but also in medicine, in the food sector and in agriculture or agrochemical industry. National and international researchers are devoting a great deal of time and

Figure 5. Illustration of an adsorbed polymer layer



capacity to nano-technology and are developing the basis for assessing its opportunities.

Netzsch, as a manufacturer of machines and complete processes has the know-how of the production of nano-particles for agrochemical

applications. Our machine scope from laboratory machines to complete process lines or turn-key plants allow our customers to get complete solutions from single source.

Note: NETZSCH Neos® is a registered trademark ■

Maximising nitrogen use efficiency with new precision technology

Written by

Deirdre Wall, Marketing Manager, *Brandon Bioscience, Ireland*

Nitrogen (N) is the most important macronutrient used in agricultural systems to enhance crop yields. At the policy level, farmers across Europe are being called to reduce nitrogen usage on their farms. In response, they are rising to the challenge by actively working to decrease nitrogen inputs in line with regulations aimed at preserving water quality and reducing emissions. However, concerns remain regarding how limited N use will impact crop yields. It is critical to address this issue while still maintaining and maximising crop yields to feed the growing global population. For consistent growth with less fertilizer, it is crucial to maximise the efficiency of the N that is applied.

The farmer is at the core of all Brandon Bioscience activities. From the first idea to the final product, innovation is driven by their needs, challenges, and aspirations. Brandon Bioscience ensures that innovations not only enhance productivity but also respect the environment to help growers reach their environmental targets. The company invests 15% of turnover annually in research and development to continue to maximise the return on investment of growers. Using their Plant Signal Induction (PSI) Technology platform they produce a suite of products for a changing climate.

What is PSI Technology?

PSI Technology uniquely balances the chemistry of raw materials with production processes and plant biology

to achieve unprecedented quality control. The PSI Technology platform is built from five interrelated pillars:

- 1. Novel marine bioactives:** deep raw material knowledge
- 2. Proprietary extraction processes:** scientifically validated optimised extraction
- 3. Physicochemical analysis:** scientifically validated product consistency
- 4. Bioactivity analysis:** scientifically validated modes of action in well-known plant models
- 5. Field performance:** scientifically validated crop field data

By optimising these five components, the PSI Technology platform combined with progressive innovation has created a range of next generation biostimulants, which are unique due to their ability to fine tune the bioactivity of extracts to create and guide the plants natural response system to target well defined responses in the plant. Through precision biostimulation, plant signalling biomolecules are finetuned to target specific crop issues and growing obstacles that farmers face. The technology focuses on nitrogen use efficiency. Brandon Bioscience understands what makes a high performing biostimulant, chemically, biologically and functionally to understand not only what it is but what it does and how it does it. Following this system, the company has developed PSI362 Precision Technology.

What is PSI362 Precision Technology?

PSI362 is a precision engineered *Ascophyllum nodosum* based biostimulant that targets a specific response in a plant. Nitrogen use efficiency is significantly improved, enabling farmers to achieve consistent yields throughout the season while using 20% less nitrogen. By helping crops utilise nitrogen more effectively, the biostimulant enhances yield per unit of nitrogen applied, allowing farmers to optimise productivity for greater return on investment while meeting their climate objectives.

It stimulates both nitrogen (N) uptake, transportation and usage in the plant. When the biostimulant is applied at the same time as N fertilizer, it helps the nitrate receptors in the root of the plant take up more of the available N in the soil. It also helps increase the nitrate content in the plant tissue to enhance crop growth and yield.

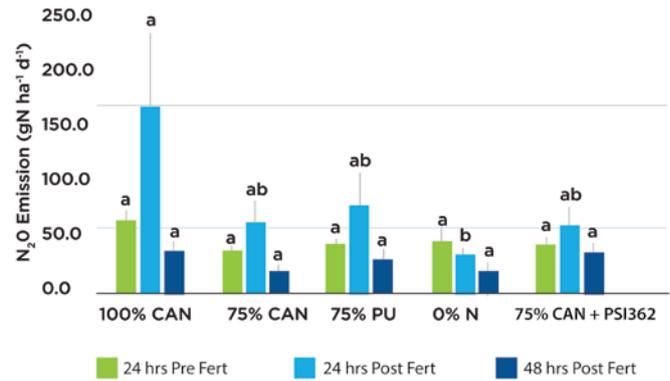
The biostimulant is expertly coated onto the NPK granule for seamless application on farm. Brandon Bioscience works with partners to reformulate the nitrogen content to cater for the inclusion of the biostimulant so that farmers can apply their fertilizer rates as they normally would.

PSI362 is certified under the EU Fertilizing Products Regulation (FPR) 2019/1009. The EU FPR allows the company to specify the effects of their plant biostimulants and make these claims on the product label.

Figure 1. PSI Technology’s interrelated pillars for consistent product offering and quality control



Figure 2. This research looks at Brandon Bioscience’s PSI362 Precision Technology and its effect on reducing nitrous oxide (N₂O) emissions and nitrate (NO₃⁻) leaching on controlled conditions grass trials with different soils taken from commercial farms under natural weather conditions



Source: Quille.P et. al., 2023, Published Jan 2024

The justification of PSI362 Precision Technology claim was verified by an independent national notified body following submission of a dossier of technical information and test results.

There are four open access peer reviewed papers published on PSI362 on grass, wheat and barley with the latest published in 2024 showing PSI362’s effect on reducing nitrous oxide emissions and nitrate leaching on farm. Patrick Quille at Munster Technological University, in partnership with Dr. Shane O’Connell (Brandon Bioscience Head of Research) and Prof. Joanna Kacprzyk and Prof. Carl Ng in University College Dublin, published “the role of an *Ascophyllum nodosum* extract in lowering the environmental impact and improving nitrogen use efficiency in pasture systems under a reduced nitrogen regime”.

The research in figure 2 shows that when using PSI362 in grass, it was possible to reduce nitrogen application by 25% without a significant loss in yield compared with a conventional 100% N system. The research also showed an increase in NUE under a 75% N with PSI362 co-application fertilization regime, and a significant increase in crude protein content compared to the 100% N fertilization

controls. Furthermore, the reduced nitrogen application results in reduced nitrogen loss through nitrate leachate and nitrous oxide to the atmosphere, thereby decreasing the environmental footprint of the pasture system.

Performance in the field

The most critical factor for customers is performance. Brandon Bioscience continues to ensure that each trial is captured and analysed allowing the company to refine and perfect products over time. PSI362 has been extensively tested in 60+ field trials on

cereal and grass crops, with consistent positive results when applied as coating for granular N fertilizer. The application of fertilizers coated with PSI362 significantly improved NUE by 22% to 33% compared with traditional fertilizers at full N rate. This means that farmers can maximise their yields per unit of nitrogen applied while meeting climate targets.

PSI362 is an award-winning innovation at the Enterprise Ireland Innovation Awards for Sustainable Agriculture (Ireland), FBD Better Farming Awards for best Agritech Science Product (Ireland) and USDA Fertilizer Challenge (USA). ■

About Brandon Bioscience

Brandon Bioscience is a marine biotechnology company based in Kerry, Ireland with further operations on the Hebrides Islands in Scotland. Producing *Ascophyllum nodosum* based biostimulants, Brandon Bioscience is a research-based company bringing products to market with peer-reviewed publications and extensive trial data. By investing 15% of annual turnover into research and development Brandon Bioscience has currently 17 peer-reviewed papers published. Brandon Bioscience is a community of scientists, farmers, and innovators who share a common goal: to create a more sustainable future for agriculture.

Visit www.brandonbioscience.com to find out more.

Note: PSI® Technology and PSI®362 Precision Technology are registered trademarks of Brandon Bioscience.

Conference preview:

Argus Clean Ammonia Europe 2024

26-28 November 2024 • Rotterdam Ahoy, Rotterdam, Netherlands

Bringing together industry pioneers driving clean ammonia adoption in Europe

The Argus Clean Ammonia Europe Conference is returning for its third edition, and with a new location of Rotterdam, Netherlands. Argus Conferences is delighted to be partnering with the Port of Rotterdam as our host sponsor for this event on 26-28 November 2024.

Attendees will benefit from three days of networking and insights, exploring ammonia’s role in the energy transition across hard-to-abate sectors in the region, including power generation, marine fuels, fertilizers, chemicals and more. With over 375 attendees from more than 175 companies and 35 countries, we are excited to welcome everyone to the conference.

This year has been a landmark year in the energy transition space, and with the event taking place in the largest port in Europe, this conference provides a unique opportunity to gain insights from industry leaders exploring key issues related to policy and regulation, social acceptance, production and import project development, infrastructure, storage and logistics. Plus, there will be insights into financing for projects as well as into CBAM and EU ETS and what they mean for clean molecules entering Europe.

Featuring a variety of panel discussions, presentations and interactive audience Q&A sessions, participants will reap the full benefits of high-level content, as well as having the opportunity to make the most of our expanded networking and exhibition area, including a barista coffee stand sponsored by ExxonMobil, and much more.

Agenda highlights

Day 1

Unlocking ammonia’s potential in the energy transition — How can blue ammonia bring cost competitiveness that will enable a quicker transition in Europe? With keynote speakers from companies including Thyssenkrupp Uhde, Port of Rotterdam, Cepsa, Woodside Energy and ExxonMobil

Policy and regulation: RED III targets and transposition and EU Hydrogen Bank tenders — What do industry targets mean and what are the ambitions for European market development? Hear key insights from Ewelina Daniel, Policy Officer, DG Clima, European Commission

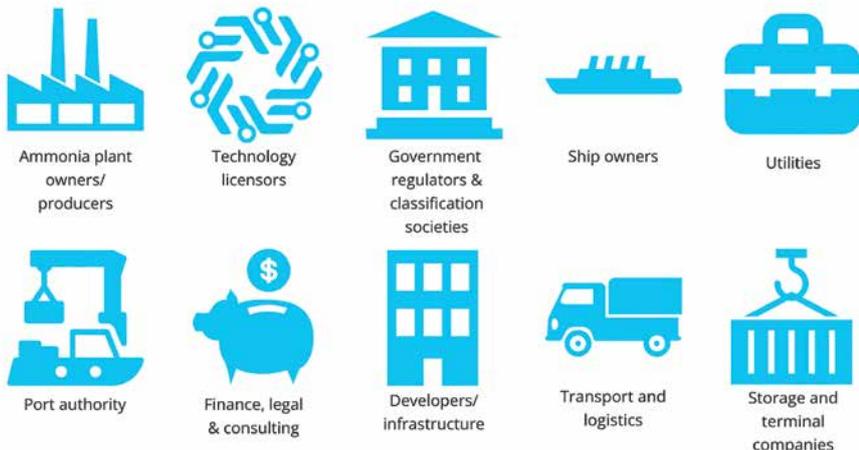
Power, marine, fertilizers: Consumer perspectives from hard-to-abate sectors looking at clean ammonia in the energy transition. Hear from leaders on their views of what the opportunities are in Europe. Hear from companies such as EnBW, Exmar, Maersk Tankers, FertigHy, Hygenco, OCI Global and Mol Group.

Day 2

Global project development landscape — How bankable are clean ammonia projects and what are the ingredients for success to bring a project forward to FID? Expert speakers include Adani Group, Yara Clean Ammonia, Uniper Global Commodities and ING.



Network across the European clean ammonia supply chain



Supply infrastructure bringing clean ammonia to Europe: Where are developments taking place? Insights from key ports in Europe, ammonia storage and transportation providers and ammonia cracking experts. Hear from Port of Rotterdam, Port of Antwerp-Bruges, Port of Duisburg, Mol Group, GTT Chane, Vopak, Thyssenkrupp Uhde, Air Liquide and VTTI.

Featured speakers include:

- **Boudewijn Siemons**, Chief Executive, **Port of Rotterdam**
- **Carl-Antoine Saverys**, Chief Executive, **Exmar**
- **José Antonio de las Heras Alonso**, Chief Executive, **FertigHy**
- **Rick Beuttal**, VP, **New Energy US, Woodside Energy**
- **Vibeke Rasmussen**, SVP Certification and Product Management, President, **Yara Clean Ammonia and Ammonia Energy Association**
- **Olivia Barnes**, Head of Low Carbon Commodities, **EnBW**

Network and develop partnerships in Europe and around the world

With more than 375 attendees, this conference provides you with an opportunity meet with potential business partners across the ammonia and cross-sector value chains in the energy transition, including our **NEW Women in Ammonia** lunch, welcome drinks, coffee breaks, lunches and evening drinks reception.

Sponsorship and exhibition opportunities

A range of sponsorship and exhibition opportunities are designed to elevate your brand in this rapidly developing space.

Join us as a sponsor or exhibitor for the opportunity to showcase your brand and products before a relevant and engaged audience. Sponsorship opportunities can be

tailored to help you raise your profile and engage with the industry's influential market-makers.

For more information, please visit our website: www.argusmedia.com/clean-ammonia-europe or contact our sponsorship team at sponsorship@argusmedia.com ■

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IFA's Sustainable Fertilizer Academy expands into West Africa

with educational collaboration from WAFA

Written by

Alexandra Dorison, Sustainability Education Coordinator, IFA, France

Two years ago, the International Fertilizer Association (IFA) launched the Sustainable Fertilizer Academy (SFA) (ifa-sfa.org), an online e-learning platform and network aimed at educating fertilizer industry professionals on sustainability, covering the entire process from sourcing to production and application on farms. IFA, whose mission is to promote the efficient and responsible production, distribution, and use of plant nutrients sustainably, plays a crucial role in ensuring global food security while protecting the environment. A key component of IFA's mission is education, capacity building, and advocacy, all of which are reflected in the work of the SFA. The academy aims to equip professionals and students with the knowledge and skills to implement sustainable practices in fertilizer production and usage.

Now in its second year, the SFA has significantly expanded its global reach. Building on its initiatives in Brazil and China, it has extended its efforts to new countries and regions such as Turkey and West Africa. This strategic growth underscores the SFA's

The SFA has significantly expanded its global reach

dedication to fostering sustainable fertilizer practices globally by addressing local challenges through education, training, and collaboration.

A key highlight of this global expansion is the collaboration between the SFA and the West African Fertilizer Association (WAFA). Together, these organizations are spearheading a transformative shift towards sustainability in the West African agricultural sector. At the heart of this partnership is the implementation of on-site workshops across universities in West Africa, aimed at enhancing sustainability knowledge and practices within the region's agricultural community. The initiative focuses on equipping future agricultural leaders with the necessary skills to improve sustainability in food production systems, with a particular emphasis on fertilizer management, crop nutrition, and environmental stewardship.

Workshops on sustainable agricultural practices

The collaboration between the SFA and WAFA began this July in Nigeria and Liberia, where a series of workshops were successfully held at seven prominent universities. These included the Federal University of Technology Akure, the Federal University of Kashere in Gombe State, the Federal University of Oye-Ekiti in Ekiti State, Ahmadu Bello University in Zaria, Adeyemi Federal University of Education in Ondo State, and the University of Ibadan in Oyo State. In Liberia, workshops took place at the Liberia Education Foundation and the University of Liberia. Each institution embraced the opportunity to participate in this groundbreaking initiative, providing students with a unique chance to gain in-depth knowledge of sustainable agricultural practices.



Participating agronomy students for the on-site workshop at the University of Liberia

The workshops attracted over 800 students, demonstrating the region's strong interest in and commitment to sustainable agriculture. These students, from various agricultural and environmental science disciplines, were eager to learn about sustainability, recognizing the critical role it will play in the future of West African agriculture.

"Our partnership with the SFA has been instrumental in our ability to reach future agricultural professionals with knowledge that is highly impactful. It is shaping their understanding of soil health and empowering them to become key drivers of West Africa's growth in sustainable food production. This regional capability is crucial for addressing the increasing hunger and malnutrition in the region, as well as enabling West Africa to meet the food needs of its rapidly growing human and livestock populations," said Innocent Okuku, Executive Secretary of WAFSA.

Data-driven approach

The structure of each workshop was carefully designed to provide a comprehensive and engaging learning experience. Spanning two days, the workshops featured four-hour sessions that covered a wide range of critical topics related to sustainable fertilizer use. The first day began with welcome addresses from representatives of both IFA and WAFSA, setting the tone for the sessions that followed. The bulk of the first day's training consisted of three instructional modules drawn from IFA's Sustainable Fertilizer Academy curriculum. On the second day, participants covered the remaining three modules, and the workshop concluded with a certification test for registered participants.

The curriculum, developed by the SFA, addressed some of the most pressing challenges facing West Africa's

The workshops attracted over 800 students

agricultural sector. Modules included an introduction to fertilizers, crop nutrition management, biodiversity and sustainability in agriculture, data-driven approaches to precise crop nutrition, and advanced concepts such as nutrient recovery and recycling. These topics were strategically selected to equip participants with the knowledge and skills needed to promote sustainable practices, reduce environmental impact, and improve fertilizer efficiency.

The interactive nature of the workshops encouraged lively discussions and active participation



(left) On-site workshop at the Federal University of Technology Akure; *(right)* On-site workshop at the United Methodist University in Liberia

from students. Trainers from Wafa facilitated dynamic Q&A sessions, allowing students to ask questions, clarify doubts, and engage deeply with the material. This interactive format transformed the workshops from mere lectures into collaborative learning experiences, where students were encouraged to think critically about sustainability and its practical applications in agriculture.

"The SFA training provided by Wafa and IFA was an eye-opener for me, helping me understand the importance of fertilizers and how to achieve their sustainable use in food production, as well as the role of data in ensuring optimal crop

nutrient use for food security. I highly recommend this training to all aspiring agriculturists, as it provides essential knowledge that will prepare them to address current and future global challenges," said Gloria Ezikiel, a student at Federal University of Oye-Ekiti, Ekiti State, Nigeria.

Professional development

During registration, students were given the option to choose whether to complete a final exam. By successfully passing this exam, participants can earn certification from both IFA and Wafa. This certification is expected to significantly enhance their

professional development by signalling to future employers and colleagues their commitment to sustainable agricultural practices. The certification process is designed to give workshop attendees the opportunity to gain formal recognition for their expertise in sustainable fertilizer use and agricultural sustainability.

The successful implementation of these workshops has paved the way for the programme's expansion into other countries in West Africa, with additional workshops planned for universities in Mali and Côte d'Ivoire. Building on these achievements, the SFA is also considering launching similar initiatives in other countries and regions, such as India, where sustainability challenges and opportunities are equally critical.

The collaboration between IFA's Sustainable Fertilizer Academy and Wafa marks a significant step forward in West Africa's agricultural sustainability efforts. By equipping the next generation of agricultural leaders with the knowledge and tools to implement sustainable practices, this partnership promises to have a lasting impact on West African agriculture, its food systems, and the overall sustainability of the region's agricultural and fertilizer practices.

For more information about IFA's Sustainable Fertilizer Academy, please contact Alexandra Dorison: adorison@fertilizer.org ■



On-site workshop at the Ahmadu Bello University in Nigeria

People and events

IFFCO Paradeep appoints P K Mahapatra as New Unit Head

Indian Farmers Fertiliser Cooperative Limited (IFFCO) has announced a leadership transition at its Paradeep Unit. Mr. P K Mahapatra has been appointed as the new Unit Head. He succeeds Mr. K J Patel, who has been promoted to the position of Director (Technical) at IFFCO's Head Office in Delhi.

Mr. K J Patel, previously the Unit Head and Plant Manager at IFFCO Paradeep, has a distinguished career spanning over 38 years in engineering and leadership roles. His contributions have been pivotal in transforming the Paradeep facility into one of the most advanced fertilizer production units in India. As the newly appointed Director (Technical), Patel will oversee operations across all IFFCO plants, ensuring synergy and excellence in production processes both domestically and internationally.

In his new role, Patel's expertise in operational management and technical innovation will play a crucial role as IFFCO continues to expand its global presence in the fertilizer industry. His extensive experience positions him well to drive improvements and innovations that align with IFFCO's mission of promoting sustainable agriculture and enhancing farmer prosperity.

Sage Potash appoints corporate finance veteran as CFO

Sage Potash is pleased to announce that Rod Reum has been appointed Chief Financial Officer (CFO). Mr. Reum brings forty years of international finance leadership experience and public company governance as Sage Potash progresses into its construction phase of developing its Sage Plain Project in Utah. As CFO, Mr. Reum has added to the recent transformation of the management team of operational industry experts, such as Shilo Sazwan, who joined Sage Potash as a strategic operations partner. Mr. Sazwan is responsible for sourcing and securing the fertilizer plant equipment purchase agreement in partnership with international process plants.

With the Company advancing towards construction and operations, Mr. Sazwan has brought on his Terrarock Industries team of in-house engineering, construction, logistics, and accounting experts to lead the project management of the construction and commissioning of its Muriate of Potash pilot plant in Utah. Mr. Sazwan and his construction and engineering team have over twenty-five years of experience designing and operating high-quality, innovative, sustainable evaporative mineral plants. The

Company's Utah Sage Plain plant will be Mr. Sazwan's ninth such facility to be built at significant cost savings.

Mr. Reum joins Sage Potash with extensive experience and a strong executive corporate finance track record, including leading high-growth start-ups and large international partnerships from development to production stages across construction, mining, alternative energy, forestry and military industries. Highly skilled in risk management, securing global strategic alliances and leading finance teams through complex international joint ventures, including a large Canadian Kraft Pulp Mill.

KRIBHCO announces new Managing Director

M R Sharma has been appointed as the Managing Director of Krishak Bharati Cooperative Limited (KRIBHCO). In addition to the assignment as Managing Director, he will continue to perform the role of Director (Technical).

M R Sharma, a Chemical Engineering Graduate from IIT Roorkee (1981) has had more than 42 years of experience in the fertilizer industry mainly in ammonia and urea production integrated complexes along with associated utility plants.

Having joined as a Graduate Engineer Trainee (GET) in KRIBHCO in the year 1982, he is the first GET to reach the position of Managing Director. During his various roles in KRIBHCO, he led several projects and contributed significantly towards revamp of ammonia and urea complex in order to expand production capacity.

Verde Clean Fuels announces appointment of Chief Financial Officer

Verde Clean Fuels has announced the appointment of George Burdette as Chief Financial Officer (CFO).

"George brings a wealth of experience and expertise in all aspects of finance and will be instrumental as we advance our plans to deploy our proprietary liquid fuels processing technology through the development of commercial production plants," said Ernie Miller, Verde's Chief Executive Officer.

Mr. Burdette will be responsible for all aspects of finance for the company. Prior to joining the Company, Mr. Burdette served as CFO of Arbor Renewable Gas, a private equity owned renewable fuels platform. Mr. Burdette received a Bachelor of Arts in International Business and French from Wofford College and an International Master of Business Administration from the University of South Carolina. ■



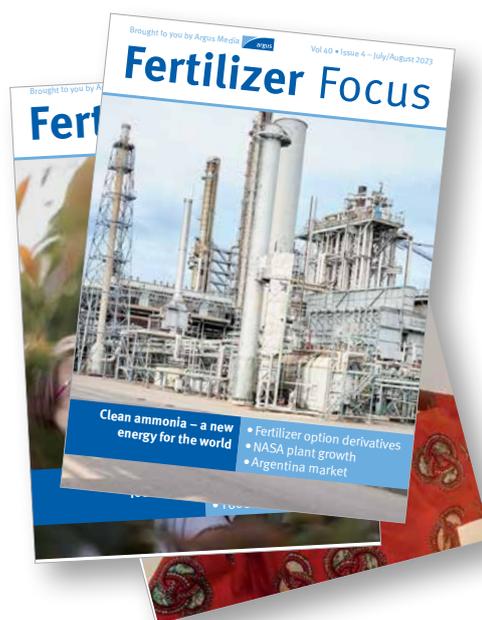
Fertilizer Focus

Media pack 2025

Fertilizer Focus heritage

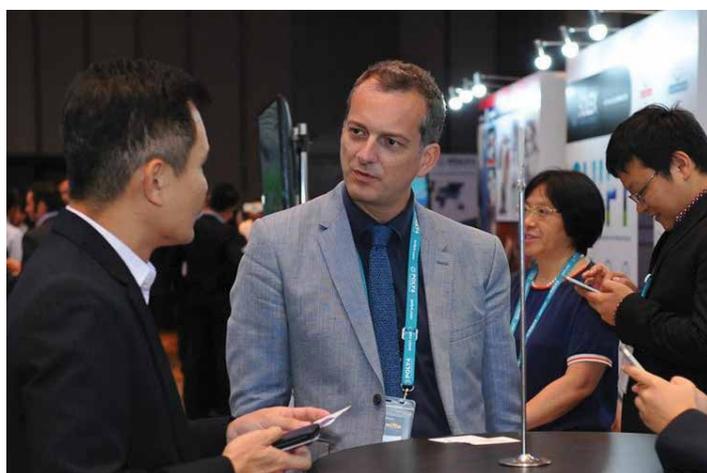
Argus produces the most comprehensive suite of pricing and market intelligence services available to the fertilizer industry

First published in February 1984 by FMB Consultants, Argus' Fertilizer Focus is the world's leading bi-monthly journal serving the international fertilizer industry. It covers the key developments influencing fertilizer and related markets, such as production economics, technology, plant and project news, and product logistics.



Drawing on Argus's unrivalled expertise and wealth of contacts from our market reporting, consulting and conferences, the editorial content in Fertilizer Focus covers the issues which are top-of-mind for senior executives in the industry. As an advertiser, your message reaches decision makers throughout the world and positions you as a thought-leader on the cutting edge topics which will define the future of the industry. The magazine features a unique blend of news, features, interviews and analysis of all aspects of the fertilizer industry, including:

- ▶ Spotlight on hot new trends and growth areas - including clean ammonia and low carbon/sustainable fertilizers
- ▶ New product developments – fertilizer blends, enhanced efficiency ingredients, micronutrients, liquid fertilizers
- ▶ Fertilizer production technology across all products
- ▶ Port logistics and shipping
- ▶ Company strategy, industry developments and emerging markets
- ▶ Agronomic analysis and changes in agricultural practice impacting fertilizers



Editorial schedule

January/February issue

Advertising due date - **6 December 2024**

Special Focus - INFRASTRUCTURE AND LOGISTICS

- ▶ Overview of new facilities
- ▶ Risk accessing shipping markets
- ▶ Traceability and certification

SUPPLEMENT - AFRICA

- ▶ The African Fertilizer Financing Mechanism
- ▶ Regional Hub for Fertilizer and Soil Health in West Africa and the Sahel
- ▶ Integrating Africa through technology

May/June issue

Advertising due date - **11 April 2025**

Special Focus - PRODUCTION TECHNOLOGY

- ▶ Innovations in water soluble fertilizers
- ▶ Case study: Updating production plants
- ▶ Modularisation of potash production

SUPPLEMENT - LATIN AMERICA

- ▶ Trends in Brazil's import markets
- ▶ Production facilities in Latin America
- ▶ Key crops and nutrient requirements

September/October issue

Advertising due date - **11 August 2025**

Special Focus - FERTILIZER SUSTAINABILITY

- ▶ Soil health and balancing carbon emissions
- ▶ Balancing food security with sustainability
- ▶ Greener SOP production

SUPPLEMENT - EUROPE

- ▶ Sulphur demand and supply in Europe
- ▶ CBAM update
- ▶ Sustainable nutrients market in Europe

March/April issue

Advertising due date - **14 February 2025**

Special Focus - LOW CARBON FERTILIZERS

- ▶ Adapting fertilizer production for decarbonisation
- ▶ Low carbon nitrogen processes
- ▶ Next generation enhanced efficiency fertilizers

SUPPLEMENT - ASIA

- ▶ The Asian sulphur markets
- ▶ Future growth in India
- ▶ Key transport routes

July/August issue

Advertising due date - **13 June 2025**

Special Focus - CLEAN AMMONIA

- ▶ Clean ammonia for agricultural uses
- ▶ Hydrogen transport and infrastructure
- ▶ Case study: Blue ammonia

SUPPLEMENT - MIDDLE-EAST

- ▶ Impact on fertilizers from Middle-East conflicts
- ▶ GCC investments
- ▶ Regional innovative technologies

November/December issue

Advertising due date - **10 October 2025**

Special Focus - THE FERTILIZER ECONOMY

- ▶ The impact of geopolitics and trade legislation
- ▶ The changing landscape of US phosphate import duties on Morocco
- ▶ Fertilizer price volatility outlook

SUPPLEMENT - NORTH AMERICA

- ▶ One year on: US election and the impact on agriculture
- ▶ Mexican fertilizer transport routes
- ▶ Canadian import market trends



Distribution

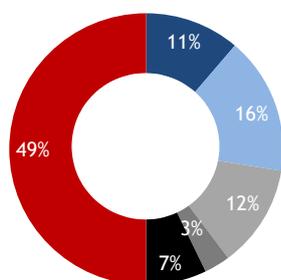
Sector leading digital and hard copy distribution

Published six times a year, the magazine is read by subscribers in over 90 countries. Fertilizer Focus has a unique, best in class distribution, benefiting from Argus' unrivaled presence in the fertilizer sector - **the digital circulation of the magazine in late 2024 was nearly 15,000 - and is growing substantially each month.** Around two thirds of our digital recipients are paying subscribers of Argus fertilizer price reporting and outlook services. This encompasses executives and decision makers in all of the major fertilizer producers, traders, importers and buyers, as well as sector focused financial institutions, shippers, engineering companies, plant contractors, government agencies and trade associations. Our key magazine features are promoted on leading social media platforms ([LinkedIn](#), [Twitter](#), [Facebook](#))

Reader profile

Our unique and unrivaled circulation means your messages reach the industry's most important decision makers.

% of all Fertilizer Focus recipients with the following in their job title



- Executive, President, Director, Vice President
- Manager, Head, Consultant, Advisor
- Sales, Commercial, Marketing, Supply
- Procurement, Buyer, Purchaser, Sourcing, Business Development
- Analyst, Intelligence, Strategy, Accountant, Finance, Investor Relations, Economics
- Other

Unique event distribution

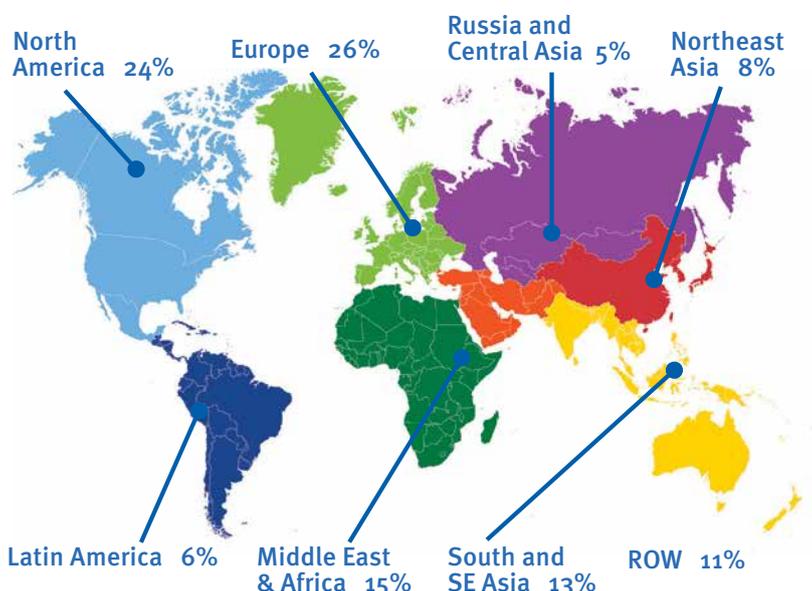
Fertilizer Focus is distributed to every one of the thousands of delegates attending Argus' fertilizer conferences around the world, and available at all of the major global and regional industry events.

Fertilizer Focus will continue to give you unrivaled events positioning. The pandemic temporarily restricted the ability of Argus and other events organizers to deliver physical events, but this is changing. Argus' industry leading conferences are returning in their traditional physical format and our magazine will be delivered to registrants at both physical and digital conferences.

Global distribution breakdown

Our geographic distribution is aligned with the broader Argus fertilizer customer base.

Regional distribution of Fertilizer Focus recipients



Argus events

- ▶ Fertilizer Latino Americano (FLA)
- ▶ Argus Asia Fertilizer
- ▶ Argus East Europe Fertilizer
- ▶ Argus Europe Fertilizer
- ▶ Argus Clean Ammonia
- ▶ Argus Vehicle Emissions and DEF Summit USA
- ▶ Argus Paris Grain Conference
- ▶ Argus Green Marine Fuels Conference

Global and regional industry events

- ▶ AFA Annual Fertilizer Forum & Exhibition, Egypt
- ▶ FAI Annual Seminar, India
- ▶ IFA Annual Conference
- ▶ IFA Crossroads
- ▶ Southwest Fertilizer, USA
- ▶ TFI Annual Meeting, USA
- ▶ TFI World Fertilizer, USA

Advertising rates 2025

Cover rates

	USD
Outside front package	6,000
Inside front cover	3,740
Inside back cover	3,530
Outside back cover	4,080

Run of press rates	1 Issue	2 Issues (10% discount)	3 -5 Issues (20% discount)	6 Issues (30% discount)
	USD	USD	USD	USD
Double page	6,460	5,748	5,100	4,464
Full page	3,120	2,808	2,496	2,184
Half page	2,640	2,376	2,112	1,848
Third page	1,860	1,674	1,488	1,302
Quarter page	1,740	1,566	1,392	1,218

For more details or to discuss our requirements please contact Stefan Worsley: stefan.worsley@argusmedia.com



Advertising specifications

Editorial & advertising schedule 2025

Edition	Due date
January/February	6 December
March/April	14 February
Maj/June	11 April
July/August	13 June
September/October	11 August
November/December	10 October

SIZE & POSITION

Once you have booked your advertisement please ensure you supply the artwork at the correct size, as below. Please note: 'Trim size' is the actual size that the advertisement will appear in the publication. 'Bleed size' is the size your advertisement needs to be supplied to us including the required 3mm bleed (if full page). 'Type area' is the suggested area that any text or important information should sit within to ensure details have some clear space around them for clarity.

TECHNICAL SPECIFICATION

Please ensure your advertisement is produced professionally, and in accordance with the following criteria:

- ▶ All artwork should be CMYK colour (No Pantone/Spot colours)
- ▶ All fonts should be embedded or outlined
- ▶ All images within the artwork must be at least 300dpi resolution and in CMYK colour
- ▶ For Full Page adverts please include 3mm bleed and crop marks

FILE FORMAT & SUPPLY

Our preferred file type is a high resolution PDF to the the following specification when exported from Adobe InDesign:

- ▶ Adobe PDF Preset: PDF/X-4:2008
- ▶ Colour Profile: Coated FOGRA39 (ISO 12647-2:2004)

The above will ensure your advertisement appears in the best possible quality, however if you are unable to supply as a PDF we will accept a 300dpi JPEG or TIFF file in CMYK colour format.

If you have any queries regarding our specifications or to send us your files, please contact: Kate.Shanley@argusmedia.com

Full page

Trim size:

297mm(h) x 210mm(w)

Bleed size:

303mm(h) x 216mm(w)

Type area:

275mm(h) x 185mm(w)



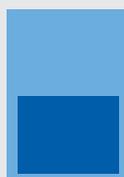
HALF PAGE (Horizontal)

Trim size:

128mm(h) x 180mm(w)

Type area:

118mm(h) x 170mm(w)



HALF PAGE (Vertical)

Trim size:

250mm(h) x 86mm(w)

Type area:

240mm(h) x 76mm(w)



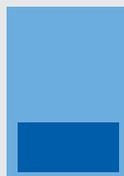
THIRD PAGE (Horizontal)

Trim size:

62mm(h) x 180mm(w)

Type area:

54mm(h) x 172mm(w)



THIRD PAGE (Vertical)

Trim size:

122mm(h) x 112mm(w)

Type area:

114mm(h) x 104mm(w)



Please note: Bleed is not required for Half Page and Third Page advertisements as these formats sit within the page, however we do recommend your advertisement includes a keyline/border if it has a white background.

Fertilizer Focus

For advertising and editorial information please contact:
stefan.worsley@argusmedia.com

Brought to you by Argus Media



Fertilizer Focus



argusmedia.com

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PLANNING YOUR ADVERTISING BUDGET?

**Want the highest return on your spend?
Send for your Media Pack now!**

Fertilizer Focus is now circulated digitally giving advertisers the widest and highest quality distribution footprint:

- Fertilizer Focus is sent digitally to all Argus subscribers to its fertilizer price and market reports, and analytics services.
- This gives advertisers a global reach to many thousands of qualified individual fertilizer influencers.

Fertilizer Focus guarantees the advertiser:

- Regular and wide distribution
- Conference representation with **Fertilizer Focus** displayed at all Argus, IFA, TFI, AFA and other major conferences
- A quality product with no issue less than 60 pages and a copy to advertising ratio no lower than 60:40
- An experienced editorial team who pursue a progressive editorial policy
- Regular contributions giving insight on global fertilizer markets from Argus's sector leading team of market reporters and analysts.

For more information and to take a look at our media pack please contact **Stefan Worsley:**

stefan.worsley@argusmedia.com
+44 (0) 7711 564 219

IN THE NEXT ISSUE...

SPECIAL FOCUS: **INFRASTRUCTURE AND LOGISTICS**

- Overview of new facilities
- Risk accessing shipping markets
- Traceability and certification

SUPPLEMENT: AFRICA

- The African Fertilizer Financing Mechanism
- Regional Hub for Fertilizer and Soil Health in West Africa and the Sahel
- Integrating Africa through technology

Nitrogen

- **Prilled:**
 - China fob
- **Granular:**
 - Egypt fob
 - Brazil cfr
 - Nola (US Gulf) fob \$/st

Ammonia

- East Asia cfr (excluding Taiwan)
- Middle East fob

Phosphates

- DAP fob China
- DAP cfr India
- MAP cfr Brazil
- DAP barges fob Nola
- MAP barges fob Nola

Sulphur

- China cfr granular \$/t
- China domestic (ex works) Yn/t

Work smarter with groundbreaking daily fertilizer price assessments from Argus

Argus daily price assessments provide you with unique benefits, including



Greater certainty

Increased price frequency gives you immediate clarity for volatile markets.



Lower risk

Additional data points ensure your business calculations are more robust.



Smarter outcomes

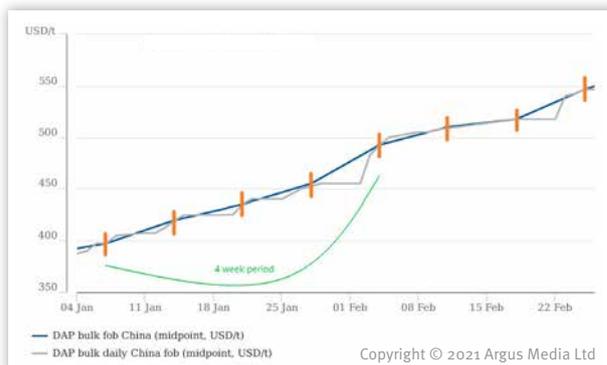
Daily data powers the most sophisticated data analysis and algorithmic trading tools.



Increased confidence

Access editorial staff in key global fertilizer hubs: Widest geographical reach and rigorous methodological adherence.

Sharp price action captured earlier with daily assessment



Over the highlighted 4 week period (7 Jan to 4 Feb 2021) the price of DAP fob China grew from \$397.50/t to \$492.50/t, an increase of 24%. The blue line on the graph, marked by the 5 weekly prices over this period (orange) clearly highlights this price growth. However, the 21 daily prices over this same period (grey line) provide greater detail on how this price growth was achieved.

For more information please contact us: fertilizer-m@argusmedia.com www.argusmedia.com/fertilizer