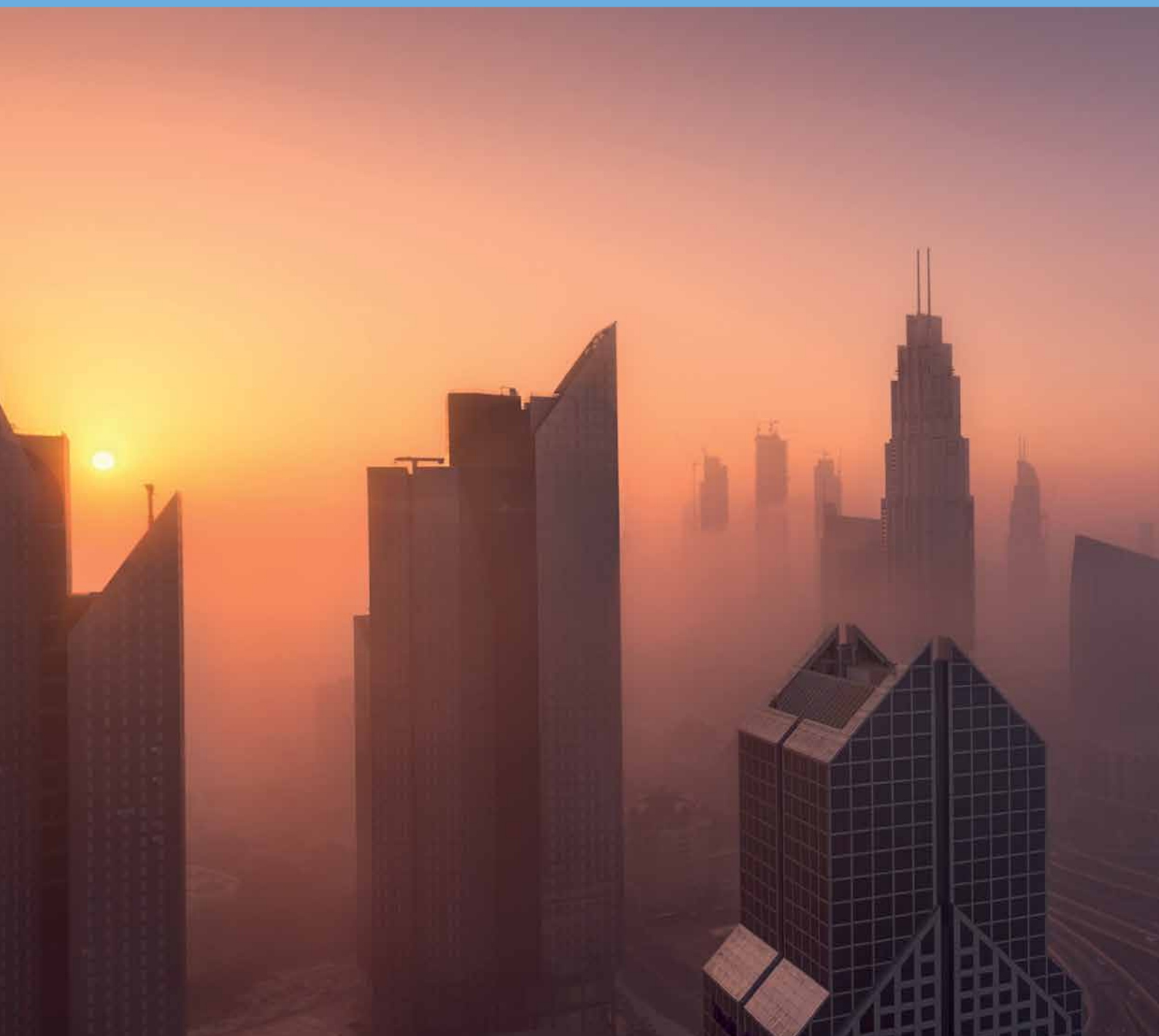


Fertilizer Focus



**The Middle East
fertilizer market in 2022**

- The shipping crisis
- Advancements in storage
- The history of fertilizers



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Argus AgriMarkets

Daily grains, seeds and oils prices, news and analysis

Issue 21-203 | Thursday 14 October 2021

SUMMARY

Black Sea wheat: Russian spot at 10-day low

Russia's spot November 12.5pc wheat extended losses from earlier this week to close at a 10-day low, as rising floating taxes continued to weigh on liquidity.

Ukraine corn: Curve turns to losses

Ukrainian corn prices turned to losses, as prompt supply concerns were partially eased with corn harvest gathering pace in recent days.

Brazil soybeans: Market has deal for April/May

The Parana paper market had a slower day with only one deal reported, although premiums have remained at high levels compared with the beginning of the week.

China soybeans: Spreads widen for Brazil beans

The spread between the best bid and offer widened for deliveries from Brazil, following higher offers from exporters.

Turkey's TMO issues new wheat tender

Turkey provisionally awards corn tender
Turkish state-run grains agency TMO has provisionally agreed to buy 325,000t of corn, reportedly of Ukrainian origin to a large extent.

Rain to weigh on China's corn output

Heavy rain in north China has slowed corn harvest progress, which could impact production levels and quality this year.

Key prices

	Loading	Bid	Offer	Mid	Δ
Wheat 5% Wheat 11.5% fab Ukraine (CWT) Spot	308.00	310.00	309.00	-1.00	
Wheat 11.5% cap Ukraine (CWT) Spot	na	na	na	na	
Wheat 12.5% fab Russia (Roussoskiy) Spot	309.00	318.00	315.50	-2.00	
Wheat 13.5% (CWT) Canada fab Vancouver Spot	na	na	na	na	
Corn 5% Corn 10% (C1) Spot	271.00	275.00	273.00	-1.00	
Corn opt (C2) Spot	na	na	na	na	
Brazil corn fab Santos diff to C1OT (d/basis) Nov	+141.0	+155.0	+148.0	-0.5	
Barley 5% Feed barley opt Ukraine Spot	na	na	na	na	
Soybeans 4% (bushel) Brazil soybeans fab Parana diff to C1OT Feb	+54.0	+60.0	+57.0	-0.5	
China soybeans cfr diff to C1OT Nov	+375.0	+380.0	+377.5	na	
Rapeseed oil (USD) €/t					
RSO fab Dutch mill Prompt	1,320.00	1,330.00	na		
RSO fab Dutch mill NSJ	1,495.00	1,500.00	na		
RSO fab Dutch mill FMA	1,465.00	1,475.00	-10.00		
RSO fab Dutch mill MJJ	1,495.00	1,495.00	na		

Dry grains freight rates

Route	Size (DWT)	\$/t	Δ
Suez Canal	60	16.40	+0.30
Malacca-Quebec	65	47.25	+0.10

AGRITEL OUTLOOK

Watch out for increasing expectations of La Nina weather this winter, with the NOAA raising the probability of such conditions to emerge in Dec-Feb to 87pc.

Grains, oilseeds and veg oils tenders

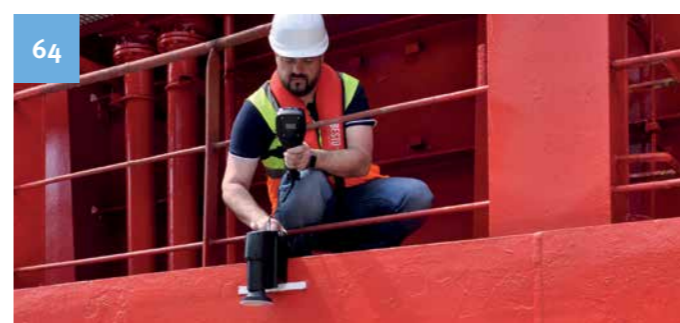
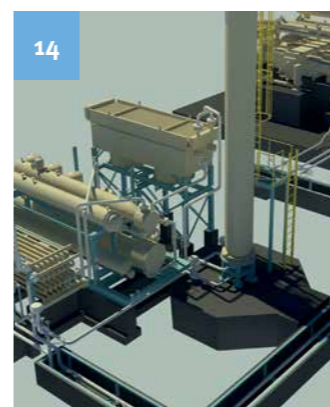
Buyer	Brand	Closes	Status	Cargo	Delivery	Price	Seller	Notes
Turkey's TMO	14-Oct	21-Oct	Open	300,000t milling wheat	Dec 2021-Feb 2022	\$129.75/t	Cargill	cfr Asaba
Jordan's MT	10-Oct	14-Oct	Closed	120,000t feed barley	Dec 2021-Feb 2022	\$129.75/t	Cargill	cfr Asaba
Japan's MAF	12-Oct	14-Oct	Closed	119,510t milling wheat	Nov 2021-Jan 2022	Low 9049WZ	Mitsui	CWRS
Turkey's TMO	5-Oct	14-Oct	Closed	275,000t corn	15 Nov-6 Dec 2021	\$106.90-117/t		cfr
Turkey's TMO	5-Oct	14-Oct	Closed	50,000t corn	15 Nov-6 Dec 2021	\$112.75-119.25/t		cfr
Jordan's MT	7-Oct	13-Oct	Cancelled	120,000t milling wheat	Jan-Mar 2022			
Pakistan's TCF	9-Oct	13-Oct	Closed	90,000t milling wheat	Jan-22			

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Forward thinking for 2022



Written by

Oliver Hatfield, Vice President Business Development,
Argus Media, UK

Welcome to 2022 and on behalf of the Argus fertilizer team, we wish you all a healthy, peaceful and prosperous year ahead. The year ahead would appear to be another with a multitude of challenges. The rapid outbreak of the omicron variant of the COVID-19 virus is once again bringing economic disruption. The good news is the impact will likely be reduced and less dramatic compared to the first outbreaks, due to a combination of what looks like weaker potency of the latest strain with reduced impact from successful vaccination programmes in many countries.

The omicron variant has not yet had much negative impact on most commodity markets, with crops and energy prices remaining relatively robust. Fertilizers and their raw materials continue to trade at prices well in excess of pre-COVID levels, though there are signs that some prices have peaked, amid questions about affordability. The rising cost of freight and the negative knock on economic impact of price inflation continue to provide potential headwinds as we look ahead. David Fyfe, Chief Economist here at Argus, focuses on this subject in his regular article.

The fertilizer supply chain gets special attention in our Infrastructure and Logistics focus articles. Further coverage of freight rates and recent shipping disruption is provided by Hudig & Vedig Chartering from the Netherlands. It looks at a more granular level at the extent of freight rate inflation for different vessels and cargo sizes. It is certainly eye catching that container freights have increased by an 'extreme' order of magnitude since the beginning of 2020 - the route from Rotterdam to China having seen freight rates increase from USD2000 to USD15,000-20,000! Readers who are members of the International Fertilizer Association (IFA) will be familiar with the valuable market analysis provided by their Market Intelligence team, led by Laura Cross. Laura provides us with a timely overview of the market impact not only of COVID, but also economic sanctions and resource nationalism, in a contribution which quantifies the extent of recent disruption. It contemplates whether we can expect market disruption to be the new norm.

We start our Middle East supplement section with some valuable insight from the executive vice president of Sabic, one of the fertilizer sector's leading producers. The article highlights the company's strengths and great ambition for further robust growth which it plans to achieve in a way which will differentiate itself from the competition, taking in to account sustainability challenges.

We are excited to bring you two new article contributions for 2022 and beyond. Michael Freeman, who spent many years as a respected fertilizer industry analyst has devoted many hours of his retirement exploring the early development of the fertilizer industry. We are delighted to be able to share this research with you, which we will roll out in instalments over the coming year. And from the past to the future – we are also introducing a new regular feature in which we shine a spotlight on how the demographic of the fertilizer industry is becoming more diverse, with a regular interview with future leaders from beyond the traditional middle-aged male category!

We hope you enjoy our latest issue! ■



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Join key market players at the biggest fertilizer networking event in Latin America

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500+
attendees



300+
companies



45+
countries



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The history of fertilizers: Part 1

The emergence of mineral fertilizers

In the first of a six part series Michael Freeman offers an in-depth account of the origins of mineral fertilizer supply.

In the introduction to his 1757 book on *The Principles of Agriculture and Vegetation*, which had been commissioned by the Edinburgh Society for the Improvement of Arts and Manufactures, Dr Francis Home observed that agriculture in Europe was little better understood in his day than it had been in the time of Virgil and Columella.

A generation before Dr Home's work, the Berkshire landowner Jethro Tull published his book on *Horse Hoeing Husbandry* in which he grappled with the following question: "The chief art

of the husbandman is to feed plants to their best advantage; but how shall he do that unless he knows what is their food?" Tull considered the possible contributions of nitre and of the four classical elements - water, air, fire and earth. He rejected nitre (sodium nitrate) because in his view it had a toxic effect when applied to the roots of plants, commenting that "nitre is as much the food of plants as white arsenic is the food of rats." He concluded that earth is "surely the food of all plants". In his view the only value of dung, or of compost,

was that after application it fermented in the earth, breaking it up so that it became easier for plant to assimilate the soil. This could be achieved more efficiently by tillage, i.e. hoeing with horses, making the use of manure unnecessary.

Dr Home attempted to carry out a more scientific investigation of soil samples, but was hindered by the limitations of analytical chemistry in the middle of the 18th century. He also carried out primitive pot trials on barley using different additives that might be expected to influence

plant growth, while noting that there is always a danger of some mistake in reasoning based on single experiments. Despite his efforts to harness contemporary science for this research, he remained attached to the idea that the four classical elements plus oil and salt were responsible for crop nourishment.

Crop rotation

Dr Home's sweeping statement, from his standpoint in the mid-18th century, about the absence of progress in agriculture over the centuries did not take account of the changes in crop rotation that had taken place. Two-course rotation had been replaced in the early Middle Ages by the three-course rotation system with two cultivated fields and one fallow field. Farmers in the Low Countries, who needed to improve harvests obtained from their poor quality sandy soils, extended the rotation cycle to four or more, and incorporated roots crops, such as turnips, and legumes into the planting programme, while paying greater attention to manuring. The good results obtained from extended rotation caught the attention of foreign observers, among whom was Sir Richard Weston, who travelled to Flanders in 1644 to study new farming methods, which he described in his "Discourse on the Husbandry of Brabant and Flanders". It is not known whether Sir Richard introduced the new system on his Surrey estate before he died in 1652, but in any case four-course rotation with turnips was better suited to the light soils of Norfolk. It was here that the 2nd Viscount Townsend farmed his Raynham estate where, in the 1730s, he introduced four-course rotation on newly-enclosed farmland where sheep were kept. His enthusiasm for turnips as feed for the sheep earned him the lasting soubriquet of "Turnip Townsend". Other landowners followed his example, including Thomas Coke, Earl of Leicester, who had inherited a big Norfolk farming estate in 1776 at Holkham. Arthur Young, another landowner in eastern



In his book "Horse Hoeing Husbandry" Jethro Tull looked at how to feed plants to their best advantage'

The second half of the 19th century saw a marked improvement in yields

England around this time, was less successful in the introduction of improvements at his properties, but he was a diligent and perceptive writer on the state of agriculture in Britain and, notably, in France, where he travelled extensively in the years before the Revolution. These men were examples of the custom among the larger English landowners to live on their estates and to study agricultural improvements that they could implement, which included the controversial practice of land enclosure.

This was also happening in other northwest European countries although, as Arthur Young noted, France lagged considerably behind its neighbours. The output of cereals and other arable crops certainly increased in Europe during the period 1700-1850, but it is not possible to find reliable statistics to illustrate this trend.

However, in most places the growth was the result of expansion of the area being farmed due to the consolidation of land ownership and the elimination of unproductive fallow land, the latter also resulting in the introduction of a broader range of crops for cultivation. In this period, average wheat yields were around 1t/ha in NW Europe but only around two-thirds of this level in France, Spain and Italy. By the second half of the 19th century there was a marked improvement in yields across Europe and in North America, as farmers began to acquire the knowledge to satisfy the nutrient needs of the crops they were growing.

Population growth

The need to produce more food crops was driven by the change in the rate of growth of the world's population. During the last millennium (1000-

The biggest component of population growth total was, and still is, in Asia

1999), the trend of population plotted with UN estimated data takes the form of a familiar J-curve, in which there is straight-line growth of roughly 50 mn per century in each of the first seven centuries, as the Four Horsemen of the Apocalypse did their effective job of preventing the exponential growth that would normally take place in population without constraints. The change started to become evident in the 18th century when the world total grew by 400 mn, reaching 1 bn in 1804. The corresponding increase in the 19th century was 670 mn, according to the UN’s estimates, and of course the world population increase in the 20th century was several times greater than this. The biggest component of the total, then as now, was the population of Asia, which was followed by that of Europe which represented 20% of it.

The implications of a surge in population numbers were discussed by the Reverend Thomas Malthus in his first Essay on the Principle of Population, that was published in 1798, and re-issued with revision four times over the next three decades. The basic proposition put forward by Malthus was that population grows exponentially, whereas food production can only grow arithmetically, at best, which implies a rising deficit in the supply of food. His proposed solution to this dilemma was the spread of “moral restraint”, noting that “in all the more improved countries of modern Europe, the principal check which at present keeps the population to the level of the actual means of subsistence is the prudential restraint

Davy, Sir Humphrey, Bt (1778-1829)



One of the best known of a group of scientists that advanced the knowledge on chemistry in the early years of the 19th century,

He was born in Penzance in 1778 where, after leaving school, he was apprenticed to an apothecary. He showed a strong interest in experimental chemistry and it was not long before he was offered a junior position at the Royal Institution, in London. This allowed him to pursue his research into electrochemistry that resulted in the isolation of potassium and sodium in 1807 and of several other elements in the following year.

He was also interested in the chemistry of agriculture and gave a series of annual lectures on the topic to the British Board of Agriculture between 1802 and 1812, published in 1813 as “Elements of Agricultural Chemistry”. They did not break new ground, but provided a reasonably clear summary of current scientific knowledge in a form that could be circulated in the farming community.

Davy was knighted in 1812, made a baronet in 1819 and received many other honours during the rest of his life. He died in 1829.

on marriage”. Malthus does not seem to have been interested in agriculture and so was unable to anticipate the potential for increased productivity which, it must be admitted, had not been evident in the period during which he was writing, as any growth in output in Europe and North America at that time was the result of bringing more land into cultivation, and Malthus forecast that this resource would soon run out.

The ideas of Malthus, as laid out in the Essay, are unlikely to have had a direct impact on farmers and farming methods. A more relevant factor would have been the change in the distribution of population as country dwellers, many of whom must have been subsistence farmers, moved into towns and cities where the new industries were in need of more workers. Farms therefore found themselves having to meet the

increasing food requirements of these expanding centres of population, with the result that areas of intensive food cultivation grew up around them, at least until the emergence of the railways in the middle of the 19th century made it possible for food to be delivered over longer distances.

At the end of the 18th century, the idea of agricultural improvement had become established as an important concept, particularly among the larger landowners in northwest Europe, who were eager for information and advice. In Britain, the Board of Agriculture was established, with Arthur Young as its first secretary, to collect information and to provide advice. It commissioned the young chemist Humphrey Davy to present a series of lectures at the Royal Institution in London on The Elements of Agricultural Chemistry. Davy delivered these lectures annually between 1802

By the end of the 18th century, the idea of agricultural improvement was established

and 1812, then putting them together for publication in 1814. The eight lectures represented a summary of contemporary scientific knowledge, and included developments that had taken place during the decade, such as Humboldt’s discovery of guano and Saussure’s analytical work on the chemical composition of crops.

In his sixth and seventh lectures, Davy presented lists of materials that could be used as manures (see table 1).

Manures of animal and vegetable origin

At the time when Davy was writing, almost all farmers used manure of natural origin, i.e. animal dung and urine, as well as other wastes from their activities, often supplemented with by-products from industries that processed animal and vegetable materials. Farmyard manure (FYM) was certainly the most important product in use at this time on European farms. Examples of manuring programmes based on FYM for two farms in northwest Europe are quoted in Slicker von Bath’s book on the agrarian history of Western Europe: a 21 ha farm near Lille, which consumed 260t of solid and liquid manure over a ten-year period, and another probably bigger farm located near Antwerp that used nearly 400t over five years. To deliver these amounts the former required 319 cart journeys and the latter 492 cart journeys, showing how labour-intensive was the use of such low grade fertilizer materials.

Table 1. Manure products available in the early 18th Century

Manures of animal and vegetable origin	Manures of mineral origin
Green crops	Common salt
Rape cake	Gypsum
Malt dust	Phosphate of lime (Powdered bone)
Linseed cake	Saline compounds of magnesia
Seaweed	Wood ashes (<i>potash?</i>)
Dry straw	Mineral alkali, or Soda
Wood ashes	Nitre (Nitrous acid + Potasa) (<i>saltpetre?</i>)
Animal manures	Sulphate of potasa
Fish	Ammonium salts
Blubber	
Bones	
Horn	
Hair, Woollen rags & Feathers	
Urine	
Skin and Leather	
Bird dung, including Guano	
Night soil	
Animal dung	
Soot	

Source: H.Davy, The Elements of Agricultural Chemistry- Lectures VI & VII (1814)

Table 2. Fertilization plan for a 21ha farm near Lille

Year	Solid Manure (t)	Liquid Manure (t)	Ash ('000 litres)	Oil Cakes (tonnes)	Crops
1	76.8	14.25	-	-	Rapeseed, Turnips, Brassica
2	-	-	-	-	Oats
3	19.2	-	2.176	1.0	Clover, Flax
4	-	-	-	-	Wheat
5	-	-	-	-	Vetches, Rye
6	57.0	-	-	1.5	Rapeseed
7	-	-	-	-	Wheat
8	25.6	30.4	1.088	-	Barley, Clover, Potatoes, Beets
9	38.4	-	-	1.0	Rapeseed, Beans
10	-	-	-	-	Wheat
TOTAL	217.7	44.65	3.264	3.5	

A lack of understanding is evident in some of the materials used as manure

In the early 1800s there was limited understanding of the nutrient content of manures, but this changed in the following decades as techniques of chemical analysis improved and with them the understanding of the composition of the materials being used to feed the soil. In a paper published in 1862, Lawes calculated the theoretical nutrient of fresh undecomposed manure (0.64% N, 0.23% P₂O₅, 0.53% K₂O) and with it presented analytical results for various farming products and waste materials, all of which are characterised by a low content of the three primary nutrients. It is therefore no surprise to find that in the Rothamsted trials conducted by Lawes & Gilbert, FYM is applied at the rate of 14t per acre (35t per ha), while less than one tonne per acre of mineral fertilizers was needed to supply similar nutrients on the same scale.

Lawes was well aware that the knowledge being developed by agricultural scientists did not spread across the wider farming community. In an 1847 issue of the Journal of the Royal Agricultural Society of England he wrote “ask the most experienced farmer to explain the principles which govern the routines he is daily in the habit of practising. Ask him to determine the value of any rotation of crops or their comparative exhaustive powers. Ask him what ingredients must be restored to the soil to keep its fertility unimpaired. Or the exact manner in which climate influences his produce. His answers will be vague and unsatisfactory. But these and a thousand other questions of a similar nature are capable of solution by



Two-course crop rotation had been replaced in the early Middle Ages by the three-course rotation system with two cultivated fields and one fallow field

science and they must be answered before agriculture can be said to rest on a satisfactory foundation.”

Utilising waste

This lack of understanding is evident in some of the materials used as manure that, by modern standards, appear to have little or no fertilizing value. As some farms began to specialise in arable or market garden crops, thus having no access to FYM from livestock, they sought alternative supplies of manure. One option was to load the empty carts that had taken their crops to market with ‘town muck’

obtained from the dust contractors who handled the collection and disposal of rubbish from streets and homes - readers of Charles Dickens’ novel Our Mutual Friend (1865) will be familiar with London’s dust heaps, that he treated in a satirical way. A more scientific approach was adopted by Henry Mayhew, author of “London Labour and the London Poor”, who made a detailed estimate of the value of the rubbish collected in London during the course of one year. He assessed the value of some 78 types of refuse that were bought, collected or found in the streets of London, worth a total of GBP1.4 mn, of which

Table 3. Fertilizer deliveries to Erdegem farm, near Antwerp

Year		
1	60 loads solid manure	48t
2	160 loads solid manure	128t
3	30 loads liquid manure	30t
4	80 loads solid manure	64t
5	160 loads solid manure	128t
TOTAL		398t

Source: BH Slicker von Bath, The Agrarian History of Western Europe (1964)

Table 4. Annual summary of London refuse products sold for use in agriculture

Cesspool soil	700,000 loads @ 10s	GBP375,000
House dust (also sold for bricks)	900,000 loads @ 2s 6d	GBP112,500
Bones (also sold for knife handles)	3,494,400 lb @ 3d	GBP105,625
Street sweepings	142,800 loads @ 2s 6d & 3s	GBP23,479
Soot	800,000 bu @ 5d	GBP16,667
Rags	4,659,200 lb @ 1½d	GBP9,707
TOTAL		GBP542,978

Source: H Mayhew, London Labour and the London Poor (1851)

39% were materials that could be sold for use in agriculture.

Table 4 does not include horse manure, a potential source of nutrient, presumably because of the difficulty of separating it from the street sweepings, although it is likely that the owners of stables would have collected and sold their manure.

Mayhew’s survey was carried out around 1850, some years before Joseph Bazalgette built London’s underground system for handling the city’s sewage. Some night soil was collected prior to this and transformed into ‘poudrette’ - a dry product that could be shipped overseas, for example to the sugar plantations in the West Indies. This was a much bigger business in Paris where the huge Montfaucon facility made poudrette for the local market,

Modern sewage systems generated a huge amount of waste for disposal

as well as for overseas territories. However, the use of night soil in Europe was negligible compared with the practice in the Far East of Asia, which greatly impressed European observers. Davy commented that “the Chinese have more practical knowledge of the use and application of manures than any other people living”, and Liebig in his 1859 volume of Letters on Modern Agriculture stated that “it is quite impossible for us in Europe to form an adequate conception of the great care which in bestowed in China in the collection of human excrements”. In his 1862 book on The

Natural Laws of Husbandry, he included an appendix on Japanese farming methods, describing the collection and processing of human waste for use as fertilizer, based on the observations of a Prussian bureaucrat who had visited the country.

The introduction of modern sewage systems in London and elsewhere in Europe in the 1860s generated a huge amount of waste for disposal. Various schemes were formulated to pump this material onto farmland, and Liebig was brought in to provide advice, but nothing permanent materialised from these projects. ■

Michael Freeman writes:

For some 45 years until I retired in 2010, I was an economic analyst specialising in the study of the mining and chemical sectors, in particular the mineral fertilizer industry. When I started out, many of the active companies had names that related to their origins in the 19th Century as producers of superphosphate and potash, traders in guano, or as suppliers of meat processing by-products. Consolidations and closures caused most of these old names to disappear, and with them the links to the industry’s origins.

Retirement gave me an opportunity to explore the early years of the modern mineral fertilizer industry and to write about it. I chose to terminate my coverage at the end of the 19th Century, by which time the production of phosphate and potash fertilizers had become well established, at least in Europe and North America, but the creation of a nitrogen fertilizer industry was still waiting for the invention of the Haber-Bosch process for synthesis ammonia early in the 20th Century.

Being based in London, I have been able to use the resources of the British Library and the London Library to supplement the material that is available on line. I have tried to prevent my account from being too Anglo-centric, although there is no doubt that the UK’s highly-developed farming and finance sectors did allow it to be the industry leader for a brief time in the middle of the 19th Century.

I would welcome any comments, amplifications or corrections to the text, and can be reached via Fertilizer Focus.

The EU Fertilising Products Regulation

– overcoming implementation barriers

Written by

Antoine Hoxha, Production and Agriculture Director, Fertilizers Europe, Belgium

On 16 July 2022, the Fertilising Products Regulation (FPR) enters into force, overhauling current rules for placing fertilizing products on the EU market. In comparison to the existing Fertiliser Regulation (EC) 2003/2003, there are significant changes on how fertilizers will be classified, putting the emphasis on what they contain, rather than the type they belong to.

The FPR aims to harmonise the certification process of fertilizing products across the Single Market. The scope of the regulation has been widened and now not only

includes mineral fertilizers, but also other products such as organic fertilizers, organo-mineral, soil improvers, liming materials, plant biostimulants, inhibitors and fertilizing product blends. These are all grouped into seven product function categories.

Implementation... issues remain

Despite the transition period running since the adoption of the

new regulation by the European Council in May 2019, many technical and practical hurdles are not resolved. Such state of play puts many fertilizer producers at risk of not complying fully with the new regulation on the first day of entry into application.

The new regulation establishes a common legal framework for fertilizing products in the form of a toolbox of measures, with different pathways depending on the product category and its content. This is to be understood as a 'conformity assessment', i.e. a process demonstrating whether specified requirements relating to a fertilizing product are fulfilled.

It will definitely require time and energy within the fertilizer industry to adapt to this new framework – and so challenges remain.

The FPR will exist in parallel to national legislation and mutual recognition as it is only creating an optional harmonization. It will therefore be up to a manufacturer to decide whether it applies for a CE mark to benefit from free circulation in the EU's internal market.

Manufacturers of fertilizers that do not bear the CE marking will still be able to place fertilizers on their national market.

Figure 1. Product function categories (PFC)

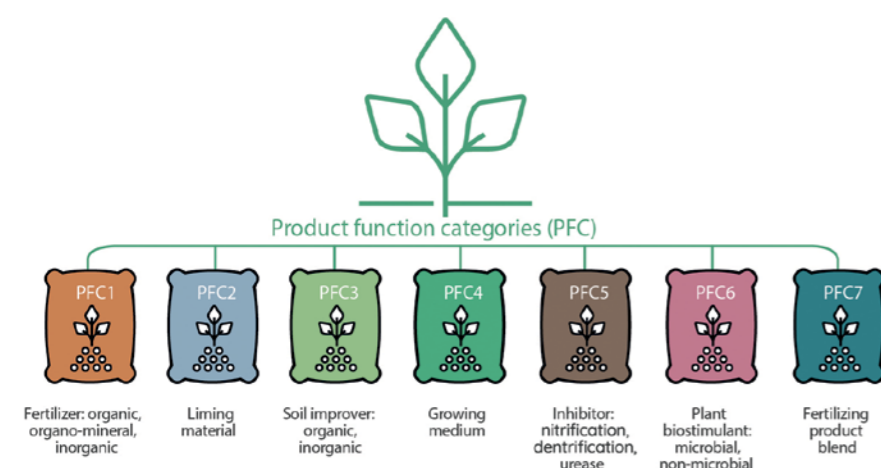
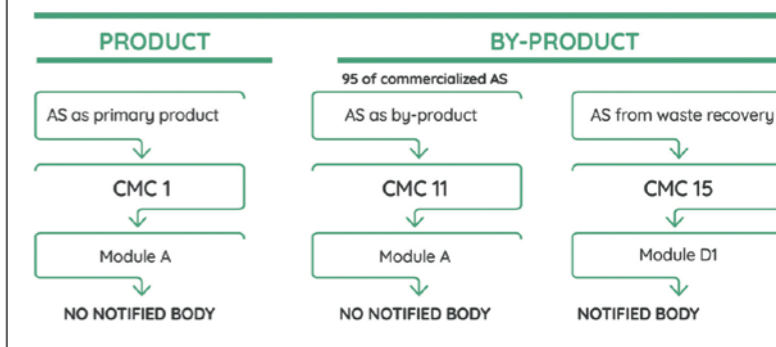


Figure 2. Involved players on the EU fertilizer market, including notified bodies – a new player



Figure 3. Classification of ammonium sulphate (SA)



The new regulation establishes a common legal framework

Notified bodies

Under the new regulation, a notified body will be a conformity assessment organisation officially designated by the national authority to carry out the procedures for conformity assessment within the meaning of the FPR.

A notified body will be required in the process of certification of a fertilizing product other than the typical mineral fertilizers. However, for other products such as ammonium nitrate, mineral fertilizers with inhibitors and products which include waste streams (e.g. garden products), notified bodies will be needed. It is estimated that the whole fertilizing products market includes over 58,000 products that fall under notified bodies' assessment.

Designated by members states, notified bodies will play an important role in bringing fertilizer products on the market. A dedicated database run by the EU Commission will list all authorised bodies. However, with just over six months before the FPR's entry into force, there are only few assessment bodies across Europe that are either approved or in the process of becoming a recognised notified body by the EU member state.

As things stand, the accreditation of notified bodies by national authorities is progressing too slowly and will likely create a bottleneck in the FPR approval system.

Labelling

Products complying with the requirements of the FPR will carry a CE marking. Products with a CE mark can be sold in all EU member states without a need to fulfil additional requirements of national legislations. The business entity that wishes to place the product on the market has the responsibility to ensure the product complies with the FPR requirements for their product function category and labelling.

Standardised conformity assessments

Not every fertilizing product has to be assessed by the notified body. In fact, the FPR allows self-assessment for certain modules. This process can be used for so-called virgin materials and substances and for other CMC materials as specified in the regulation. Regrettably, the practical details of self-certification remain unclear. The situation is further complicated since 'Harmonised Standards' will not be available at the date of entry into application.

To help its members with the implementation issues, Fertilizers Europe has developed standard technical documentation dossiers for typical mineral fertilizer products such as urea or CAN.

One of the main advances in the implementation phase was the status on the ammonium sulphate by-product. The initial proposal by the Joint Research Centre, the technical arm of the European Commission, provided a criteria that was too rigid for ammonium sulphate. Fertilizers Europe argued in favour of a more practical solution that reduces administrative burden. A recently published delegated act confirmed that only ammonium sulphate from waste recovery will need to go through the scrutiny of notified bodies.

The EU mineral fertilizer industry is at the forefront of innovation

The mineral fertilizer industry has always been a leader in recycling millions of tonnes of by-products into high quality nutrient inputs for agriculture. The new framework will further facilitate the current innovative pathway that the industry has already undertaken in the spheres of circular economy, such as controlled realised fertilizers and biodegradability solutions. Fertilizers Europe continues engaging with stakeholders across the EU agri-food sector to work out common workable solutions and ensure a smooth transition to new legislation. ■

Green ammonia: striving towards sustainable fertilizer production

Written by

Ms. Anna Bashuk, Content Marketeer, Stamicarbon, The Netherlands

The increasing focus on sustainability can be seen across all business areas, including the fertilizer industry. Conventional processes that rely on fossil fuels and other non-renewable energy resources must be redefined to ensure a sustainable, environmentally friendly future.

In line with this, Maire Tecnimont Group has launched its sustainability strategy in June last year, inspired by the United Nations Sustainable Development Goals, developed through a concept of innovation that is technological, economic and social. Maire Tecnimont intends to position itself as an enabler of the energy transition worldwide, focusing on people and their well-being and the communities of the geographies in which the Group operates. From this perspective, Stamicarbon, the Group's innovation and licensing company, is determined to be part of the change with innovation and investment in sustainable, carbon-free fertilizer production. Its recently introduced the 'Stami Green Ammonia' (SGA) technology package which makes it possible to produce ammonia from renewable energy sources, paving the way to more environmentally friendly production of nitrate-based fertilizers.

Green ammonia technology offers a more sustainable alternative

Green ammonia plant in the US

In September 2021, Stamicarbon signed an agreement with Greenfield Nitrogen LLC to develop the first dedicated green ammonia plant in the US Midwest, working with other subsidiaries of Maire Tecnimont Group, MET Development (project development) and NextChem (development of green technologies and energy transition). The 240 mtpd plant will be based on the SGA technology, while NextChem will start a feasibility study, and MET Development will assist with project development. This is already the second commercial SGA plant under development since the technology entered the market in May 2021.

The new plant to be located near Garner, Iowa, will be the first of Greenfield Nitrogen's green ammonia facilities in the US Corn Belt, the region in the Midwest widely known for its production of corn. This new

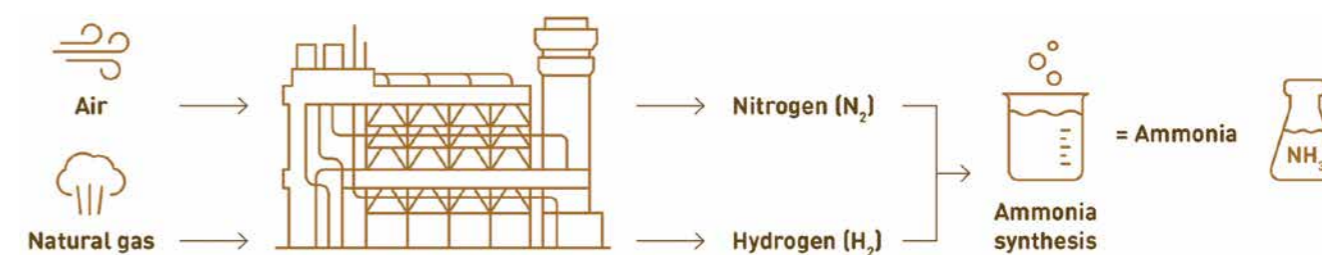
plant will be powered by renewable energy resources and produce around 83,000 t of ammonia per annum, reducing the region's dependency on imported ammonia. It will also contribute to reducing CO₂ emissions by the industry, expected to save over 166,000 t of CO₂ emissions per annum.

Chemistry behind green ammonia

Production of ammonia on an industrial scale mainly relies on the Haber-Bosch process, which uses nitrogen from the air and derives hydrogen from hydrocarbons, most commonly natural gas, through a conversion process of steam reforming (see figure 1).

The use of fossil fuels as feedstock for ammonia production in the first step of the process results in carbon monoxide production alongside hydrogen. While hydrogen continues

Figure 1. 'Grey' ammonia production process



further into the synthesis, carbon dioxide, having no other role, is mainly released into the atmosphere. The output of this process is known as 'grey' ammonia.

In the green ammonia process, water electrolysis is used to derive hydrogen, nitrogen is added from the air, and the rest of the production is powered by renewable energy sources. Using electricity, water is separated into hydrogen and oxygen, no fossils involved, while electricity is derived from renewable sources like solar, wind, water, and geothermal energy (see figure 2). Therefore, green ammonia technology offers a more sustainable, carbon-free alternative.

Ammonia can be produced with natural elements such as the sun, air and water

In short, ammonia can be produced with natural elements such as the sun, air and water, resulting in a sustainable output. Of course, since the plant operates on renewables, it needs a constant supply of energy, so the location needs to be considered carefully – it is best to build a green ammonia plant near the energy source to optimize the financial model. But it is also possible to obtain electricity by connecting the plant to a green energy grid or hydropower or considering carbon-free nuclear power.

Green ammonia technology features

Recent technological developments in the fertilizer industry have focused more on the economy of scale and fertilizer production of higher outputs. However, now that the industry is moving towards greener technologies, the availability of renewable electricity, limitations in electrolyzer production capacity and lack of economy of scale thereof must be considered, and these are not

Figure 2. Green ammonia production process

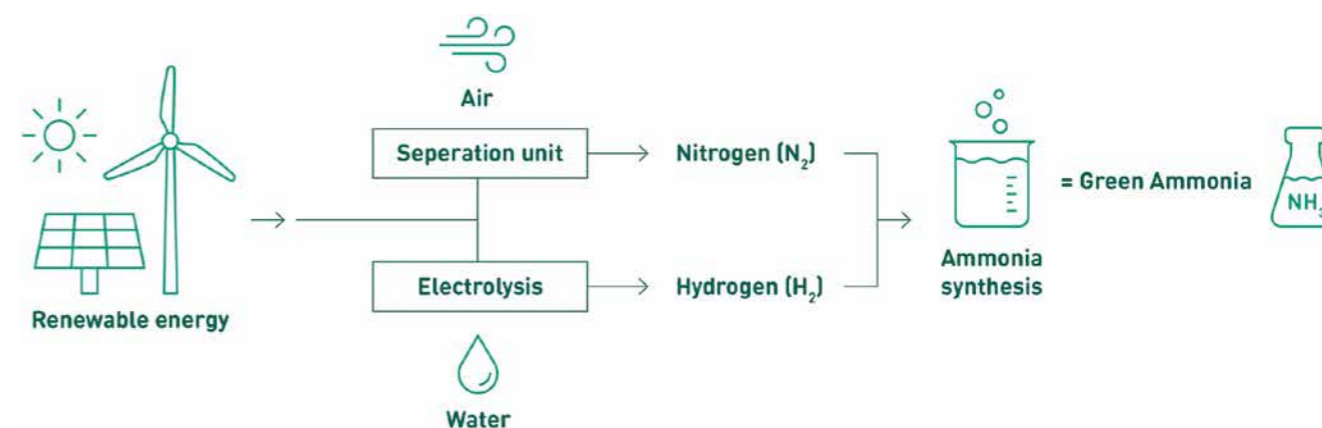
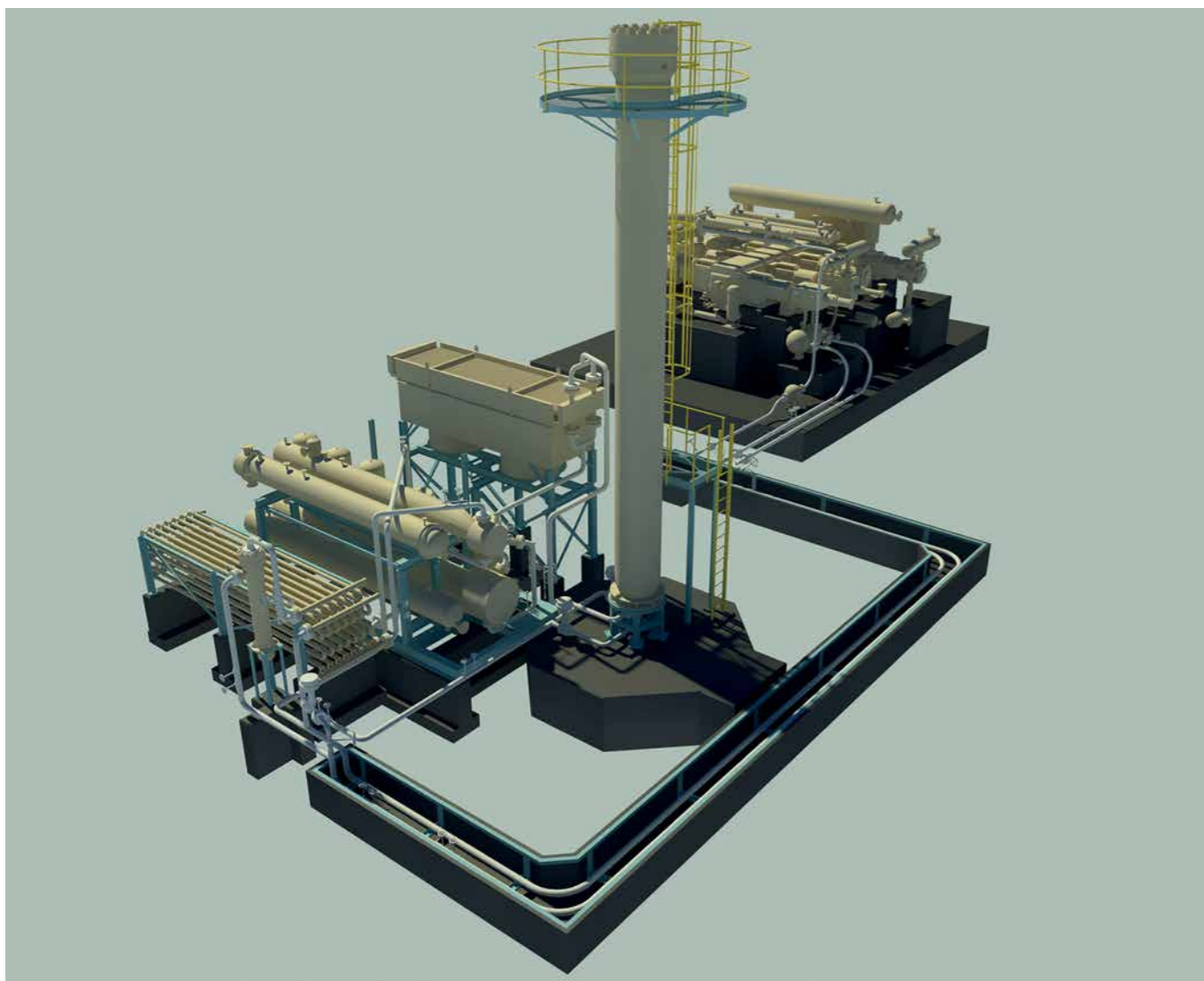


Figure 3. 3D model of a Stamicarbon green ammonia plant



yet sufficient to facilitate large-scale projects on short notice. Furthermore, existing technology is not yet ready to efficiently manage the intermittency of renewable feedstock required for standalone large-scale green ammonia production.

The high-pressure ammonia synloop (approximately 300 bar) at the heart of the SGA technology has been customized to make the most efficient plant design at a small scale and with green feedstock. This design choice allows ammonia to be condensed with the cooling water, eliminating the need for a refrigerating compressor. As a result, the plant operates with

The technology offers a competitive solution for local production

a single proven and reliable electric-driven reciprocating multiservice compressor. The minimal equipment needed for plant operations leads to substantial CAPEX saving, which is an important consideration for small-scale applications.

Key characteristics

A green ammonia plant offers a viable solution for tackling the global carbon challenge by using renewable energy sources to power ammonia synthesis instead of fossil fuels. The technology configuration, characterized by a modularized approach and thus perfect for small-scale facilities, is the first of its kind, based on proven technology.

The technology package is available in proven design capacities for small-scale plants – 100, 200 and 250 mtpd of ammonia production – but can be scaled upwards. The set up has a lean and compact design, with a footprint

A green ammonia plant offers a viable solution for tackling the global carbon challenge by using renewable energy sources to power ammonia synthesis

of approximately 15 x 30 m, including the compressor building, and uses about 35-100 MW of power, depending on capacity (see figure 3).

Stamicarbon green ammonia has four recently commissioned operating technology references based on natural gas. This is the strongest technology reference in a small-scale range that makes a sound basis for further development of the future small-scale ammonia plant concept.

The technology includes the following key features:

- High CAPEX efficiency
- Strongest reference base with four small-scale plants in operation
- Lean, compact and modularized design
- High plant reliability with a proven track record
- Compliance with the highest environmental standards

The green ammonia technology offers a competitive solution for local production on a small scale. It can be applied in combination with existing (mono-pressure and dual-pressure) nitric acid and urea technologies, moving from grey ammonia to green ammonia-based fertilizers to produce green nitrate fertilizers. In combination with the use of recycled or recovered CO₂, it reduces the carbon intensity of urea fertilizer production.

Commercialization of green ammonia in Kenya

The green ammonia technology was applied in May 2021, when Stamicarbon, MET Development and NextChem started to work on the first commercial nitrate fertilizer plant operating at an industrial scale

(approximately 200 kt/a) powered by renewable energy sources at the Oserian Two Lakes Industrial Park in Kenya. Stamicarbon will contribute its green ammonia and nitric acid technologies to the renewable power-to-fertilizer plant located in the 150-hectare sustainable development project in Nakuru County, 100 km from Nairobi.

The plant will be powered primarily by geothermal and solar energy, using about 70 MW of renewable power, which will allow for a yearly reduction of 100,000 t of CO₂, compared with a fertilizer plant powered by natural gas. The objective is to start commercial operation of the plant in 2025, producing 550 mtpd of calcium ammonium nitrate (CAN) and fertilizers based on nitrogen, phosphorus and potassium (NPK) to meet the demand of local agricultural requirements. The green power-to-fertilizer plant at the Oserian Two Lakes Industrial Park will become the first of its kind and support local fertilizer production in Kenya, securing the availability of fertilizers at the right time in the agricultural season.

European green initiatives

Besides the direct development and licensing of new commercial green ammonia plants, Stamicarbon participates in two European green initiatives to make the industry more sustainable. The first one is an EU-funded project INITIATE (Innovative industrial transformation of the steel and chemical industries of Europe) to use the carbon-rich off-gases from steel mills as feedstock for urea production. This process's core is a modular carbon-capture utilization-and-storage (CCUS) technology,

which allows for integrating the conditioning of steel gases with ammonia synthesis. The company will be responsible for the commercial implementation plan and supply its green ammonia technology to justify the pilot project's viability and prove the capability to produce ammonia to build a reference plant for urea production in the next stage. In addition, it will supply the ammonia technology license and ammonia converter for the 3 mtpd pilot plant in Luleå, Sweden.

The second initiative is the delivery of the green ammonia technology to PROMETEO, a European Horizon 2020 project to develop an innovative prototype for high-temperature electrolysis, using renewable energy to power the continuous production of green hydrogen. The innovative solution will address intermittency in the solar power supply by managing energy conversion and re-generation phases. Green hydrogen produced in this way will contribute to the production of green ammonia and green fertilizers.

Green ammonia for a greener future

The world is demanding accelerated cooperative climate action to reduce emissions. At the same time, feeding the ever-growing population remains a challenge. Green ammonia projects aim to serve as a gateway to carbon-free and future-proof green ammonia production, representing a significant leap for sustainability within the fertilizer industry while also offering exciting opportunities for collaboration between the fertilizer and energy markets. ■

News in brief

EUROPE

Haldor Topsoe and Green Fuel enter into a MOU to develop scalable technologies for green ammonia

Green Fuel and Haldor Topsoe have signed a Memorandum of Understanding (MOU), which will see the companies partnering to identify efficient and scalable technologies for the production of green ammonia in Iceland.

The agreement also enables the two companies to explore other business opportunities within green ammonia.

Green ammonia will be vital for the decarbonization of hard-to-abate industries such as shipping, heavy goods transport and agriculture.

Topsoe and Green Fuels are both already active in developing green solutions to help combat the climate challenge. The two parties are now collaborating to develop viable and efficient solutions, which could serve to establish Icelandic production of green ammonia.

Topsoe develops cutting edge new technologies within green hydrogen, green ammonia, eMethanol and efuels, and Green Fuel is a hydrogen and ammonia company that intends to be at the forefront of the energy transition. Green ammonia is seen as a future fuel which will play a vital role in the decarbonization of salient industries including shipping, heavy goods transportation and agriculture.

“Iceland offers large-scale volumes of the renewable power needed from its vast hydro and geothermal resources, and we see an exciting potential for the production of clean fuels,” says Tore Sylvester Jeppesen, Senior Vice President at Topsoe.

As part of its plan to produce green ammonia and green hydrogen in Iceland, Green Fuel has also secured a Letter of Intent to operate at Bakki Eco-Industrial Park in north-east Iceland.

Anglo American upgrades scope of Woodsmith polyhalite fertilizer project

Anglo American has conducted a detailed technical review of the Woodsmith polyhalite project in the UK

since mid-2020 to ensure the technical and commercial integrity of the full scope of its design. Now largely complete, the review has confirmed the findings of Anglo American’s due diligence that a number of elements of the project’s design would benefit from modification to bring it up to Anglo American’s safety and operating integrity standards and to optimise the value of the asset for the long term.

Anglo American is also making a change to the leadership of the project following its integration into Anglo American and ahead of the full project execution phase. Tom McCulley, who has led the development of the Quellaveco copper project in Peru, will take over from Chris Fraser as CEO of Crop Nutrients. After 12 years of driving the project from inception to its position today, Chris Fraser will step aside and take on a strategic projects role for Anglo American.

The Woodsmith team is further developing the engineering to optimise the configuration of the project, recognising the multi-decade life of the mine. Particular attention is on those aspects identified at the outset of Anglo American’s ownership – namely, the sinking of the two main shafts, the development of the underground mining area, and the changes required to accommodate both increased production capacity and the more efficient and scalable mining method of using only continuous miners; such improvements will also require the installation of additional ventilation earlier in the development of the underground mining area.

Anglo American expects that these changes to the design of the mine infrastructure – which will result in a different, enhanced configuration and therefore a different construction and production ramp-up schedule – will ensure that its exacting standards are met and the full commercial value of the asset is realised.

Mark Cutifani, Chief Executive of Anglo American, said: “We are very happy with the high quality and exciting potential of Woodsmith, with the scale and quality of the polyhalite orebody pointing to a Q1 operating cost position and strong margins. This is a very long-life asset and we are going to take the necessary time to get every aspect of the design right to match our long term vision and value aspirations.

“We have said from the outset that we expect to make improvements and that we will execute certain elements of the construction differently and with a more conservative schedule. We expect to have completed our design engineering, capital budget and schedule at the end of

2022, with a fully optimised value case that recognises the upside potential we see in Woodsmith, and we will then submit the full project to the Board.”

In the meantime, construction of the major critical path elements of the project, principally the two main shafts and the mineral transport tunnel, is progressing, with approximately US\$0.7 bn of capital expected to be invested in 2022.

Anglo American’s development of the market for its POLY4 fertilizer product continues to demonstrate the benefits of its multi-nutrient, low chloride characteristics on the full breadth of crops at commercial scale. Beyond its crop yield and quality benefits over other bulk fertilizer products, the value of the product in the market is also expected to be enhanced by its positive environmental properties – a very low carbon footprint given minimal processing requirements, its natural ability to improve soil health, and its certification for organic use.

OCI and Navigator sign agreement for provision of CO₂ transportation and storage services through Heartland Greenway

OCI N.V. has announced that its wholly-owned Iowa Fertilizer Company facility has entered into an agreement with Navigator CO₂ Ventures LLC to provide CO₂ transportation and storage services on its carbon capture and storage (CCS) system, the Heartland Greenway.

The project is backed by BlackRock’s Global Energy & Power Infrastructure Fund III, which invests in essential, long-term infrastructure assets, and is commercially anchored by Valero.

The agreement signed by both companies outlines the key terms for Navigator to provide CO₂ transportation and storage services under a long-term agreement for up to 1,130,000 t of CO₂ per year, equivalent to the carbon emissions of approximately 245,000 vehicles driven annually. The project will have two phases, with the first phase focused on process gas representing approximately 500,000 t of CO₂ per year, and the second phase for the balance, subject to regulatory enhancements of the 45Q programme to make installation of the required post-combustion capture equipment economically feasible.

When the new infrastructure is installed, the project has the capability to capture and store materially all of the CO₂ emissions from Iowa’s largest fertilizer plant. Start of operations for the first phase is expected at the end of 2024.

Ahmed El-Hoshy, CEO of OCI N.V. commented: “We are excited to partner with Navigator on this project which

allows for an effective and quick solution to reduce our CO₂ footprint and offer low carbon products to our customers across the value chain from our world-scale facility in Iowa. We are monitoring the on-going discussions in Congress around enhancements to the 45Q programme to support the project economics and potentially open the opportunity to widen the scope of this project to capture more CO₂. This agreement follows the announcement earlier this year that we have the ability to produce up to 365,000 t per year of blue ammonia at OCI Beaumont in Texas, and blue and green ammonia projects in Abu Dhabi and Egypt, and marks another milestone towards achieving our sustainability goals and progressing towards a greener future.”

“OCI is a global leader in the ammonia and nitrogen fertilizer industries – an important component of agriculture - and forward thinking in their plans for decarbonization. We’re excited to embark on this project with them to provide a long-term and cost-effective solution for handling their CO₂ emissions,” says Navigator CEO, Matt Vining. “State-of-the-art nitrogen producers like OCI play a critical role in decarbonizing the agricultural supply chain, as well as industrial feedstocks and fuels, and we look forward to advancing a greener future together.”

Navigator will be working with other industrial processing plants in the Midwest to adopt a more sustainable approach in the execution of their services and aid in the reduction of their carbon footprints through Heartland Greenway.

Once fully expanded, the Heartland Greenway will be able to capture and sequester 15 mn t of CO₂ annually, which, according to EPA estimates, is equivalent to eliminating the annual carbon footprint of the Des Moines metro area three times over.

The agreement is subject to finalization of definitive documents.

Yara begins electrifying the factory at Herøya

Yara has been granted NOK283.25 mn from Enova for the development of an initiative to produce green ammonia. With this Yara officially takes the first step towards full decarbonisation of the ammonia plant at Herøya in Porsgrunn.

Yara’s fertilizer factory at Herøya is one of Norway’s largest sources of CO₂ emissions outside the oil and gas industry, releasing 800,000 tonnes of CO₂ annually. A crucial element in fertilizer production is hydrogen, which is converted into ammonia. Today, the hydrogen is produced using liquefied fossil gas. By producing hydrogen based on renewable energy, Yara will be able to create emission-free ammonia.

Norway has the unique opportunity to take a leading position in the green transition, but the window of opportunity is limited. That is why this decision is so important and will be able to help accelerate a new, Norwegian industrial adventure. Green ammonia is a versatile, climate friendly input factor and hydrogen energy carrier. Emission free ammonia is the key to reducing emissions from world food production and long-distance shipping, says Svein Tore Holsether, CEO of Yara.

Yara's corporate board has made the decision to invest in the 24 MW demonstration plant, where the technology will be demonstrated and quality assured. This plant will be one of the largest projects producing green ammonia in the world.

Renewable energy will replace fossil fuels and thereby reduce CO₂ emissions by approximately 41,000 t per year. The plant will produce enough hydrogen to produce 20,500 tonnes of ammonia per year, which converts into between 60,000-80,000 t of green fossil free mineral fertilizer.

The project aims to supply the first green ammonia products to the market as early as mid-2023, both as fossil free fertilizer, as well as fuel for ships. We move from good intentions to actions, the investment decision has been made and the project begins now, says Magnus Ankarstrand, director of Yara Clean Ammonia.

Holsether underlines that this is an important move to ensure Yara's plans to reduce their own emissions.

Yara has already cut its own emissions by about 45% since 2005 and will continue to reduce its own emissions and emissions from power production by an additional 30% before 2030. We are very pleased that the authorities support the investment and has granted us the necessary permits and the financial support from Enova, says Holsether.

Eurochem to buy controlling stake in Brazil's Heringer

Russia-based fertilizer producer Eurochem has agreed to purchase a 51.48% stake in indebted Brazilian distributor Heringer in a deal valued at 554.6 mn Brazilian reais (USD97 mn), subject to antitrust approval.

Heringer controls 14 storage, blending and distribution units in Brazil, of which 11 are active. The capacity of the active units was 4.2 mn t/yr, with storage capacity of 638,000 t, the firm said in its latest quarterly report.

The firm's three most-southerly units in Porto Alegre, Rio Grande and Paranagua are inactive. The firm resumed production at its 11th unit in Rio Verde, in Goias state, in

the third quarter. Heringer sold a 400,000 t/yr blending unit in Uberaba, in Minas Gerais, to Brazilian fertilizer producer Cibra in February this year.

Heringer is operating under a bankruptcy reorganisation plan, which was approved by creditors at the end of 2019 and certified by a civil court in February last year.

The firm's court-supervised debts totalled RUB1.01 bn as of September. Overall liabilities were RUB2.35 bn. The firm posted a profit of RUB101.3 mn in the third quarter, up from RUB7.09 mn a year earlier.

Heringer's fertilizer deliveries totalled 1.06 mn t in the first three quarters of this year, up by 17.5% on a year earlier, boosted by strong demand for a range of crops.

Heringer has been courted by other potential Russian acquirers in recent years. Fertilizer supplier Uralchem and potash producer Uralkali, both owned by majority shareholder Dmitri Mazepin, had agreed to purchase a controlling stake of 51.5% in Heringer in September 2019, but the deal did not materialise.

Eurochem's deal values 51.48% of Heringer at RUB554.6mn, or RUB20/share.

Yara to end potash sourcing from Belarus

Norwegian fertilizer producer Yara has initiated a wind-down of potash sourcing from Belarus, which it expects to be completed by 1 April.

State-owned potash producer Belaruskali and marketing arm Belarus Potash (BPC) are both under US sanction, as part of attempts to pressure the government of President Alexander Lukashenko, which has been cracking down on opposition.

Belarus is one of the world's largest potash producers, accounting for around 17% of global output of potassium chloride (MOP) in 2020, International Fertilizer Association (IFA) data show.

Yara is one of the largest non-sovereign buyers of potash globally, typically sourcing 10-15% of Belaruskali's total annual output of the product, it said.

Yara's primary use for potash is in the production of complex fertilizers.

The company has sought to bring about "positive change" by leveraging its presence in Belarus to promote occupational safety and human rights, but the impact on the supply chain from the current sanctions have forced it to initiate a wind-down of sourcing from the country, it said.

"The effects of the current sanctions on Belarus reduce Yara's ability to positively influence the safety and

wellbeing of Belaruskali workers," Yara International president and chief executive Svein Tore Holsether said. "For Yara, this is a disappointing development.

"We remain strongly committed to the safety and wellbeing of Belaruskali's workers. Despite the wind-down of potash sourcing, Yara aims to continue the industrial safety programme initiated in 2021, in close co-operation with the independent trade union in Belaruskali and in full compliance with applicable sanctions," Holsether said.

Belarus has been in the West's focus since Lukashenko retained power as president through disputed results of an election that took place in August 2020. The country's fertilizer production — including NPK and straight-nitrogen output — have been targeted.

Crucially, though, EU and UK measures did not ban the country's largest export category of potash products. MOP with a potassium content evaluated as K₂O by weight, exceeding 40% but not exceeding 62% on the dry anhydrous product — that which falls under CN code 3104 20 50 — was not included in the regulations.

Belarus exported just below 11.76mn t of MOP under code 310420 in 2020, GTT data show. Around 9.78mn t of that total fell under the more specific 31042050 reference.

But EU member state Lithuania — used by landlocked Belarus for seaborne exports — has been threatening to prevent transit of potash, and Yara's latest announcement is likely to be a significant blow to the Lukashenko regime and the country's fertilizer industry.

NORTH AMERICA

US farm group asks DOJ to investigate fertilizer prices

US agricultural research and policy non-profit Family Farm Action Alliance (FFAA) has asked the Department of Justice to launch an antitrust investigation into higher fertilizer prices, citing concerns about squeezed profitability at the farm gate.

The FFAA in a letter said fertilizer producers "are using their monopoly power" to alter prices based on crop values instead of fertilizer supply and demand.

"If these corporations are tying the price of their products to the farmer's ability to pay rather than supply and demand, that equates to an abuse of the market," FFAA president Joe Maxell said in the group's letter to the Justice Department. "Such abuses allow concentrated corporations to extract maximum profit out of the supply chain, leaving the farmer with no hope of profitability."

The letter also said fertilizer companies cited global shortages to justify higher prices, arguing company documents "refute any claims and reveal they have additional capacity they are not utilizing".

Specific fertilizer companies named in the letter included Yara, CF Industries, Nutrien, Mosaic and Koch, none of which responded to a request for comment.

Key fertilizer prices in the US — such as Nola urea fob, Nola DAP fob and Nola MOP fob — have doubled or more than doubled since the start of the year amid surging feedstock costs, and planned and unplanned production outages domestically and globally.

The FFAA argued corn and soybean farmers had profit "stolen" because fertilizer values outpaced rising crop prices. The Federal Reserve Bank of Kansas City earlier this month said farm income in 2021 remained strong through the end of the year but higher input costs are "likely to increase credit needs and weigh on profit margins going forward".

But farmers are expected to post a profit in 2021 nonetheless.

Farmer income this year is forecast to increase by nearly 15% from last season and reach the highest level since 2013, according to the US Department of Agriculture (USDA).

Gross income from crop sales is expected to grow by 18% year-over-year, more than offsetting the estimated 12% increase in fertilizer expenditures.

SOUTH AMERICA

Brazil's Fertgrow to double potash market share

Brazilian blender Fertgrow intends to double its potash market share with Russian producer Uralkali in its shareholding structure.

Fertgrow accounts for 18% of potash deliveries in its marketing area, delivering fertilizers to customers in Maranhao, Piaui, Tocantins, Pará and Mato Grosso. The company intends to double its market share by 2025.

Uralkali has agreed to acquire a 50% stake in Fertgrow earlier this month. After the move, Uralkali will share Fertgrow's composition with Agrex, a subsidiary of Mitsubishi Corporation.

For nitrogen and phosphate fertilizers, Fertgrow accounts around 30% of the market share. Fertgrow is based in Sao Luis, in Maranhao state, and it has an installed capacity of more than 1 mn t per year.

The company delivered 700,000 t of NPK fertilizers in the 2020-21 crop, and it intends to increase its deliveries to 750,000-800,000 t in the 2021-22 crop. Brazilian antitrust authority Cade is expected to evaluate the deal by late January-early February 2022, according to Fertgrow.

ASIA

Australia government in deal to secure urea from Incitec

The Australian government has made an agreement with Australian fertilizer and chemicals group Incitec Pivot to increase the supply of refined urea in order to produce more diesel exhaust fluids (DEF), also known as AdBlue, to address the potential shortfall of the fluid for the mining and agriculture sectors.

Under this agreement, Incitec Pivot will design, trial and, on completion of successful tests, scale-up manufacturing of significant quantities of technical grade granular urea (TGU), a critical component of AdBlue, the Australian energy minister Angus Taylor said in a statement. As part of the agreement, Canberra will provide a grant of AUD29.4 mn (USD20.90 mn) to Incitec Pivot, which in turn will supply quantities of TGU as needed by current suppliers.

The agreement with Incitec Pivot follows the formation of a taskforce, known as the AdBlue taskforce, to address a potential shortage of DEF.

“Australia currently has adequate stocks of AdBlue stock on hand, but this agreement with Incitec Pivot will enable domestic production of TGU or supply of an AdBlue product to domestic manufacturers to ensure current supply chain disruptions don’t impact on Australian businesses,” Taylor said.

The increase in TGU production by Incitec Pivot will be done without impacting agricultural fertilizer supply to local farmers or disrupting local distribution chains for AdBlue, the minister said.

Canberra has also secured additional supplies of refined urea from Indonesia, which will provide 5,000 t of refined urea in January, Australian trade minister Dan Tehan said. This supply from Indonesia is enough urea to make around an additional month’s worth of AdBlue, Tehan said.

“By working closely with our partners, we have been able to secure this critical supply for Australia,” the trade minister said.

Earlier this month, Australia’s national road haulage industry body warned the country’s diesel market could

be affected by potential shortages of DEF because of restrictions China has placed on fertilizers such as urea, a key feedstock for DEF.

DEF is used in the catalytic converters that are part of the vehicle exhaust system and injected into the exhaust gases and burnt at high temperatures to break down the nitrogen oxides in the exhaust fumes. It ensures diesel-fuelled trucks comply with Australia’s national emission standards.

Australia plans hydrogen hub

The Australian prime minister Scott Morrison has announced plans to build a green hydrogen and ammonia hub at the nation’s largest thermal coal export facility at the Port of Newcastle in New South Wales (NSW).

The Port of Newcastle and Australian bank Macquarie’s Green Investment Group have launched an AUD3 mn feasibility study into developing a hydrogen hub, which will initially be built around a 40MW electrolyser that would increase to over 1 GW in capacity. The study, which is supported by an AUD1.5 mn grant from the federal government’s Australian Renewable Energy Agency, will look at hydrogen use in the coal mining region of the Hunter Valley and opportunities for export to global markets.

Macquarie’s agriculture platform, which manages more than 4.5 mn hectares of farmland in Australia, will also look at using hydrogen produced at Newcastle to create green ammonia for fertilizer production.

“With our existing access to global energy supply chains, world-class infrastructure, strong industry partnerships, proximity to the existing demand, links to domestic road and rail networks, a local highly skilled workforce and proximity to renewable energy zones, Port of Newcastle is well placed to develop a hydrogen hub and export hydrogen as a tradable energy commodity,” Port of Newcastle chief executive Craig Carmondy said.

Newcastle exported 131.86 mn t of coal in January-October, down from 132.43 mn t in the same period last year and 137.14 mn t in the first ten months of 2019 before the global pandemic, according to Port of Newcastle trade data. The coal through Newcastle had a trade value of AUD37.18 bn in January-October and made up 92.6% of the value of all goods exported through the port.

Australia’s Strike gets govt support for urea project

Australian independent Strike Energy said it has received support from both the Australian federal government and the Western Australia (WA) state government for

its proposed AUD2.5bn (USD1.78bn) 1.4mn t/yr Haber urea project in the mid-west region of WA given the current concerns of about global shortages of urea and its derivatives such as diesel exhaust fluids (DEF), also known as AdBlue.

Canberra awarded a AUD2 mn grant to Strike through its supply chain resilience initiative programme and has been elevated in the WA government project planning process, Strike said. The grant to Strike follows the Australian government forming a taskforce to address a potential shortage of AdBlue, which includes procuring supply of urea.

There is a global shortage of urea resulting from the ongoing northern hemisphere energy crisis, Strike Energy said. The energy shortfall has resulted in significant quantities of urea manufacturing capacity being shut in, as gas feedstock have been diverted away from industry to primary use of power and heating, the Perth-based firm said.

Major urea exporting nations such as Russia, Egypt and China have subsequently placed restrictions on urea exports which has amplified the current supply shortage, it said. This has translated into international urea pricing surpassing previous all-time record highs with FOB Middle East prices reaching more than USD1,000/t in the spot market, Strike said.

Australia is currently on course to have zero domestic urea production capacity by December 2022, with Incitec Pivot closing its Gibson Island production facility.

In addition to urea being in short supply for agricultural purposes, a secondary impact is the availability of AdBlue, a fluid used to reduce nitrous oxide (NOx) in modern diesel and freight engines, Strike said.

AdBlue availability is forecast to start impacting international and Australian supply chains within the coming January-March 2022 quarter, unless additional capacity is either built or supplies of urea improve, it said.

Strike plans to see 22% of its urea production into the WA domestic market and 50% to the rest of Australia and the remaining 29% to be exported on international markets, it said.

The Haber urea plant will use gas from the Greater Erregulla gas field plan whereby under phase one of the joint venture will bring 80 TJ/d (2.14 mn m³/d) of gas from the West Erregulla field in the onshore Perth basin to market in 2022, via a gas plant to be built, owned and operated by Australian Gas Infrastructure Group (AGIG), which in turn is owned by Hong Kong-based conglomerate CK.

The West Erregulla field is jointly owned by Strike and fellow Australian independent Warrego Energy. Under

phase two of the plan, up to 300 TJ/d could be brought to market via West Erregulla and Strike’s 100% owned South Erregulla field, it said.

Strike has a cooperation agreement with the Mid West Ports Authority to progress access to the Geraldton port and associated facilities for urea shipping, it said.

Strike plans to seek interest from equity partners to fund the capital requirement of the project, with Strike expecting to retain a 30% the Haber urea project, it said. The firm is planning to complete engineering studies in 2022 and starting construction in early 2023, it said.

China seeks 1.1mn t of fertilizer for summer storage

China’s National Development and Reform Commission (NDRC) and Ministry of Finance’s Economic Construction Division has issued its annual tender to buy urea, DAP and NPK for summer storage.

The tender seeks a total amount of 1.1mnt t of urea, DAP and NPK fertilizers to be delivered and stored in 24 provinces in China.

According to market participants, 59 fertilizer suppliers and producers have been awarded to supply between 2.65mn-2.95mn t of fertilizers, mainly urea, DAP and NPKs. The tender stipulated that the participating producers and suppliers should deliver the fertilizers to their respective regional storage facilities from the date of the tender award until 28 February, for storage between 1 March and 31 May. These fertilizers in storage are not to be exported.

Most state-owned producers as well as major fertilizer producers have been awarded this tender.

According to local market participants, this tender is a yearly occurrence for the domestic fertilizer market. In China, most of the fertilizers are used during the spring and autumn planting seasons, but some is also used during the summer months.

This tender is seen as a move by some local participants to bolster inventories while producers face the current export restrictions policy. The restrictions are set to officially remain in place to the end of June, with the tender allocating volumes to the national reserve in advance to supply to the domestic market.

At this stage, the tender should have minimal impact on export availability or prices, local market participants said.

China’s domestic demand for fertilizers is starting to increase in anticipation of the spring application season which will start in mid-February until the end of May. ■

Soft commodities: Wheat market in search of a new momentum

Information from Agritel – An Argus Media company

Wheat summary

Despite the general rebound of the financial markets, speculative funds are ignoring the wheat market for now. The market lacks new bullish elements, and the US export numbers are particularly weak.

The recent upward revisions of production in Canada (+0.7 mn t), Australia (+3 mn t) and Argentina are weighing on prices. The announcement of an export quota in Russia from 15 February to 30 June of 9 mn t against 5 mn t as initially expected has also had a downward impact. The latest USDA report confirms this situation with stock increases in the USA and in the eight major exporters.

The recent price drop has allowed French milling wheat to regain competitiveness. Thus, the French origin is now USD5/t below the FOB Ukraine price against USD20/t above two weeks ago.

In this context of relaxation, China is back to buying. It is looking for sorghum, corn, barley, and wheat from its main suppliers, with new purchases of French feed wheat in January-March. This will compensate for the Algerian market that has become more competitive with OAIC specifications that are very favourable to Black Sea regions. Algeria's on-going tender will therefore be followed closely.

Internationally, the increase in soft wheat availability justifies a downward adjustment of price and demand rationing objectives. But let's not forget that stock levels at major exporters

remain at their lowest since 2007. In this context, the wheat market should try to find a balance between EUR280-310/t on Euronext. It will remain reactive to any climatic event among major grain producers and to the geopolitical risk between Russia and Ukraine.

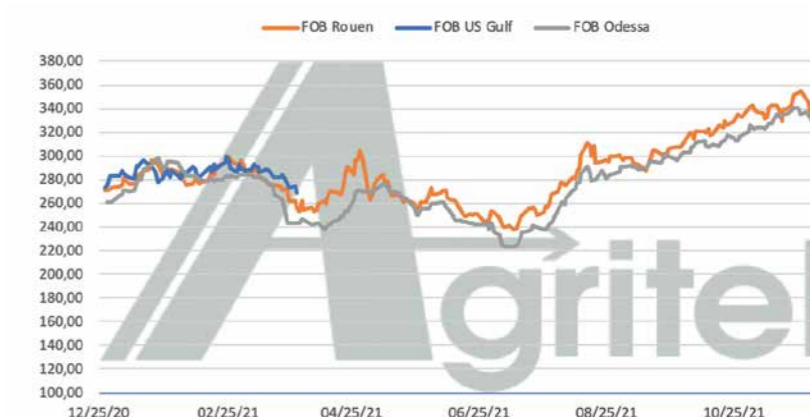
AGRITEL OPINION: After having reached all-time highs, the wheat market is retreating due to an upward revision of availabilities. Given the small size of stocks in the major exporters, any climatic or geopolitical event will likely boost prices again.

Corn summary

Operators are integrating some new elements in a context of grain market clearly less buoyant. Profit takings are weighing on the market trend. The monthly USDA report did not bring any

major changes. The US ending stock was left unchanged at 37.9 mn t against 31.4 mn t last year. Unsurprisingly, US production was rolled over to 382.6 mn t, but it was on the demand side that traders were expecting changes, particularly the figure for the ethanol industry. Week after week, the 1 mn barrels per day mark has been surpassed without causing an improvement in inventories, a sign that demand is dynamic. The USDA did not really reflect these elements and announced a domestic consumption of 313.2 mn t. On the export side, the USDA has left US sales at 63.5 mn t while 58% of the target has already been reached. Ukraine, on the other hand, is still showing a dynamic export performance in relation to this year's record crop, estimated at 40 mn t by the US Department of Agriculture. Several cargoes are currently loading to China. Finally, ending stocks at the

Figure 1. Wheat (\$/T)



MARKET ANALYSIS >

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Figure 2. Corn (\$/T)

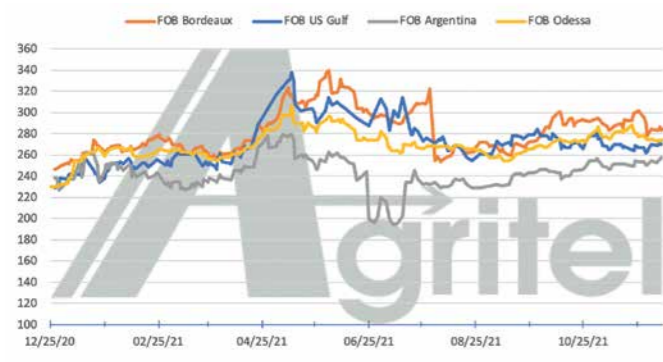
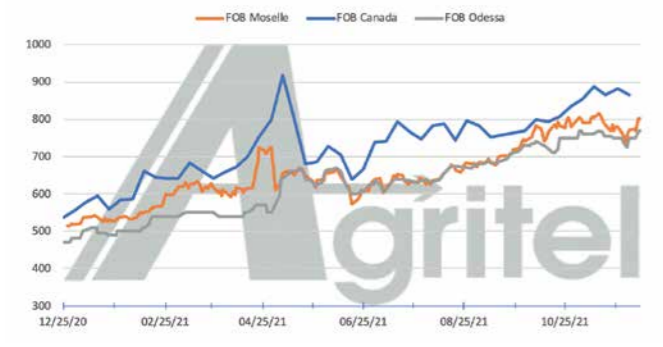


Figure 3. Rapeseed (\$/T)



four main exporters increased by only 300,000 t, to 51 mn t.

Nevertheless, uncertainties regarding the weather in South America should lead to further adjustments later in the season. The risk of La Nina threatening the Argentinean and Brazilian corn production is increasing according to weather offices. Operators are keeping in mind last year's setbacks, and this remains a supportive factor for the market. In France, FranceAgrimer confirmed the excellent yields, and the production is estimated at 15.4 mn t.

AGRITEL OPINION: Availability in Ukraine and in the USA is important this year, but demand remains present, especially for cattle feed in Asia or ethanol in the USA. In the medium term, the weather in South America will be decisive for the evolution of prices.

Oilseed summary

Rapeseed continued its upward momentum to reach a record-high of EUR723.25/t on the February 2022

contract of Euronext. The market gained EUR80/t recently, recouping previous losses linked to the degradation of the sanitary situation.

The fundamental tension following the dramatic fall of the 2021 crop in Canada is felt on the European market. Only 2.025 mn t of rapeseed has been imported into the EU27 since the start of the season, far behind the 3.102 mn t and 3.482 mn t recorded in the two previous seasons to date.

Despite a 2021 crop of 18.1 mn t compared to 17.3 mn t and 16.9 mn t in the previous two years, the availability of rapeseed in the EU is at its lowest since 2006. Crushing demand exceeds that of recent years with 6.137 mn t used at the end of October, according to Fediol, compared with 5.84 mn t in both of the last two years. The price spread between Euronext rapeseed and Canadian canola in Winnipeg (EUR+5/t) is far from being sufficient. In Australia, after the delayed harvest, the local canola is now facing a high demand from other countries.

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The weather outlook in South America may lead to further adjustments

European crushing margins remain very favourable. Rapeseed oil is gaining ground in Rotterdam in the wake of palm oil. Malaysian stocks are low and palm oil is trading at record levels.

Rapeseed meal prices are more expensive as well in the wake of soy meal. European rapeseed needs another EUR20-30/t to curb the demand significantly on short and medium term.

However, the market remains vigilant about the sanitary context in Europe. The price of rapeseed biodiesel continues to fall in Rotterdam. This decline is not yet penalizing as rapeseed biodiesel prices at EUR2240/t are twice higher than last year at the same time.

AGRITEL OPINION: The fears about the Omicron variant have eased for the time being, and the extreme tension of the European rapeseed market is back in the spotlight. Higher prices are necessary in Europe to boost imports and reduce crushing. The deteriorating health situation in Europe remains a cause for concern. ■

Hard commodities: Freight costs underpin surging inflation

Written by

David Fyfe, Chief Economist, Argus Media, UK

Sustained inflationary pressures will likely pull interest rate rises forward in 2022, albeit central banks must tread carefully to avoid derailing post-pandemic recovery. Underpinning these gains in inflation has been resurgent world trade that has pushed freight costs up by between two- and eight-fold relative to pre-pandemic levels. Container, dry bulk, air freight and LNG shipping costs could all remain elevated well into 2022, although depressed crude oil tanker rates may see only modest recovery.

Omicron risks prolonging inflationary pressures

Eye-watering inflation data for November have again raised the prospect of central banks, in the Atlantic Basin at least, further tightening monetary policy in early-2022. Expectations are now that the US Federal Reserve could move as early as the second quarter to raise interest rates. Of course, conditions vary between nations and regions, with Asia less beset by consumer price inflation than the Atlantic Basin. Nonetheless, supply chain bottlenecks continue to bedevil the movement of merchandise goods and commodities alike, a phenomenon

Supply chain bottlenecks continue to bedevil the movement of merchandise

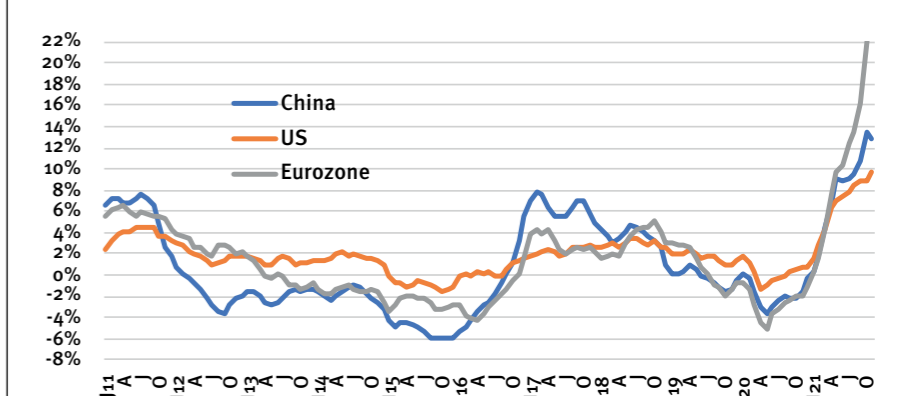
that may be further exacerbated by the Omicron variant of the virus if this delays a more complete re-opening of the global economy.

Further partial lockdowns, while less disruptive than early-2020 levels, would not only strain existing logistical fragilities, but may defer the demand-side rebalancing of consumer spending, back towards greater

outlays on services, and less spent on merchandise goods. Many observers consider such a normalisation of spending patterns as key to subduing current extreme inflationary pressures.

The slope of the V-shaped recovery in trade since the depths of the pandemic in early-2020 was steeper than the recovery after the Great Financial Recession over a decade

Figure 1. Producer Price Index, %Y-o-Y



Source: Argus Media, BLS, CEIC, Eurostat

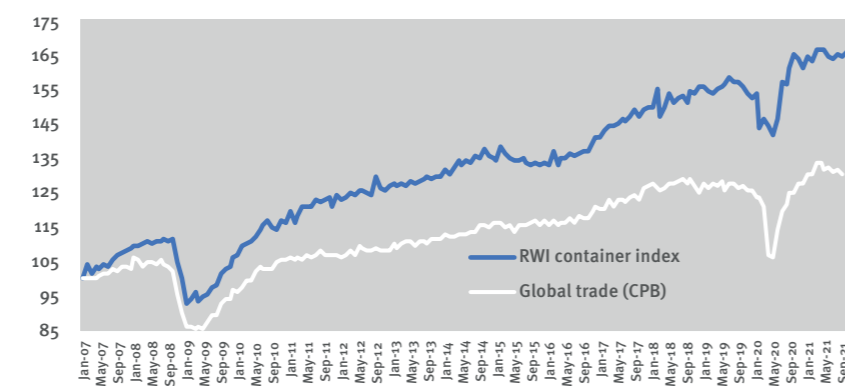
ago. It also highlights how a demand-side rebound has at times outstripped the ability of the supply-side to respond, with a global logistical industry that is still adjusting. Combined with weather-related supply disruptions and sporadic re-impositions of, albeit successively weaker, mobility restrictions as new variants emerge, the world remains a long way from normality as regards supply-chain functioning.

Unfortunately, so long as there are risks of renewed pandemic-related disruptions to commodity and manufactured goods production and shipment, so distributors and consumers will continue to stockpile, worsening what economists refer to as the 'bullwhip' effect. In such circumstances, information asymmetries can render the synchronisation of shipment and distribution problematic, so driving up prices as unpredictable shortages emerge along the length of the supply chain. While such physical issues could potentially ease as rapidly as they have emerged, sporadic hoarding and stockpiling episodes towards the distributor/consumer end of the chain could sustain prices as long as the risk of renewed lockdowns persists. And with inventories for many goods and commodities still relatively low when compared to end-user demand, erstwhile expectations of short-lived inflation are being revised towards longer time horizons.

Container freight tightness underpins broader shipping surge

Container freight rates began rising in late-2020. Surging consumer goods demand, as personal spending remained skewed away from travel, tourism and entertainment, combined with a post-lockdown dislocation in vessels, containers and crews. Together these saw container rates rise nine-fold through Summer 2021, and while rates have since stabilised, there is little sign of them falling back towards more normal levels.

Figure 2. Resurgent demand drives sharp trade rebound



Source: Argus Media

Container rates rose nine-fold through Summer 2021

Inflated container costs arguably represent the most significant cost pressure deriving from transportation bottlenecks. Some 90% of the world's merchandise trade moves by sea. Analysts estimate that in November around 11% of the world's loaded container volumes were stuck in logistical bottlenecks of some description, almost double the normal level of delay. The causes of delay are manifold. Maritime, port and trucking workforces have been reduced by lockdowns, illness or migration to other sectors. Port loading and unloading delays are being caused as much by process and productivity shortfalls as by truck or driver shortages. The Port of Los Angeles, a key entry point for Asian imports to the US, reports 115,000 empty containers sitting idle at the port.

Moreover, ship brokers see little prospect of sizeable new-build container tonnage hitting the water before 2024. So elevated container freight rates could persist for much of 2022, at least until stockpiles become replenished. Normalising demand, as much as incremental supply, likely holds the key for lower container rates in the short to medium term.

Spill-over to dry bulk and air freight

Dry bulk rates strengthened earlier than container rates, moving sharply higher from mid-2020 as Chinese manufacturing and commodity import demand rebounded. Dry bulk strengthened further in first-half 2021 as iron ore imports took off and as China also sought incremental coal imports to offset a collapse in domestic production.

Recovering Chinese coal production from the autumn, easing port congestion, power rationing, and industrial output limits to meet annual emission targets have since seen dry bulk shipping rates ease. However, they remain four to five times higher than pre-pandemic levels. Shipping companies also report some spill-over from the container freight squeeze, as products like grain and scrap metal normally moved by container have shifted to Handysize bulk vessels.

Dry bulk rates could remain high by historical standards in 2022, as knock-on impacts from container freight inflation persist, the dry bulk vessel order book remains modest, and if a potential uptick in infrastructure

spending post-pandemic boosts demand for cement and steel. The bulk shipping sector will be watching with interest both the trajectory of the Omicron variant and any negative spin-off from China's evolving property sector liquidity crisis.

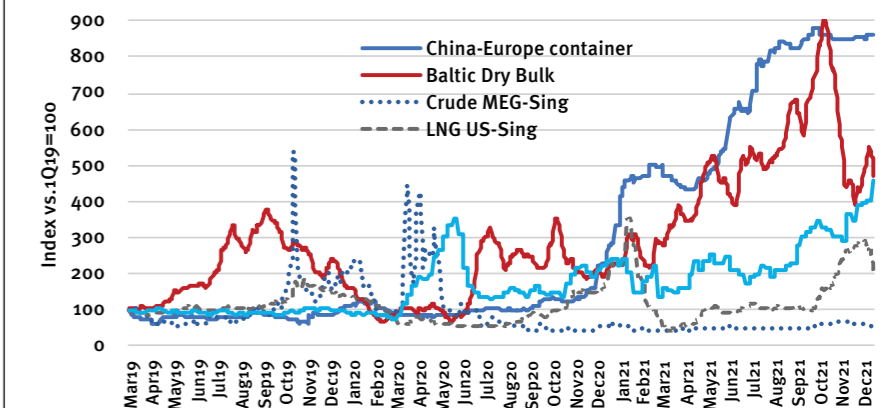
Dry bulk shipping is not the only segment to benefit from container shipping delays. Freight spill-over has also occurred into the air cargo sector, where rates per kilogramme transported on the China-US route have risen four-fold since the pandemic. Incremental demand has confronted a 10-15% reduction in air cargo carrying capacity in the last two years. Traditionally, 50% of global air cargo moves in the hold of passenger aircraft, and while short-haul passenger aviation has recovered during 2021, long-haul flights remain largely grounded. Nor does a rapid or imminent recovery in long-haul travel look to be on the cards, suggesting that air cargo rates could remain elevated for much of 2022.

LNG shipping rates bullish too, but crude freight is the poor relation

Not to be out-done, LNG freight rates have trebled since September, as spot prices for the super-cooled fuel into Asia rose from early-year lows around USD5/mmbtu to nearly USD40 in October. The durability of higher LNG freight will hinge on prospects for Asian LNG demand itself. Competitive coal prices and returning nuclear units, plus currently benign winter North Asian weather forecasts, suggest a high point may already have been reached. However, limited upside flexibility for gas supply into both Europe and Asia through first-quarter 2022 could place a floor under both spot LNG prices and LNG freight rates in the short term.

No such windfall has accrued for a beleaguered crude oil freight segment. Tanker operators have been unable to pass on the near-

Figure 3. Surging international freight costs



Source: Argus Media

Controlling Covid-19 infection rates via broader global vaccination will be key

doubling in bunker fuel costs seen in the last 12 months as incomplete global oil demand recovery and an over-supplied fleet continue to weigh on profitability. Argus analysis suggests from a sample of a dozen major tanker operators that USD200 mn of 3Q2020 profits transformed into a USD400 mn loss in 3Q2021. Admittedly 2020 performance was supported by a floating storage boom, and 3Q2021 may represent the nadir for returns, with prospects for a gradual recovery moving forward.

On the positive side, OECD oil inventories need replenishing, transportation and petrochemical feedstock demand will continue to recover and Middle East OPEC+ production volumes should rise at least through mid-2022. Long-absent Iranian exports could also potentially re-enter the market. However, optimism is tempered by what looks like a slow US shale oil recovery, currently unattractive Atlantic Basin-Asia crude arbitrage economics and a dirty vessel fleet overhang that looks likely to persist into 2023. Tanker rate recovery could prove

modest in the short term, the more so if Omicron stifles oil demand growth in early-2022.

The tide will eventually turn

Central bankers have begun to row back on earlier claims that inflation will prove a short-term phenomenon that eases as post-pandemic recovery proceeds. Many in the maritime sector similarly now see elevated freight rates (crude oil aside) persisting through much of 2022. Controlling Covid-19 infection rates via broader global vaccination will be key. Not only would this help in normalising commodity and merchandise goods demand growth and stockpiling behaviour, but also in easing the bottlenecks that persist along the supply chain. Eventually, post-pandemic labour market dynamics and wage claims may take over from supply chain issues as they key driver of inflation trends. However, ongoing cargo bottlenecks and the need to replenish inventory could sustain cargo shipment costs a while longer in 2022. ■



Shipping and trade news

Saudi Arabia seen as likely renewable bunkers source

Saudi Arabia was pegged in a study as the mostly likely source east of the Suez Canal for competitively priced renewable methanol and renewable ammonia for bunkering in Singapore, the biggest bunkering port in the world.

The study conducted by shipping classification firm Lloyd’s Register said the route from Al Jubail on Saudi Arabia’s east coast to Singapore has the lowest levelized cost for renewable methanol and renewable ammonia in Asia, given a low projected cost of renewable electricity in Saudi Arabia. The levelized cost, or the average net present value of future costs, between 2030-2050 is projected at USD25-27/GJ for renewable methanol and at USD21-23/GJ for renewable ammonia. The route from Australia to Singapore was pegged as the second lowest levelized cost route and the second-most likely route for renewable methanol and renewable ammonia.

The study projects inland China to Hong Kong to be the least expensive levelized cost route for renewable hydrogen for bunkering in Asia, at USD42-45/GJ between 2030-2050. The second lowest levelized cost route for renewable hydrogen is Australia to Singapore.

The study also assumes the use of biomethanol, made from used cooking

oil, for bunkering in Asia. It pegs the route from East Kalimantan, Indonesia, to Singapore as the lowest levelized cost route at USD31-32/GJ between 2022-2025.

The International Maritime Organization is requiring that vessels reduce their CO₂ emissions by 40% by 2030 and by 70% by 2050 from 2008 base levels. Ship owners are considering sources and prices of alternative fuels that are low in greenhouse gas emissions to meet the restrictions.

Yara to start operating the world’s first fully emission-free container ship

The world’s first electric and self-propelled container ship – Yara Birkeland departed for its maiden voyage in the Oslo fjord in November 2021. The Norwegian Prime Minister was given a tour by CEO of Yara, Svein Tore Holsether.

“We are proud to be able to showcase the world’s first fully electric and self-propelled container ship. It will cut 1,000 t of CO₂ and replace 40,000 trips by diesel-powered trucks a year, says Svein Tore Holsether, CEO of Yara.

He welcomed Prime Minister Jonas Gahr Støre and Minister of Fisheries and Ocean Policy Bjørnar Skjæran on Yara Birkeland, after the ship had completed

its maiden voyage to Oslo, Norway.

Yara Birkeland, which has already received wide coverage in Norwegian and international media, has been developed in collaboration with the Kongsberg Group (KONGSBERG). The ship was built by VARD with financial support from Enova, and will be in commercial operation from 2022.

“We have been looking forward to this day for a long time. Yara Birkeland will transport mineral fertilizer between Porsgrunn and Brevik and will contribute to significant emission cuts during transport. This is an excellent example of green transition in practice, and we hope this ship will be the start of a new type of emission-free container ships. There are a lot of places in the world with congested roads that will benefit from a high-tech solution like this, says Holsether.

Now begins a two-year testing period of the technology that will make the ship self-propelled, and finally certified as an autonomous, all-electric container ship.

Yara Birkeland is a collaborative project between several actors, where KONGSBERG is responsible for the development and delivery of all newly developed technology on the ship. The ship will be operated from Massterlys’ monitoring and operations center in Horten. Massterly is a joint venture between KONGSBERG and Wilhelmsen.

FREIGHT RATES

POTASH	Price type	Units	Timing	Low	High	Date
Dry potash Vancouver - China 60-65kt	outright	USD/t	prompt	30	32	16-Dec-21
Dry potash Red Sea - WC India 25-30kt	outright	USD/t	prompt	40	42	16-Dec-21
Dry potash Baltic Sea - Brazil 30-40kt	outright	USD/t	prompt	50	52	16-Dec-21
Dry potash Baltic Sea - SE Asia 25-30kt	outright	USD/t	prompt	117	123	16-Dec-21
Dry potash Vancouver - SE Asia 25-30kt	outright	USD/t	prompt	76	78	16-Dec-21
Dry potash Baltic Sea - China 60-65kt	outright	USD/t	prompt	59	62	16-Dec-21
Dry potash Baltic Sea - US Nola 50-55kt	outright	USD/t	prompt	37	39	16-Dec-21
Dry potash Vancouver - Brazil 30-35kt	outright	USD/t	prompt	58	60	16-Dec-21
Dry potash Hamburg - Brazil 30-35kt	outright	USD/t	prompt	44	46	16-Dec-21

SULPHUR	Units	Low	High	Date
50-60kt – Vancouver-China	USD/t	34	35	16-Dec-21
Below all 30-35kt				
Mid East – EC India	USD/t	34	35	16-Dec-21
Mid east – North/River China	USD/t	46	48	16-Dec-21
Mid East – South China	USD/t	41	44	16-Dec-21
Mid East – Brazil	USD/t	43	45	16-Dec-21
Mid East – North Africa	USD/t	44	47	16-Dec-21
Mid East – South Africa	USD/t	33	34	16-Dec-21
Black Sea – North Africa	USD/t	38	44	16-Dec-21
Black Sea – Brazil	USD/t	55	57	16-Dec-21
Baltic – Brazil	USD/t	56	57	16-Dec-21
Baltic – North Africa	USD/t	46	48	16-Dec-21
35-40kt – US Gulf - Brazil	USD/t	40	42	16-Dec-21

“Norway is a big ocean and maritime nation, and other nations look to Norway for green solutions at sea. Yara Birkeland is the result of the strong knowledge and experience we have in the Norwegian maritime cluster and industry. The project demonstrates how we have developed a world-leading innovation that contributes to the green transition and provides great export opportunities for Norwegian technology and industry, says Geir Håøy, CEO of the Kongsberg Group.

Enova, a government enterprise responsible for promotion of renewable energy, has allocated up to NOK133.5 mn to build the world’s first electric and autonomous container ship.

“On the way to a low-emission society, transport emissions must come down to almost zero. To achieve that, we need projects that can transform the market - projects that have the potential to pave the way for others and increase the

pace of change in their sector. This is exactly what we believe the world’s first autonomous and all-electric container ship will do, says Nils Kristian Nakstad, CEO of Enova.

In parallel with the construction of Yara Birkeland, Yara has initiated the development of green ammonia as an emission-free fuel for shipping, through the newly started Yara Clean Ammonia.

“Renewable energy was our starting point in 1905. Now, ammonia can bring us back to our roots. Our large shipping network and existing infrastructure means that ammonia has the potential to become the leading fuel for long-distance shipping globally,” says Magnus Krogh Ankarstrand, CEO of Yara Clean Ammonia.

As the world’s largest producer of fertilizers, Yara relies on ammonia to make fertilizer, and to help feed an ever-growing population. At the same time, current ammonia production represents

2% of the world’s fossil energy consumption. This corresponds to about 1.2% of the world’s total greenhouse gas emissions.

“As the world’s largest producer of ammonia, Yara has launched an offensive plan of international scale, both to remove current emissions and to establish the production of new, clean ammonia,” says Ankarstrand.

Russia details fertilizer export quota allocations

The Russian government has outlined the volume restrictions for fertilizer products, as well as by supplier, applicable from 1 December 2021 to 31 May 2022

AN exports will be capped at 745,000t in December-May 2022, a notable cut from the 1.76 mn t shipped in the period a year earlier, trade data show.

Suppliers will be limited to shipping a maximum of around 4mn t of urea, with exports lower at 3.69 mn t in December to May this year.

Shipments of UAN as well as mixtures of calcium nitrate and AN (HS code 31026) are not to exceed a combined 1.15 mn t, above the total 936,000t shipped in the most recent period. Exports of the designated calcium nitrate/AN product were insignificant at 9,000t in December-May.

Nitrogen shipments across these major products will be capped at a total of 5.9 mn t.

In terms of phosphate-based products, NPKs will be held to 2.58 mn t, a cut from shipments of 2.77 mn t in the 2020-21 period.

MAP shipments will not exceed 1.3 mn t, marking a drop from exports of 1.42 mn t in December to May this year. DAP exports will be held to 764,000t, slightly up on the 745,000t shipped in the most recent period.

NPs exports will be limited to 698,000t, for products with HS codes 310551 and 310559, compared with combined shipments of 623,000t for the 2020-21 period.

Phosphate-based products will be capped to a total of 5.35 mn t.

Some Russian producers have reported an inability to customs clear fertilizers for export in the run up to the implementation of the quota system.

Suppliers themselves will also be restricted on an individual basis from the start of next month. A breakdown of the quotas by supplier and their respective product limits will follow.

Brazil approves legislation for rail, cabotage

Brazil's congress has approved legislation that lays out the legal framework for new rail projects and that encourages cabotage to boost efficiencies and lower costs.

The cabotage legislation aims to encourage the practice, which consists of shipping goods among the country's many ports, both for eventual export and for domestic consumption.

The Ministry of Infrastructure says that cabotage is another logistical alternative and that encouraging this type of transport can increase competition and reduce costs.

Currently, cabotage has an 11% share of Brazil's logistics matrix. The new legislation, called Brazil by Sea, is expected to push that up to 30%. The volume of containers transported per year is also expected to increase from 1.2 mn TEUs (twenty-foot equivalent units) in 2019 to 2.0 mn TEUs in 2022.

The New Legal Framework for Railroads, in turn, changes the operating model for new stretches of track and reduces the processes required to launch new projects, with the aim of modernizing the sector.

The main change that the new law proposes is providing new railroads with the option to come under the so-called authorization model, similar to what has been implemented for the natural gas and basic sanitation sectors. This model is different from the concession model, in which the state bears all the costs and construction of the project, and then passes it on to the private sector for a set fee. It is estimated that the operating cost of rail transport is 40-50% cheaper than road transport.

Under the authorization model, an interested company can take on a project without a formal bidding process. Because there is less state participation, interested companies assume the risk of the project, assuming construction and operational investments.

In this model, the rail project is formalized by a contract with a minimum term of 25 years and a maximum of 99 years, which may be renewed successively. In the case of two different requests for the same stretch of track, the regulator can establish which is the better proposal.

Both pieces of legislation have been debated and approved by Brazil's lower house and senate, and now await President Jair Bolsonaro's signature. ■

NITROGEN/UREA		Units	Low	High	Date
Middle East - US Gulf	45kt	USD/t	54	58	16-Dec-21
Middle East - Thailand	30kt	USD/t	42	45	16-Dec-21
Middle East - Brazil	40kt	USD/t	46	48	16-Dec-21
Baltic - Brazil	30kt	USD/t	57	60	16-Dec-21
China - India	60kt	USD/t	26	27	16-Dec-21
Algeria - Brazil	30kt	USD/t	40	42	16-Dec-21
Algeria - French bay	12kt	USD/t	37	39	16-Dec-21
Baltic - EC Mexico	30kt	USD/t	60	61	16-Dec-21
Baltic - WC Mexico	25kt	USD/t	95	96	16-Dec-21

PHOSPHATES		Units	Low	High	Date
Morocco – Brazil	30kt	USD/t	40	42	16-Dec-21
Tampa – Brazil	30kt	USD/t	46	48	16-Dec-21
KSA – EC India	30kt	USD/t	39	41	16-Dec-21

AMMONIA	Units	Low	High	Date
Yuzhny - Morocco , 23kt	USD/t	30	38	21-Dec-21
Ras al Khair - South Korea, 23kt	USD/t	71	87	16-Dec-21
Ras al Khair - WC India, 23kt	USD/t	15	38	16-Dec-21
Ras al Khair - EC India, 23kt	USD/t	38	54	16-Dec-21
Point Lisas - East Asia, 23kt	USD/t	110	130	16-Dec-21
Point Lisas - US Gulf, 23kt	USD/t	25	47	16-Dec-21
Point Lisas - NW Europe, 23kt	USD/t	49	57	16-Dec-21
Bontang - East Asia , 23kt	USD/t	32	44	16-Dec-21



Price watch

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

AMMONIA

European production is slowly returning, demand remains strong

European producers have slowly been ramping up production at their ammonia units, but several will not be running at full capacity until European gas hub prices return to 'normal' levels. Producers are thought to have resumed production for several reasons. Northwest European import prices are now at parity with production costs following the latest sale and prices are expected to remain in line with production costs until gas prices correct. Producers are thought to have been at risk of losing carbon emissions credits if production units were to stay off line for an extended period. And importing ammonia into Europe has harder than consumers would have expected. Not only have the issues of passage through the Turkish straits limited availability, pumping rates to Pivdenny have been lower over the past couple of months and global demand is high.

Fewer Trinidadian cargoes have been shipping to Europe in recent weeks as they have largely been sent to the US, Brazil and the rest of the Americas. The deficit in the US, in the wake of the cold snap in early 2021 and more recently Hurricane Ida, has meant that for Trinidadian producers the US has been the most attractive market in terms of netbacks on the willingness of buyers to pay higher prices. Current weather conditions mean the season is likely to be extended this winter into next year, and while the US continues to absorb the majority of Trinidadian product on offer, other consumers of Trinidadian ammonia, such as European consumers and OCP, are having to source ammonia elsewhere. And any surplus ammonia in the US market is being upgraded into higher value urea and nitrates fertilizer products.

OCP's stocks are dwindling ever lower, as it continues to consume ammonia at a high rate in order to produce phosphates to meet the large market deficits. Reduced shipments from Trinidad for the reasons outlined above, and fewer from Pivdenny due to delays along the Turkish straits, has seen OCP having to source ammonia from outside its usual suppliers and is thought to have paid close to USD1,000t/ cfr for a Turkish cargo. OCP will need to continue to source spot cargoes from wherever possible if it is to continue producing phosphates at its usual rate, but availability will be limited. East of the Suez Canal, Saudi Arabian production continues to run uninterrupted. Producers are busy fulfilling backdated contract shipments into India and east Asia and the ability to meet global demand is restricted by vessel availability. Once Ma'aden can charter its four new vessels, its ability to supply customers outside of its contract commitments will improve. Although this will be limited until new production comes on line. The impact of Ma'aden's new 1.1mn t/yr plant will be less extensive than first thought. The producer is expected to run the ammonia unit below capacity until the phosphates portion of the project comes on line. But the capacity will be there for the producer to ramp up to full production, if needed.

Higher prices have hampered 2022 contract talks between east Asian customers and their suppliers. With supplies still largely not agreed, some additional spot demand is showing in the market for the start of 2022. India continues to try and resist higher import prices. The high cost of importing phosphoric acid means it is more economical to import finished DAP fertilizer than to produce it. But with global DAP availability low, India may have to come to the spot market if it wishes to actively replenish its low inventories.

Overall, we expect prices to continue to firm through to the first quarter of 2022. Demand is strong, there are no immediate signs of supply improvement and the fundamentals are supportive. As always, our current view will depend on the evolution of market gas prices. But the severity of the market deficit is likely to prevent a price correction until ammonia demand dissipates and new production can correct the market balance.

NITROGEN/UREA

Prices look stable, but tender activity could push levels higher

The urea's price rally looks to have run its course, with markets stabilising in late November. But while India continues to buy urea in December and January, it is unlikely that there will be a substantial downwards correction in the near term. It is possible that Middle Eastern producers have enough bargaining power to extract further price gains during the next tender, but these are likely to be limited in scope. Of more concern is the price stratification that is occurring, with only those markets facing severe urea shortages — such as India and South Korea — being forced to pay cfr values around the USD1,000/t level.

Where buyers have the inventory positions to attempt to wait out these high prices, they are doing so. And as a result, we have seen limited purchasing and stable pricing in Brazil — a spread of over USD100/t now exists between cfr India and cfr Brazil. In the US, prices are now falling and the spread between cfr India and the Nola barge market has reached almost USD150/t.

While India and South Korea remain active in the seaborne market, urea prices look stable. When they stop buying, or when the market becomes convinced that they have, we would expect to see prices fall. As we expect them to remain active until February, it seems unlikely that there will be any significant and sustained downwards movement for the next two months. Government buyers in Ethiopia and Pakistan could also be in the market for urea at these higher prices.

Demand has become elusive outside these four countries at such high prices. But when prices do start to fall as India withdraws from the market in February, we would expect to see demand re-emerging from Australia, Thailand, Latin America and Europe. This should put a floor under the market throughout much of January-June 2022.

Chinese export supply is minimal and expected to stay so until June at least. Small cargoes are being shipped to Taiwan and South Korea, but this is the extent of the activity and we do not expect to see meaningful volumes shipping in January-June. Russian exports have not been eroded by the introduction of limits, although a big cut to Russian AN exports could trigger some substitution of demand into urea.

Gas markets are still tight, with prices in Europe continuing to fluctuate around the USD30/mn Btu level. We do not anticipate any structural shift downwards before spring. Urea values — should they fall from their current level — will see further support from persistently high gas prices. And the need to keep EU urea producers operating should ensure that fob Egypt prices do not fall below USD750/t without a corresponding drop in gas prices.

New urea supply is finally online in India. Matix is now running at full load — around 100,000 t/month — and Ramagundam is ramping up and producing in excess of 50,000 t/month. BFI in Brunei is commissioning, and further new plants are due to launch in India in the coming year. This new supply will reduce India's 2022 tender requirement. And as logistical port challenges in Nigeria and Brunei are overcome, supply from the large, worldscale additions in 2021 will finally be felt in the seaborne market.

The degree to which 2022's new supply affects the market will be determined by how successful operators are with the commissioning of their plants. Covid-19 looks to have caused significant construction overruns during the last two years, and plants have increasingly struggled through delayed commissioning processes. New Covid variants like omicron could keep the pressure on operators looking to complete construction and bring ammonia-urea trains to market.

PHOSPHATES

Russian export caps commence

The market has been relatively stagnant since our last outlook. Prices have been broadly flat across many benchmarks, with buyers weighing up options, assessing the latest developments and in some instances biding their time in hopes of stable, if not softer, pricing. On the sell-side, Russia's export caps are now in force, while in China slow progress is still being made towards increasing exports, which has fuelled a shift in market sentiment.

Starting with Russia, export caps came into force on 1 December, and as expected, there were some delays associated with issuing export licenses that slowed deliveries and loadings down in the first week of December. The caps, as discussed in more detail below, do little to alter export volumes based on historical figures, but still they remove Russia as an option to boost shipments and help fill the availability gap left by China. Yet once again this month, supply discussions are focusing on China. More phosphate cargoes have cleared Chinese customs, albeit small, and these clearances have prompted reports of fresh tonnes being offered by suppliers for export. These two factors have notably shifted market sentiment as many were expecting prices, and particularly DAP prices, to continue to firm significantly across the entire first half of 2022, while now, once the second quarter commences, it is expected that prices will start to soften.

The now-consistent trickle of Chinese exports is expected to pick up across the coming quarter and more than likely return to almost normal levels from early in the second quarter, rather than June as previously stipulated. Indeed, there has always been an expectation that Chinese exports would start picking up before June as the country's producers and suppliers would not want to miss out on firming overseas prices, but now that Chinese producers are almost continuously reducing operating rates and domestic prices are softening, with potentially further steep softening expected, an earlier than originally forecast uptick is now more than likely on the cards.

When it comes to key buy-side developments, India's government has boosted the DAP subsidy once again to offset November-December losses. So far, this boost seems to be incentivising domestic producers to raise production rates, with November output totalling 473,000t, the highest monthly rate since March 2019, and first-half December preliminary data are showing production to have hit 248,000t of DAP. But with availability still tight, spot import buying is not expected to pick up in turn, despite there being a need for tonnes, particularly as inventories are now at just 1.2mn t of DAP.

Elsewhere, demand loss and demand destruction are still very much a concern as affordability questions persist. Indeed, as can be seen from the table on the first page of this report, we are now expecting some softening to come to the market, particularly for DAP, in the second quarter and beyond.

But prices across 2022 for all phosphates are still expected to hold at elevated levels and well above the 2021 average, particularly as there is still room for price firming in the first quarter. The picture for MAP is slightly different but this is led by the differing seasonality of the MAP market to the DAP market and the fact that it is overall a smaller merchant market and therefore there is less flexibility and fewer supply-side players.

The second quarter so far is expected to remain in deficit, unlike DAP, particularly as some buyers are forecast to defer some buying, spreading it out across the first quarter and into the first part of the second quarter in the hope of flattening out the price firming that has yet to come in the first three-month period.

POTASH

Market to be balanced by demand erosion in 2022

Prices globally have begun to stall after rising steadily since the summer, as falling crop prices and high prices for N and P fertilizers have led to affordability concerns in all markets. All producers are operating assets at high rates so some demand decrease will help balance the market, as only

Canadian producers have capability to increase production in 2022. The situation in Belarus continues to cloud the market, however, with participants uncertain of the degree of disruption from evolving EU and US sanctions.

Demand

Brazil — Brazilian prices have stabilised at around USD800/t, with a strong agricultural season expected for both corn and soybeans despite lower rainfall owing to La Nina. But rising barter rates indicate declining affordability as crop prices have not matched the rises in fertilizer, and the market requires a price fall or risks pricing some demand out.

US — Market sentiment remains positive heading into 2022 owing to a strong autumn application season and expected loss of supply when sanctions on Belarus came into force on December 8, but affordability concerns are creating demand uncertainty to balance these supply concerns.

China — Chinese MOP imports have been down by 11% on the year so far, and the government has auctioned domestic reserves to maintain affordable MOP supply to NPK producers. A new contract agreement is expected early in 2022 to ensure sufficient supply for the spring planting season.

India — A low contract price agreement for 2021 has seen suppliers reduce volumes shipped to India or avoid the market altogether, creating an imminent need for MOP imports. To attract suppliers a new contract agreement will have to align more closely with spot markets, which will necessitate more government subsidisation to support importers.

Southeast Asia — In Indonesia and Malaysia steady increases in CPO prices have continued to support rises in MOP. This should continue into early 2022 as CPO supply belatedly catches demand. Thailand and Vietnam are facing more pressing affordability concerns, with the Thai government aiming to keep prices at current levels, so there is little upside in these markets.

Europe — The European market has been quiet as high nitrogen prices have caused buyers to focus on securing nitrogen fertilizer and delayed their purchasing of potassium fertilizers. With high gas prices expected to continue through winter, affordability creates downside for near-term European demand.

Agriculture — Agricultural fundamentals are strong heading into 2022 with increases in planted area expected in the US and Brazil, but crop prices have fallen from mid-year highs, which is contributing to affordability concerns worldwide despite a steady outlook.

Supply

Canada — Nutrien is raising production to around 14mn t in response to current market tightness, and has the capability to increase capacity by a further 1mn t in 2022

if the market requires. Mosaic anticipates sales volume recovering in the fourth quarter after a 22% year-on-year fall in the third quarter, and both Esterhazy K3 and Colonsay are expected to reach full operational capacity by the end of the first quarter of 2022.

Belarus — Further US sanctions on BPC will have limited impact as the US was already expected to cease importing from Belarus from December. The producer itself has so far shown no signs of strategy change, with 100% asset utilisation and commissioning of the new 1.5mn t/yr Petrikov mine in August, but entities involved in the Belarusian potash supply chain will need to decide for themselves whether to enter into contracts.

Russia — Eurochem's slowed ramp-up with debottlenecking at Usolskiy and low commercial expectations for VolgaKaliy mean full-year expectations are for 2.5mn t of production in 2022. Uralkali is expected to produce around 12mn t in 2021 and continue current high asset utilisation into early 2022.

Europe — Germany-based producer K+S has outlined plans to ramp up capacity at its Bethune solution mine to 4mn t/yr, but incremental capacity growth will only be of the order of 100,000 t/yr. In Germany, K+S plans to concentrate on speciality grades of MOP and other speciality fertilizers which retail at a premium to allow its mines to remain cost competitive.

Middle East — ICL achieved record quarterly production for both the Dead Sea and its Spanish operations in the third quarter. Utilisation rates are not expected to come down in the near term and inventory build is also unlikely at current price levels. APC's production and sales are expected to be flat on 2020 at 2.5mn t, although the producer has focused more heavily on American markets this year as a result of the arbitrage that has opened up between spot and contract markets.

Freight — Despite a recent downward correction the outlook for bulk freight is robust into 2022, as bulk commodity demand is expected to be strong as countries emerge from Covid-19 restrictions, and limited bulk freight fleet growth is forecast.

SOP — Increasing export checks and a strong domestic market have seen Chinese exports drop by 36%, tightening the traded market. Prices are high as a result of high feedstock and energy costs, which will balance the market by pricing some buyers out.

SULPHUR

Question marks over Chinese restrictions on fertilizer exports

Key global benchmarks have continued to firm this month, strengthened by China's absence from the fertilizer market, heightened demand from major importers and supply constraints in sulphur-producing regions. The Middle East fob spot price (excluding Iran) has risen to USD265-270/t following the latest spot business and levels have reached the highest recorded for the UAE Official Selling Price (OSP) since 2008 and the Qatar Sulphur Price (QSP) since Argus began recording these prices in 2013.

In China, the all-forms range stood at USD160-295/t cfr in mid-December, with molten sulphur priced at USD160-170/t cfr. Tank space has remained a logistical issue and Shandong demand, in particular, is down, widening the gap between granular and molten product. Early indications suggest China's restrictions on fertilizer exports could be removed sooner than originally planned. Several phosphates suppliers have started offering small lots of DAP for export after news emerged in the first half of December that cargoes had passed customs inspections.

In eastern Europe, the locks have now been closed for the winter along the Volga-Don barging route to Black Sea ports and no further barging is expected to take place between December and March as the river remains frozen. Some product is expected to continue to be railed to the Black Sea region, but poor winter weather conditions will limit exports.

In North America, the Vancouver fob price stood at USD230-240/t fob in mid-December, lagging behind other key benchmarks as logistical issues at the Port of Vancouver persist – limiting liquidity on the benchmark. Sulphur cargoes continue to compete with cargoes of grain, coal and potash on the main line to the port. It is unlikely that the Port of Vancouver will return to normal operations until the middle of the first quarter of 2022, which would include eliminating the backlog of cargo traffic and hindering the timely delivery of first-quarter contractual supply.

The outlook for European refiners is increasingly uncertain as leaders grapple with rising numbers of Covid-19 infections driven by the more transmissible Omicron variant. The prospect of re-introducing travel restrictions is becoming increasingly likely and this would lead to diminished refining outputs in the region, reducing sulphur production and squeezing the supply-demand balance further. ■

Saudi's Sabic eyes overseas growth

Written by

Adal Mirza, Senior Correspondent, Argus Media, Dubai

Saudi Arabia's Sabic is looking to overseas acquisitions as it plots a path to becoming one of the world's leading fertilizer producers by 2025. Speaking to Argus on the side lines of the GPCA Forum in Dubai last week, Samir al-Abdrabbuh, the executive vice president of Sabic's agri-nutrients business set out the plans for expansion and the challenges from the energy transition.

Sabic can currently produce up to 7.5mn t/yr of fertilizers – including 6mn t/yr nitrogen-based and 1.5mn t/yr phosphate-based through the company's joint ventures – all inside the kingdom and centred around the Jubail industrial complex on the Mideast Gulf coast.

40% of the nitrogen-based fertilizers applied to the soil are lost to leeching

"We need to get up to between 9mn t/yr and 11mn t/yr to be a global leader. To do that, you need to do two things – either organic growth or inorganic growth. Whenever there is an opportunity with reasonable feedstock, in a market we want to be in, then we will pursue," Abdrabbuh explained.

The company plans to grow by 80% by 2025, from baseline in 2017, and to have about 20% of its total portfolio as specialties product, which will help Sabic differentiate itself and "allow us to take the leading position" he said.

That would put the company at third or fourth globally, Abdrabbuh added.

Sabic completed the integration of its nitrogen assets under Saudi Arabian Fertilizer Company (Safco) rebranding the business as Sabic Agri-Nutrients. It now owns Sabic's share in National Chemical Fertilizers Company (Ibn al-Baytar), Al Jubail Fertilizer Company (Al Bayroni) and 33% of GPIC.

Vertical integration is another pillar of the company's strategy, allowing it to build from production all the way to blending and distribution. Sabic's



(left) The SABIC team is constantly focusing on producing the next generation of environmentally friendly agri-nutrients; (above) Mr. Samir Al-Abdrabbuh, executive vice president of Sabic's agri-nutrients business; (right) SABIC's manufacturing plants are dedicated to producing formulations that respond to current and anticipated market demands

strategy calls for growth both within the kingdom and overseas.

As an executive of a listed company, Abdrabbuh could not give details, saying only that progress had been made on the strategic plans, some of which were "around the corner to be announced".

"Africa is an almost virgin region because of the low quantity of applied fertilizers. It is one of our focus areas. The other one is Latin America, particularly Brazil," he said.

The two regions face different challenges. In Africa – where the average application rate is as low as 15-20 kg nutrients per hectare, according to the International Fertilizer Association, most of the imported fertilizer is blended and distributed across the continent. "You need to find opportunities where you can join hands with people and do your own blending and distribution. One avenue for that is through acquisitions.

"Some of the countries in Africa have very, very reasonable gas, but maybe high risk. So, you need to mitigate this. And we cannot dismiss the opportunity to set up grassroots facilities. All avenues are open and they are set out clear in our study. We are now executing".

Abdrabbuh estimates Brazil currently faces a 7mn t/yr fertilizer deficit, but the challenge for anyone thinking of setting up new nitrogen-based capacity will be the high cost of gas feedstock.

"Nobody in their right mind was you know, facility there to sell in Brazil. So you need to mitigate that one of the mitigation avenues is to set up at the Gulf of Mexico, just north of Brazil, buy shale gas at a reasonable price and then export some of it to Brazil, and at the same time send some of it to the North America market, which is 4mn t in deficit," he said.

Sustainability challenge

Sabic is very focused on differentiating ourselves from the other competitors. "So, we already have the first patent or what we call biodegradable, control-release urea, and we're going to probably commercialise very soon."

According to Abdurabbuh, 40% of the nitrogen-based fertilizers applied to the soil are lost to leeching, and another 30% lost to volatilization, or evaporation, leaving the plants only able to benefit from 20% of the fertilizer.

The industry has previously coated the urea with a porous polymer allowing it to slowly disseminate into the soil. But the polymer continues to contaminate the ground.

"We have created the first biodegradable control release urea. So, the coating is biodegradable, and it's regulated in many countries now and we are going to commercialise soon," he said. ■

The growing importance of water-soluble fertilizers in the Middle East

Written by

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Agriculture is one of the strategic investment sectors for sustainable development of Middle Eastern (ME) countries. The arid/semi-arid growing environment of this region, characterized by limited water availability and high temperatures, challenges all types of agricultural practices from open-field to modern Ag-tech practices. Crop cultivation in ME is performed by diverse mix of controlled conditions varying from traditional open fields to net houses, polyhouses, greenhouses and the modern indoor farms. Integration of large-scale irrigation combined with mechanization has enabled extensive production of high-value cash crops, including fruits, vegetables, in addition to routine crops such as cereals, lentils/chickpeas, potato, date palm and others.

Water is a precious resource in Middle Eastern agriculture, the region receives about 1% of the World's precipitation, the majority of which is utilized efficiently in agriculture. Fertilizer use in the region showed a steady increase in nitrogen (N) fertilizer consumption during the last three decades. The use of phosphorus (P) fertilizers also increased but at slower rate, while consumption

Phosphorus has many structural functions in plants

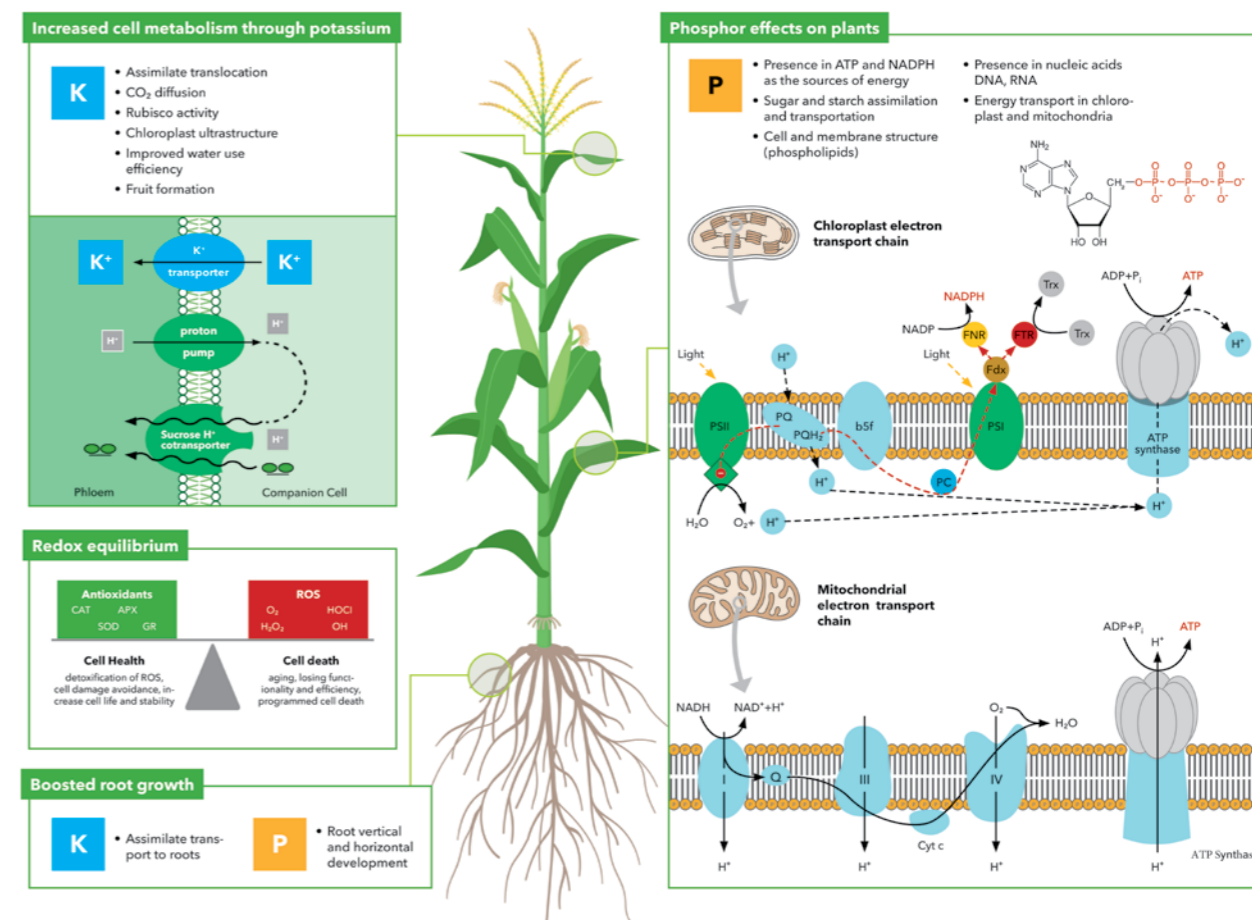
of potassium (K) fertilizers did not increase. Optimal nutrition practices urges a balanced application of all macronutrients therefore both potassium and phosphorus are required to ensure a successful crop cultivation in the ME region. It is also important to first understand the function of both nutrients in relevance to the environmental conditions of the middle east agriculture.

Functions of phosphorus and potassium in the plants

Phosphorus has many structural functions in plants. It is a very important component of nucleic acids such as DNA and RNA which translate the genetic information into structural and functional proteins. The latter is not only crucial for plants growth but also affects their response to the hourly and daily environmental changes such as

temperature, humidity, stress, which is a common phenomenon in the ME region. Phosphorus is also present in phospholipids acting as the structural element of cell walls and cell organs. Polyphosphates and phytates are the other forms of phosphorus pool in the plants, dominantly present in leaves and fruits. Nevertheless, the most important function of phosphorus is its role as the heart of energy transfer and metabolism in cells by presence in phosphate esters, adenosine triphosphate (ATP) and Nicotinamide adenine dinucleotide phosphate (NADP). Consequently, photosynthesis and carbon partitioning in the leaves is highly dependent on P content in plant chloroplast and cytosol (see figure 1). Phosphorus deficiency in plants is manifested as purple pigmentation in leaves due to accumulation of starch and sugars, as a result of lower ATP content. The normal P content in the plants is between 0.2-0.5% of dry matter. Seed's and fruit's growth, and

Figure 1. The effects of potassium (K) and phosphorus (P) on plant's growth



Source: Modified by Ershad Tavakol from the following papers (DOI number- <https://doi.org/>): Traenkner et. al 2018 "10.1111/ppl.12747"; Prochaska and Cvetkov 2013 "10.1007/978-3-642-16712-6_25"; Rochiay 2011 "10.1016/j.bbabi.2011.05.009"; Allen et. al 2011 "10.1016/j.tplants.2011.10.004"

the respective uniformity and quality are the important results of optimum phosphorus fertilization.

In comparison to phosphorus, potassium (K) possesses a higher portion of dry matter (2-4%). The major role of potassium is witnessed in photosynthesis, photo-assimilate translocation, osmoregulation, and stress resistance. Optimal K supply also determines stomatal conductance, chloroplast ultrastructure and rate of assimilate transport in plants. The role of potassium is clearly witnessed in ME agriculture, when it comes to managing severe stress conditions such as drought, heat, cold and salt

stresses. The boosted osmoregulation performed by potassium, keeps a constant water flow from the roots to leaves thereby keeping the metabolism at a persistent rate even under stress. The latter, contributes to a high physiological performance and aids the plants in reaching highest growth potentials under unfavourable environmental conditions. Adequate supply of potassium also mitigates the negative effect of toxic compounds known as reactive oxygen species under abiotic stress. Plants with sufficient K supply can detoxify these compounds and avoid yield and biomass loss under stress. Consequently, the optimal K supply aids in the mobilization of assimilates

to the reproducing organs such as fruits, seeds and tubers and ensure high yield with a distinguishable quality (see figure 1).

Environmental conditions affecting fertilizer use efficiency

No matter how good optimized nutrition is practiced, the method and the form of fertilizer application makes a significant difference whether the nutrients supplied to the soils are plant available. Here, the environmental conditions must be taken into account. In regions where drought stress conditions are

Fertilizer use contributes to more than 50-60% of the success of Middle Eastern agriculture

combined with soil salinity and high pH, most of the nutrients applied are either not plant available or limitedly available. Areas such as Middle East, North and central Africa are examples having such harsh environmental conditions with low soil quality and limited nutrient availability.

Eventually the availability of P and K to crops in ME agriculture is challenged by the adverse growing environment. Phosphorus undergoes fixation reactions and potassium is subjected to leaching, being washed away from the root zone, restricting the optimal availability of both nutrients. Similarly, fertigation environment characterized by saline irrigation water with high content of total dissolved solids reduces phosphorus availability in the soil. Phosphorus fertilizer input react with ions in the water source, causing precipitation of phosphates resulting in clogging of drip emitters. Likewise, continuous use of single potassium fertilizer source results in salinity build up, restricting the uptake of other essential plant nutrients.

The Middle East specialty fertilizer market

Fertilizer use contributes to more than 50-60% success of ME agriculture. The distribution of crop cultivation varies from open fields (50-60%) to controlled farms (40-50%) in net houses, poly houses and green houses. Fertigation is the commonly used practice for supplying water and nutrients both in open farms and controlled farms. While some farmers use decomposed manures/compost/organic sources for improving the harsh soil characteristics, majority of farms depend on artificial growing media and practice aggressive fertigation regime aiming for higher crop yields with improved crop quality.

As a result, the fertilizer use is distributed amongst solid grades for soil application to water-soluble fertilizers for fertigation. Even though nitrogen, phosphorus and potassium are considered as the major essential plant nutrients, Middle East farms give equal emphasis to all essential nutrients including major, secondary, and micronutrients. Among the fertilizer grades for soil application, two forms are popular, straights and tailor-made sources. While urea, DAP, SSP, TSP, SOP are the popular straights, granular NPKs (e.g. 15-15-15 and 17-17-17) with and without trace elements (TE) are the alternative options supplying N, P and K. Under the water-soluble range, MAP (mono ammonium phosphate 12-61-0), UP (urea phosphate 17-44-0), and MKP (mono potassium phosphate 0-52-34) are the popular P sources while SOP (potassium sulphate 0-0-50) and NOP (potassium nitrate 13-0-46) are the predominant K sources. Tailor-made NPKs such as high-P formula (13-40-13, 0-60-20, 15-30-15) and high-K formula (12-12-36, 16-8-24) are very common.

Optimization of fertilizer application

While using straights is always recommended to replenish the soils with major nutrients, tailor made fertilizers offer solutions for meeting

growth stage specific crop nutrient requirement. Plant nutrient demand at different physiological growth stages is achieved with a combination of straights and specialty fertilizers with the inclusion of micronutrients. The right mix also helps in balancing harsh growing conditions, such as pH and salinity, and aids in improved nutrient uptake. As an example MAP with pH 4.5 is alternated with urea phosphate, UP (pH 1.7) and K fertilizer MKP (pH 4.5) is rotated with solid pekacid/acid MKP (pH 2.0) to balance the pH and keep the nutrients in soluble state when dissolved in irrigation water with high pH and high TDS.

Salt index (SI) is a measure of the salt concentration that a fertilizer induces in the soil solution or near the root zone. In ME agriculture, SI is often used as an indicator to caution potential salt effects due to repeated use of single source fertilizer in terms of decreased seed germination or increased seedling injury. Water-soluble potassium fertilizers containing phosphate (MKP)/sulphate (SOP) as the source of K have lower SI than those containing chlorides (KCl). Alternating K source driven by variable Salt Indexed K fertilizers (MKP 8.4, SOP 46.1, NOP 73.6, and acid MKP 15.0) is key for balancing secondary salinity build up due to continuous fertigation practice.

Table 1. Characteristics of few water-soluble phosphorus and potassium fertilizers

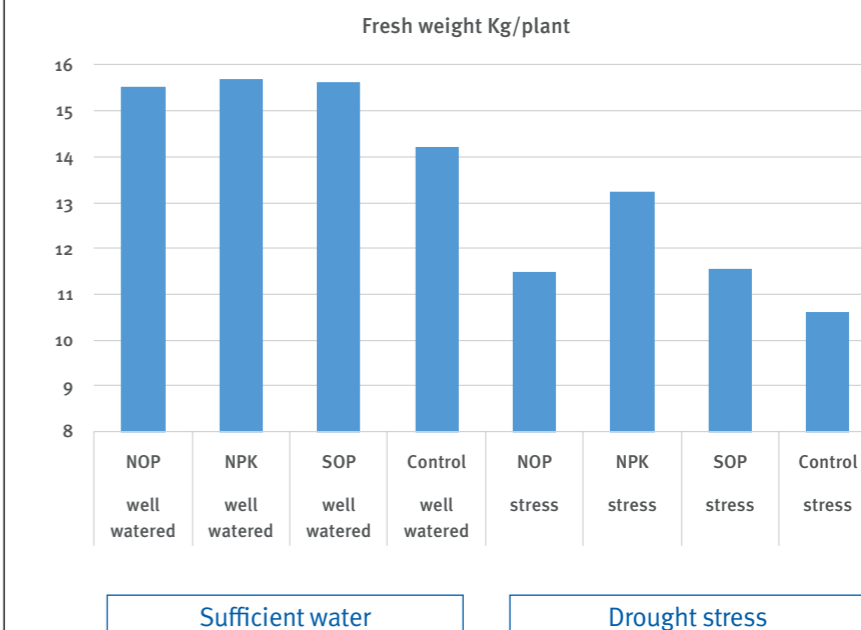
Parameter	MAP	MKP	SOP	NOP	MOP
Formula	NH ₄ H ₂ PO ₄	KH ₂ PO ₄	K ₂ SO ₄	KNO ₃	KCl
pH (10% solution)	4.5	4.5	2.5	7.0	7.0
Solubility (g/l) 10°C	295	183	93	210	312
Solubility (g/l) 20°C	374	230	111	316	342
Salt Index	26.7	8.4	46.1	73.6	116.3

The challenges of harsh growing conditions in the Middle East are being addressed

Fertilizer compatibility often decides the success of fertigation practice. Some fertilizers form insoluble precipitates upon mixing, therefore, while preparing fertilizer stock solution, growers are advised to know about the compatibility before tank mixing the fertilizers. For example, Ca salts (calcium nitrate) mixed with sulphates (ammonium sulphate, magnesium sulphate and potassium sulphate) forms a precipitate of gypsum and makes the nutrients unavailable to the plant. Solubility, defined as the maximum quantity of the fertilizer that can be completely dissolved in a given amount of water at a given temperature, is another important factor that decides the success of fertigation. It is suggested not to dissolve any fertilizer at rates over and above the solubility limits for effective dissolution of fertilizers for fertigation. The irrigation water in ME region is primarily hard in nature with high pH and Ca content, therefore, the growers are advised to mix the fertilizers well below the threshold solubility level.

High quality water-soluble fertilizers are also suitable for leaf applications. In case a severe nutrient deficiency of any macro/micronutrient is perceived, leaf application could rapidly replenish the needs of the plants and avoids growth inhibition (see figure 2). Furthermore, in case of immobile nutrients such as iron, copper, boron, manganese and zinc, the constant leaf application of fertilizers enriched with trace elements will avoid deficiency and ensures optimal biomass generation.

Figure 2. The effects of foliar application of SOP, NOP and NPK on biomass yield of tomato grown in greenhouse conditions (Kg/plant) under normal and drought stress (75% field capacity).



Science-based fertigation

Prospective agriculture is undoubtedly perceived as a sustainable food security initiative in the ME region. The challenges of harsh growing conditions are being addressed with modern ag-tech solutions, witnessed through scaling fertigation practices with integration of water-soluble and novel specialty fertilizers. Optimal application of

plant nutrients through right science-based fertigation prescriptions is to be promoted for harnessing better crop yields and improved farm profits. To this end, sufficient attention needs to be given to phosphorus and potassium as they play a decisive role in stress mitigation and plant growth under harsh environmental conditions prevalent in the Middle East region. ■

K+S soluFamily

Worldwide recognition of the K+S brand, long-term agronomic expertise, sound technical know-how in fertigation and existence over 150 years led K+S to introduce soluFamily in the Middle East region. With the establishment of LSU in Dubai, United Arab Emirates in 2017, K+S integrated the supply of German quality water-soluble fertilizers along with the organic certified K+S specialties for application in open field and controlled conditions through fertigation. The soluFamily range of K+S portfolio is characterized by water-soluble straights, tailor-made crop specific NPKs and Micronutrients. With Agronomy and Advisory driven integration, K+S is successfully moving towards the expansion of soluFamily in the Middle East to help farmers achieve the sustainable food security goals in the region.

Challenges and opportunities for Middle East fertilizer producers

Written by

Mr. Karan Chechi, Director, ChemAnalyst, India

The continuously increasing demand for fertilizers and growing awareness among the farming communities about the use of fertilizers to increase productivity is driving the fertilizer market in the Middle East. Increasing demand for fertilizers from various countries is driving the production across the region. The Middle East

is one of the largest producers of nitrogen fertilizers in the world, with an estimated ammonia production of close to 16 mn t and urea production of around 20 mn t in the historic period.

The Middle East has plenty of conventional gas reserves and high shale gas resource potential, and so

the cost of natural gas is low in the region. Hence, the low production cost makes the construction of export-orientated, integrated urea plants quite impressive. Being the largest ammonia and urea producing region, Saudi Arabia is the largest exporter of urea, followed by Iran and Qatar. It is not very surprising that the Middle East is one of the regions where ammonia and integrated urea capacity has developed rapidly in recent years. One of the major factors favouring the growth of the fertilizer market in the region is the surging demand for food grains and ensuring its security. Rapidly growing urbanization and industrialization rate reaching up to 70% as of today is further augmenting the fertilizers market across the region.

Most of the fertilizers produced in the Middle East are exported to other countries, including India, the US, Brazil and Thailand. Strong fertilizer demand from these countries is also driving fertilizer industry growth in the region. The demand for potassium fertilizer is expected to grow in the near term driven by strong requirements in China, India, Brazil and Indonesia.



Increasing demand for fertilizers from various countries is driving the production across the region

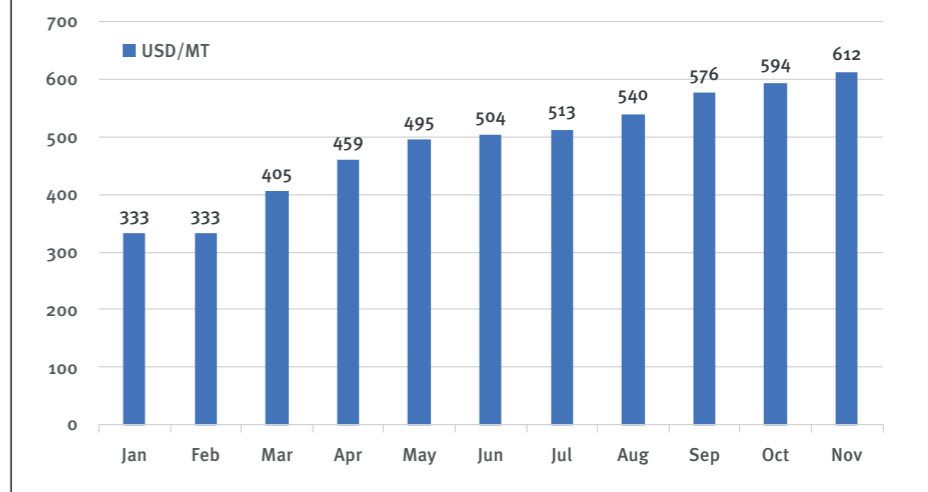
Increased demand from key crop-growing regions has been the driving force

Challenges

The development of the agricultural sector in the Middle East has remained hindered by several factors, including relatively small farm sizes, diminishing arable land, weak infrastructure, water scarcity, amongst others. The regional capacity growth outlook is affected by the prevailing global oversupply situation. The price of fertilizers skyrocketed in 2021, particularly phosphates and urea, driven by strong demand and higher input costs. Higher feedstock prices became a lot more challenging for fertilizer producers of the region. Fertilizer prices are expected to ease in 2022. Disproportionate consumption patterns have played a primary role in promoting food insecurity in the Middle East.

Capacity expansions, geopolitical tensions and environmental policies on fertilizer use have also impacted fertilizer prices around the world. Phosphate's feedstock costs, particularly sulphur and ammonia, have increased sharply as refinery curtailments due to COVID-19 restrictions limited supplies. Fertilizer prices have risen immensely in recent months due to increased global demand, particularly from the US, China and India. Urea feedstock prices also surged in early 2021, including natural gas prices which jumped due to unusual weather conditions. Diammonium Phosphate (DAP) prices reflect higher feedstock prices, including ammonia and phosphate rock, as well as increased shipping costs. DAP exports from Saudi Arabia declined in 2021 due to the issues related to phosphate production. Spot Asian LNG and European and western

Figure 1. The rise in Diammonium Phosphate (DAP) FOB prices in 2021



Maaden's phosphate plant

US natural gas prices hit record highs in early 2021.

Increased demand from key crop-growing regions has been the driving force behind high fertilizer prices. Agriculture commodity prices, such as corn and soybeans, have rallied amid strong demand and tighter supplies. Although there is ample capacity to cater to the strong demand, it may take some time to ramp up output, providing there is continued short-term price support. Geopolitical tensions

in Russia and Belarus could increase the prices of potash, but stringent environmental policies in China may slow potash imports. US Gulf Coast (USGC) producers are on par with Saudi Arabian suppliers of ammonia/urea into the USGC, thanks to the high availability of competitively priced shale gas.

In the Middle East, Saudi Arabia and Kuwait also have stepped up their oil imports in 2021 amid soaring temperatures and recovering economic activity.



Smart farming – operating agricultural drones, plant sensors, agribots and smart tractors through electronic devices whilst tracking the weather

Opportunities

The Middle East has always been at the forefront of recent developments in technology and agriculture is a key sector for food security, employment and income generation in the region. Smallholder farmers play a vital role in the food security of the Middle East's and produce the bulk of the domestic staple supplies. However, they are amongst the most vulnerable to the impacts of climate change. Improving their resilience to climate-induced agriculture sector challenges is important to support their livelihoods and protect food security throughout the region.

Over the last decade, various technologies have been developed to address agriculture's longstanding structural problems related to unproductive farming soils and water shortages. Such initiatives could potentially provide fertilizer producers several opportunities to promote food systems' resilience across the region. Such technologies are designed to

Smallholder farmers play a vital role in the food security of the Middle East

enhance and improve the outputs of the agricultural sector while using less energy and more sustainable methods with the use of chemical fertilizers.

Dutch Chemicals Group, one of the major producers of ammonia, announced in mid-2021 that its nitrogen fertilizer production arm Fertiglobe, the largest producer in the Middle East, had signed an agreement with TA'ZIZ to join a world-scale blue ammonia production project at Al Ruwais in Abu Dhabi. This project will be functional in the purpose-built TA'ZIZ Industrial Chemicals Zone, adjacent to the Ruwais Industrial Complex, which will supply hydrogen and nitrogen feedstocks. The one-million-tonne-per-year plant will be the first-ever large-scale project in the Middle East, with a final investment

decision expected in 2022 and a start-up is targeted for 2025.

OCI N.V., having fertilizer plants in various countries, reported that the development would allow the company to capitalize on emerging global demand for blue ammonia as a hydrogen carrier fuel. Nassef Sawiris, executive chairman of OCI and CEO of Fertiglobe, added: "This venture fits well in our strategy to decarbonize our global and regional platforms." An executive described ammonia as "a versatile and clean hydrogen carrier, with many exciting fuel applications," in addition to a wide range of fertilizer and downstream industrial uses.

Dr. Sultan Ahmed Al Jaber, UAE Minister of Industry and Advanced Technology and ADNOC managing director, described the agreement

as "a significant milestone in the development of its blue hydrogen and ammonia business." The UAE is well-placed to meet increasing global demand for this new fuel which will boost the fertilizers industry in the Middle East.

Reducing the ecological footprint

Transformative technologies such as the Internet of Things (IoT) play a crucial role in ensuring sustainable production that guarantees the future of the agricultural sector in the Middle East. IoT is the driving force behind smart farming, connecting smart machines and sensors integrated on farms to make agricultural processes data-driven and more efficient. Smart farming can potentially reduce the ecological footprint of farming and drive time efficiency, cost reduction, and increased productivity. The application of IoT, Artificial Intelligence (AI), and other technologies will play an important role in agriculture. The Middle Eastern region has some of the most penetrated mobile markets worldwide, which provides a fertile ground for the mobile technology applications to the agricultural sector. Smartphone connections are expected to exceed 500 mn by 2025, driven by the utilization of more affordable devices. As smartphones are becoming easily available to smallholder farmers, smart farming applications will not be limited to large agricultural enterprises. Through smart farming, with the use of sensors, farmers will be able to find the nutrients that are lacking such as phosphorus and nitrogen in the region, which will further boost the demand for fertilizers.

Major players operating in the fertilizers market in the Middle East include Gulf Petrochemical Industries Company, Qatar Fertilizer Company, Saudi Arabian Fertilizer Company, Emirates Bio Fertilizer Factory, Fertil, amongst others.

The Middle Eastern region has some of the most penetrated mobile markets worldwide

What is causing a major drive in the fertilizer industry in the Middle East?

The growing awareness among the farmers about the utilization of fertilizers to increase crop productivity is driving the fertilizer market in the Middle East. The use of fertilizers by the farmers to protect food security and produce the bulk of domestic supplies is further driving the fertilizers industry across the region.

What are the challenges faced by the fertilizer producers in the Middle East?

Declining arable land, deserted location, smaller farms, weak infrastructure, intensive heat, and water scarcity are some of the major challenges faced by the agriculture industry in the Middle East. Skyrocketing feedstock prices amidst the strong demand for fertilizers is the major challenge faced by the fertilizer producers in the region. The geopolitical tensions and environmental policies on the usage of fertilizers can also be challenging for some of the fertilizer producers.

What was the impact of COVID-19 on the fertilizers industry in the Middle East?

COVID-19 became a food security crisis in many countries, including the Middle East. Due to the nationwide restrictions, the supplies

of fertilizers were restricted across the region, which resulted in the increment in the feedstock prices, particularly sulphur, ammonia and phosphate.

Emerging technologies

Despite uncertain challenges such as high feedstock and energy prices in the Middle East, there are numerous opportunities for the fertilizer producers to bolster the fertilizers market across the region. Emerging technologies are coming into the light with the potential to drive the agriculture industry across the Middle East on the back of strong demand for chemical fertilizers, particularly from the US, China, and India. Lacking nutrients in the region such as phosphorus and nitrogen will further boost the need for fertilizers. Smart farming methods will be readily available to smallholder farmers in the upcoming years through transformative technologies, which will drive the agriculture industry across the region.

The environmental policies related to fertilizer use, capacity expansions, extreme weather conditions, and geopolitical tensions have severely impacted fertilizer prices worldwide. However, fertilizer production in the Middle East is expected to hit 50 mn t by 2035. Key factors that are likely to drive the agriculture industry's growth include:

- The abundance of natural gas, phosphate rocks and sulphur in the region
- Access to world-class infrastructure
- A favourable supply chain
- Advantageous geographic proximity of expanding fertilizer markets in Asia ■

Why we can't keep treating the underground superorganism like dirt



Written by

Matthew Evans, farmer, chef, food writer, broadcaster and activist, Australia

They are easy numbers to bandy about: There are more living things in a teaspoon of healthy soil than there are humans on the planet - A single shovel full of soil is more biodiverse than the entire Amazon rainforest (and the Amazon rainforest is the most biodiverse ecosystem on land) - 98% of the matter living in soil is unidentified by science.

And those numbers, despite being seemingly too fantastical, are true. The reality is, we've underestimated what lives in soil, how it operates, and why it matters. The upshot, however, is that in the process, we've managed to damage soil in recent times in a way that would previously have been thought unimaginable. Globally, we currently lose topsoil 30-40 times faster than nature can make it. Arable land, and pasture, the bit we use to feed humanity, is finite. And it's in peril. For too long we've seen soil in its physical form, tried to understand its chemical behaviour, and ignored, or underestimated, its biology, the life within.

What has this got to do with fertilizer? Well, plants don't eat dirt. Apart from the few things a plant can get from the air and water (nitrogen, carbon, oxygen and hydrogen), everything else comes from soil. It might be boron, or copper, or selenium or iron. Plants need lots of things, in lots of biochemical forms, and many of those elements may only be required in relatively tiny amounts. But tiny amounts don't make them

unimportant. And the best way for a plant to access nutrients is through the incredibly complex array of microbes in its rhizosphere, the biologically dense area close to a plant's roots. The best soil is blessed with organic matter, from dead things, too.

Which means, the best fertilizer for soil is one that encourages life, not damages it. The best fertilizer leaves soil more fertile in the long run, not just for this year's harvest. Of course, the cheapest, most common, and most accepted fertilizer is nitrogen captured from the air, commonly known in all its forms as artificial nitrogen fertilizer.

Lost nitrogen

Artificial nitrogen, however, has a cost beyond the dollars and cents of its production. And the cost of the fertilizer is borne not just by the farmer, but also by the farmed land and environment further afield. For a start, more than half of the artificial nitrogen added to a field is lost into the air and the waterways. Some say 70% is wasted. This lost nitrogen is terrible for the environment.

Over half of the rivers in New Zealand have become unswimmable and artificial nitrogen runoff is to blame. In the UK, nearly 30% of groundwater, a major source of drinking water, has to be treated, diluted, or replaced because of nitrogen pollution. In the US, marine dead zones are taking

over the Gulf of Mexico. Globally, oceanic dead zones have increased exponentially since the 1960s, when nitrogen fertilization really started to take off.

The thing is, while for a time we didn't know or fully understand the damage artificial nitrogen fertilizer caused, now we do. While we can (and do) get away with some things in the short term, but in the long term, soil remembers. The dilemma is that people also continue to need food and fibre, in large quantities. So can we fertilize crops, feed soil, and not create environmental problems for future farmers and succeeding generations to face?

Soil erosion

The soil of the Amazon certainly remembers, and it offers an inspirational tale.

Most of the Amazon isn't actually as fertile as many people think. In fact, overall, it's a pretty poor place to grow crops. Thanks to nutrient-leaching from high rainfall, and the fast rate of organic carbon decomposition due to the warm temperatures, Amazonian soils are generally not very suitable for agriculture. However, certain parts of the Amazon Basin have far richer soil than the relatively impoverished soils nearby, a difference that can't be explained by geology. These patches – many about 20 hectares in size, but some

up to 350 hectares – have been made astoundingly fertile by the deliberate actions of people. What's more, these terra preta patches have been fertile a thousand years, some up to 7000 years.

Far from humans always mining and eroding soil, this shows we can also build it. Millennia ago, some Amazonians worked out that putting things in soil makes it more fertile. We don't know how they knew. We don't even know how they did it, because these farms were abandoned after the original inhabitants died, probably of smallpox, after Europeans arrived in the 1500s and 1600s. But we can guess. One of the things you always find in terra preta is charcoal. Yes, half-burnt wood. Terra preta, sometimes called Amazonian Dark Earth, has 70 times more charcoal in it than comparable soils nearby.

The charcoal in terra preta is often called biochar. Essentially it's wood burned in a low-oxygen environment until it is porous, mostly carbon, and stable.

The Amazonians buried the charcoal – probably with animal and possibly human waste, and potentially food scraps. Terra preta soil is, quite often, 13-14% organic matter. That's about five times as high as much of the depleted arable land in the UK.

The ancient Amazonians really were onto something. And we now know how vital it is to store carbon in soil. It stores water, feeds the underground ecosystem, provides soil structure and allows the all-important passage of air.

A living, breathing super-organism

In fact, according to UK's Environment Agency's 2019 State of the Environment: Soil report, "intensive agriculture has caused arable soils to lose 40 to 60% of their organic carbon."

It will come as no surprise to many that "over two million hectares of soil are at risk of erosion in England and Wales." Dead soil, or impoverished soil, is more likely to wash or blow away.

These aren't arbitrary numbers, and they aren't just plots on a graph. They represent massive problems now and into the future, not only for growing food, but also for Britain as a whole. These numbers are mirrored around the world. In fact, in the country I call home, Australia, we've lost half our topsoil in the 200 or so years since Europeans arrived. In the US, they're on track between now and 2035 to lose eight times more topsoil than during the devastating and infamous dustbowl era. And topsoil, remember, is the magic bit, the part that grows 98-99% of all the calories that humans eat. Sadly, and I say this as someone who grows food for a living, agriculture is most at fault. While fertilizer isn't the only culprit, part of the problem is its use and misuse. Despite improvements in nitrogen management in many places, including the UK (and a corresponding plateau in nitrogen runoff), we are still a long way from using fertilizer sustainably. Meanwhile, examples like terra preta show us there are better ways.

So how best to nourish soil? First, we need to put it first, not second, or last, on our list of priorities. It's a living, breathing super-organism that needs things that we need. Soil needs feeding, and that involves more than just NPK. It needs warmth. It needs air (the entire top 20-30 cm of soil can exchange all its gases every hour, unless, like 4 mn hectares of the UK's topsoil that's at risk, and too heavily compacted). This super-organism needs moisture, it needs living plants in it (the original food source) and it needs to not be cut open.

Using more natural systems

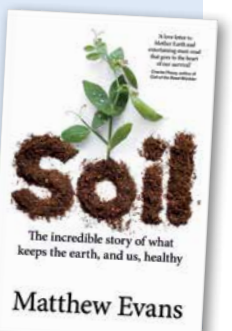
How you fertilize matters. Simple, excessive fertilization can trigger short-term leaf growth, but impoverish soil. It can impair microbial growth, alter the soil's microbiome for the worse, simplify the underground ecosystem and damage vital nutrient cycling, the very lifeblood of healthy soil. Using more natural systems – compost, worm juice, seaweed, cover crops,

mulch, and having green living plants in the ground the entire time as much as possible – feeds soil for the long term. What we need to do is feed soil today so we can have food for all the tomorrows we hope to have.

More than anything, the simplistic notion that we fully understand soil, and can supply what plants need without looking to what soil needs, has to be addressed. We need to wean ourselves off synthetic nitrogen. Apart from cascading through the environment, causing harmful runoff, killing or weakening soil life, forming acid rain, and taking fossil fuels to make it, transport it, and spread it, it also forms nitrous oxide, also known as laughing gas. This gas it's no laughing matter; nitrous oxide is a greenhouse gas about 300 times more warming per kilogram than carbon dioxide, with a lifespan measured in centuries, not decades.

Transitioning away from simple, ultimately soil-harming fertilizers won't happen in a single year. It will take many forms, over many months and years, on every patch of useful land. But focusing on single or simple plant nutrients to get higher yields, without giving consideration to what soil needs in the short, medium, and very long term, is ultimately a strategy for disaster. The numbers don't lie, and responsible growers need to be agents for change, before it's too late. The good news is, there are already better options out there. ■

Matthew Evans is an Australian farmer, chef, food writer, broadcaster and activist. His latest book, *SOIL: The incredible story of what keeps the earth, and us, healthy* (Murdoch Books, £14.99), is out now, and gives us all a reason to celebrate soil and care about its fate.



People and events

Grow Asia appoints Beverley Postma as Interim Executive Director

Grow Asia has appointed Beverley Postma as Interim Executive Director of Grow Asia. Beverley, an experienced CEO and strategist, will bring her unique blend of non-profit and corporate experience to Grow Asia, drawing on her career spanning 30 years in the agriculture, food and international development sectors.

Most recently, Beverley was CEO of the Roundtable on Sustainable Palm Oil (RSPO) where she led a team of 112 and worked with the Board to develop an ambitious new five-year strategy to make certified sustainable palm oil the norm. Prior to this, she was CEO of HarvestPlus, working with smallholders in 30 countries across Asia, Africa and Latin America to improve the nutrition of staple crops. Beverley has also served as the Founder and Executive Director of Food Industry Asia (FIA) and has held senior corporate affairs and marketing roles with Kellogg's and Syngenta.

Nutrien Announces CEO Transition

The Board of Directors of Nutrien has announced that Mayo Schmidt has left his position as President and CEO of Nutrien and has resigned from the Board. Ken Seitz, Executive Vice President and CEO of Potash, has been named the company's interim CEO. Mr. Seitz brings extensive global leadership experience in the agriculture and mining sectors and is well-positioned to progress the company's stated strategy and lead the integrated business during the transition.

Anglo American appoint CEO of crop nutrients business

Tom McCulley, currently CEO of Anglo American in Peru, will now lead the development of Anglo American Woodsmith as CEO of the crop nutrients business. Mark Cutifani, Chief Executive of Anglo American Commented: "I am confident that Tom and his team will finalise our plans and then deliver the project we all envisage safely and with great precision."

Anglo American has appointed Adolfo Heeren as CEO of Anglo American in Peru. Adolfo will work together with Tom McCulley during the first half of 2022 to ensure a smooth transition from the construction and commissioning phase of Quellaveco into operations, expecting first copper production in mid-2022.

New financial advisor for Abu Qir Fertilizers methanol project

The board of directors of Abu Qir Fertilizers and Chemicals Industries Company (ABUK) approved to appoint Al Ahly Capital Holding as the financial advisor for the International Company for Methanol and Derivatives (under establishment), the company revealed in a statement.

The financial advisor will be responsible for arranging the required financing for the methanol and ammonia project set to be built in the Suez Canal Economic Zone (SCZone), according to a statement.

AmmPower Corp. announces the appointment of Eric Kelley as the Director of Marketing

AmmPower has announced the appointment of Eric Kelley as the Director of Marketing for its agricultural line of Green Ammonia Production Products, which includes portable agricultural units that will supply farmers much needed green ammonia, to serve a variety of purposes in the agricultural space. These units will be capable of producing up to 4 t of green ammonia per day.

Eric has over 10 years experience in all facets of agriculture crop production and equipment sales. He has sold new and used self-propelled fertilizer spreaders and chemical application equipment as well as tractors. As founder of Kelley Precision Ag he performed soil analysis and provided guidance for better farming practices and intelligent ways to improve nutrient management, such as variable rate mapping. He has also provided both growers and suppliers guidance regarding fertilizer equipment and storage solutions based on his knowledge of ammonia storage, safety and compliance aspects as well as the supply and demand structure required by the time sensitive industry of agriculture. Mr. Kelley states, "The role of green ammonia is critical towards the future of the agricultural space. Indeed, I am excited by the prospect of AmmPower becoming a disruptor in the space by not only creating green ammonia, but by getting ammonia production closer to the end user. I am truly excited about helping lead the green movement in an arena that I have worked in for over a decade."

Rene Bharti, President, states, "Moving AmmPower into the agricultural space positions it well to add an early revenue stream to go along with the potential partnerships with large port facilities currently in discussion." ■



Special focus

INFRASTRUCTURE & LOGISTICS FOCUS >

The impact of the shipping crisis on the fertilizer industry

Written by

Bob Kuit, Broker, Hudig & Veder Chartering B.V., The Netherlands

2020, what a year it was. Not only on a personal level, but also the shipping world went upside down in a relatively short period. At first, it seemed that the global pandemic did not hit the shipping market as hard as originally thought, but with large cargo volumes still in the pipeline, the worst was yet to come.

The development of the shipping market in 2020 and the coronavirus pandemic

In March, May, June and July in 2020, industrial activity went down due to lower demand and many factories were shut down as a result of the global pandemic. To stop the spread of the pandemic, people were limited in their movements which meant that shops closed, tourism stopped and demand for all kinds of products in general came to a dramatic halt. As a result of this, demand for transport was hit hard which led to ships laying idle and shipping owners not knowing what to do. Layby berths and anchorage areas were full of vessels looking for employment which provided an imposing landscape to watch, especially here

The increase in demand for ships led to a strong increase in freight pricing

in Rotterdam and surrounding areas. It felt like the shipping industry was doomed again to a scenario similar to the financial crisis of 2008. The market decline was also widespread; from bulk carriers to LNG carriers and from small coasters to the big crude carriers, all markets went into a downward spiral which did not seem to come to an end soon. Figure 1 shows the strong decline in earnings in USD per day of the Capesize, Panamax, Supramax, and Handysize type vessels.

Light at the end of the tunnel?

This period marked a beneficial period for charterers; there was enough supply of shipping tonnage due to the shortage of cargo which meant low freights. But, there was light at the end of the tunnel for the ship owners. The period after the summer saw an increase in earnings (see figure 1) due to the increase in

demand for vessels in general. The overall feeling was that the pandemic was more or less over. Factories were in full swing again and the industry was busy catching up and resuming where they left off before the pandemic started. This was a rather surprising development given the fact that just a few months prior, the recovery looked a long way off.

Increase in freight prices

The increase in demand for ships led to a strong increase in freight pricing. In November and December 2020 the market became stronger and stronger with high demand for tonnage. The end of the year is often a busy time for the shipping industry – supplies are bigger because most traders are trying to reach their contractual obligations for year-end. The high demand for transport also meant that the supply chains needed to be able to catch up, and this was something that was lacking.

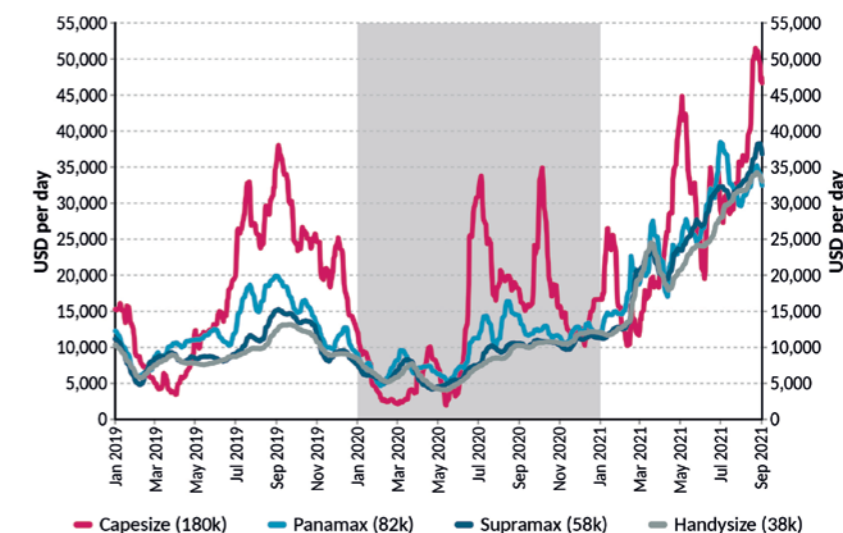
No one expected the price developments which were to come in 2021

As a result, congestion arose which caused vessels to remain longer in port, which resulted in fewer available vessels and more tension in the shipping market. How the congestion influenced the market, will be discussed more extensively later in this article. The winter period also brings increased problems with poor weather and this slows the turnaround of vessels in ports. The increase in freight rates caused a positive feeling in the shipping market amongst ship owners.

Extreme increase of container prices

Many reports were written and forecasts were made by experts in the shipping field, but no one expected the developments which were to come. Container prices saw an increase in the price of almost ten times compared with the year before. At the beginning of 2020, a 40ft container from China to Rotterdam was priced at around USD2,000. Now, the price of this same container is around USD15,000-20,000. As a result, a lot of multinationals started to search for alternative ways to transport their goods. Bulk carriers were used to transport containers which, as a consequence, had an influence on the shortage of tonnage in the segment of these particular vessels. A good example of this situation is the well-known Swedish self-building furniture store which started to charter bulk carriers and build their own containers to keep ahead of this difficult market.

Figure 1. Development dry bulk earnings 2019-2021



Source: BIMCO, Clarksons

Figure 2. European Short Sea Index – Nov 2020-Nov 2021

	Current	Last Week	Diff. %	Trend	Month ago	Year ago
EU SSXIX (2021/46)	42.85	(41.92)	2.1%	→	38.89	22.73
North Europe	€33.67	(€33.54)	0.4%	→	€31.71	€25.38
Mediterranean	\$69.09	(\$67.47)	2.4%	→	\$56.25	\$23.13
Sea of Azov	\$45.44	(\$45.33)	0.2%	→	\$42.92	\$29.31
Black Sea	\$40.33	(\$40.08)	0.6%	→	\$37.83	\$18.83

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Source: BMTI copyright EUSSIX

Unusual development of freight rates in 2021

The Capesize market still had some fluctuations, but the overall trend was a strong increase in earnings/daily hires from the end of 2020 towards the end of 2021. What also drew attention was the way the freight rates

developed over the year. Whereas there is normally a standard trend in the market with a relatively weak market with low prices at the beginning of the year, a strong market in the Spring, a low market again in the Summer months, and a strong market towards the end of the year, this tendency was now eliminated and the market kept

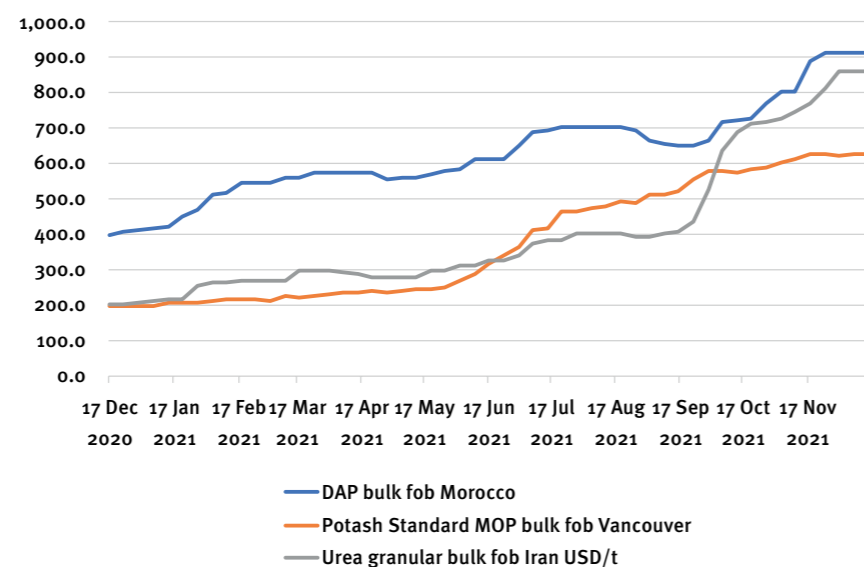
Another development playing a role in freight rates is the investments by owners

growing. 'As a company active in coaster shipping market as owners and brokers, Hudig & Veder operates vessels of between 2,400-3,400 t DWCC (deadweight cargo capacity), and seeing freight rates doubling was not a strange phenomenon anymore. The market was also strong worldwide; from China to South America and from coasters in the short sea market around Europe to Capesize vessels. Figure 2 shows the European Short Sea Index (EUSSIX) which illustrates how the freight rates in the European Short Sea market developed.

Shortages of staff and material

One of the reasons for the very tense market situation was the earlier described fact that the industry was catching up again after the pandemic hit. Another major factor that played a role in this period, was the pandemic-related logistical challenges. Shortages of staff and material were causing serious problems in the various supply chains. Shortage of containers has been a hot item over the recent period, but also shortages of staff on terminals caused major logistical problems with congestion as a result. In China, shortages of river pilots in some areas caused waiting times of almost two weeks which also had its influence again on the freight rates.

Figure 3. Development of fertilizer prices (USD/t)



Source: Argus Media

Decarbonization investments

Another development that is playing a role in the development of the freight rates, is the investments by owners in recent years due to decarbonization. For a long period, ship engines were allowed to burn all that was left from the refineries, but now there are more and more restrictions coming into force to reduce the output of pollutant gasses and particles of sea-going vessels. Investments have been made by ship owners and these will influence the freight price levels. In 2020, a new limit was set for the amount of sulphur in fuel oil which is used on board of ships by the IMO (International Maritime Organization). This meant that in the designated emission control areas, the limit went from 3.5% to 0.5% and within the designated areas the limits were set on 0.1%. This caused owners to look for other, more expensive, types of fuel. In other cases, adjustments on the ship's engines are needed as well as systems that clean the gas of ships (so-called scrubbers) to meet these new regulations.

Speaking of ship fuels. Energy prices also showed a strong increase over 2021. Not only the gas prices went up and caused challenges in the supply chains, but also oil prices saw an increase. Whereas a ton gasoil (MGO) in Rotterdam did cost around USD 200,- in April 2020, the price went to USD 450 – 400 in December of 2020, then to USD 590 – 560 for June of 2021 and to USD 700,- in mid-October which caused more costs on a voyage basis for ship owners and therefore higher freights.

Another phenomenon that can be seen in this tense market and that contributes to the tightness in the market, is that shipping capacity is not always used to its full potential DWCC. Due to the shortage of vessel capacity, it often happens that 4,000 t DWCC vessels are used to ship 2,000 t of cargo - desperate times require desperate measures, one can say. Charterers are tending to jump on the first available vessel they see in the market and secure it to at least have a vessel instead of waiting for a more suitable vessel tonnage-wise. As a result, shipping tonnage is not efficiently used adding to a further strain on freight rates.

One phenomenon that can be seen in this tense market and that contributes to the tightness, is that shipping capacity is not always used to its full potential

What the current shipping market means for fertilizers going forward

The feeling is that the high freight rates will remain for the biggest part of 2022. The market will remain tense, fuelled by the also earlier described developments. Of course, new build vessels are underway as ship owners have some money to spend in this market which is in their favour, but it will take time before these vessels will enter the market and the supply of tonnage will increase. How the rates will develop in the coming months is difficult to predict. Many experts proved to be wrong in their forecasts over the last year. The Deepsea bulk market seems to be stabilizing and let's hope that the Short Sea market will follow suit to reach a more balanced market with more workable freight rates that everyone is more or less happy with. January should give us a glimpse of how 2022 will be after the dust clouds of a strong December month have disappeared.

But what do all these developments mean for the fertilizers as a

commodity? According to one large fertilizer producer/trader, sales prices have tripled for some types of fertilizers over the last 1.5 years. This can be seen in figure 3 which shows the development of fertilizer prices on which the high freight rates also had their influence. This same producer/trader pointed out that it seems that there are no shifts in the market concerning the relationship between supplier and receiver. What can be observed in other markets is that receivers tend to look for other sources to get their materials from to avoid the high rates for sea transport.

Influence of charterers on the freight rates

There are some ways in which charterers can have their influence on freight rates:

- Timing of when to enter the market with cargo is an important aspect for example. Do not go into the market too much on a spot basis, because owners will assume that pressure is on and

this could translate to higher freight rates.

- Another way to have some influence on the freight rates is good coordination within the chain between shippers, receivers, and stevedores. When and where will cargo be shipped? By minimizing the time for port stays, avoiding congestion, and making sure that the voyage for vessel owners is as short as possible, charterers can have their influence on the freight rates. Would it be possible to arrange SSHINC (Saturdays, Sundays and holidays included) terms for example instead of SSHEX (Saturdays, Sundays, and holidays excluded) at the load or discharge port?

These are factors which could translate into a more favourable freight rates. This applies of course not only to the fertilizer business but also to all kinds of commodities. Good cooperation between all parties concerned in the chain will be of importance, particularly in these times. ■

About Hudig & Veder

Hudig & Veder went into business more than 225 years ago as a broker company, bringing ship and cargo together to ensure trustworthy transport by sea. Nowadays, we have expanded our activities with fast, flexible and reliable shipping solutions. Focusing on any type of bulk commodity, break bulk and project cargo. In 2020, Hudig & Veder joined forces with Hartel Shipping. Due to this merger, the Hudig & Veder/Hartel fleet now consists of seven modern general cargo vessels ranging in DWCC from 2,400–3,300 t.

These vessels are mainly active in the part cargo business and sail around the European continent from the Black Sea to the Baltic Sea. Besides our own ships, we also have our own dry bulk storage in the port of Rotterdam and are active in bulk logistics from storage to transshipment, and barging to road or sea transport. Hudig & Veder is furthermore active as a broker for many well-known companies, is active as a forwarder and provides agencies in Dutch ports.

Please see for more info: www.hudigveder.nl

Is disruption the new normal for the fertilizer supply chain?

Written by

Laura Cross, Director, Market Intelligence, *International Fertilizer Association (IFA), France*

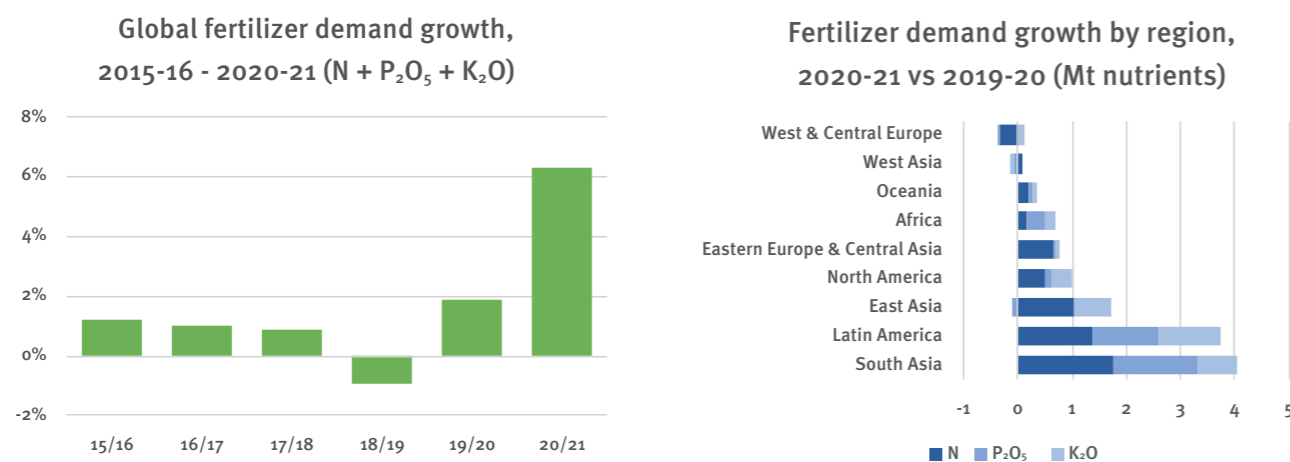
The fertilizer industry entered 2021 on a positive note, having outperformed expectations in 2020 despite the global impact of Covid-19. Fertilizer demand (N + P₂O₅ + K₂O) increased by more than 6% in the year 2020-21, driven by strong crop markets, government emphasis on food security and support provided to crop input sectors (see figure 1).

In order to meet this demand, several governments designated fertilizers as essential goods and supply chains were able to operate largely uninterrupted throughout 2020. As a result, every major fertilizer product saw higher levels of production and trade in 2020.

Nitrogen production increased in China, Russia and the US, which more than offset lower output in regions

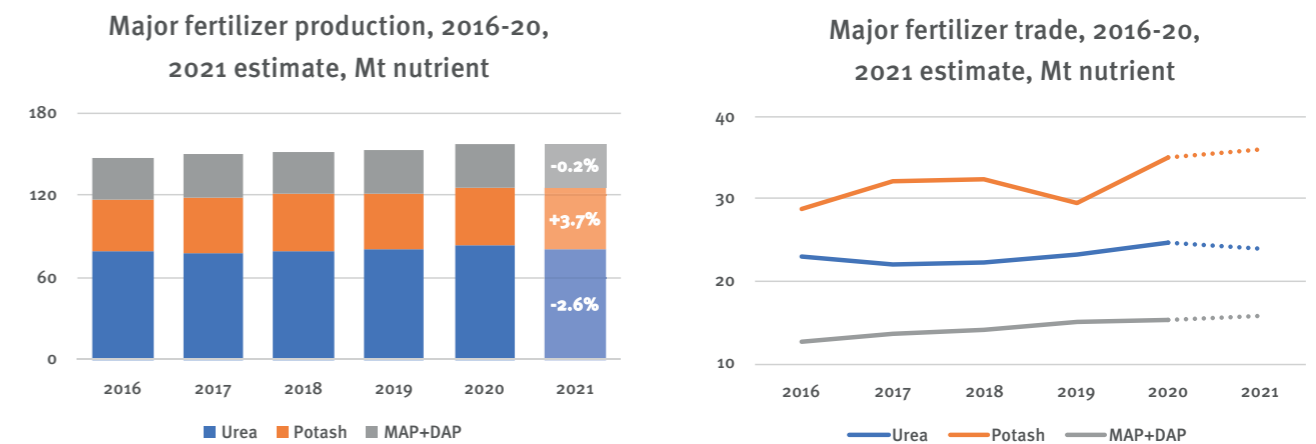
such as India and Indonesia. A number of phosphate producing countries experienced supply difficulties in 2020, namely China, Tunisia and Saudi Arabia, but this was mitigated by higher production in Morocco and Brazil. Potash production increased across the board in 2020, with all major producing countries increasing output in response to the exceptionally strong demand environment.

Figure 1. Global fertilizer demand jumped by 6% in 2020-21



Source: IFA Short-Term Fertilizer Outlook 2020-21
Note: Annual periods refer to fertilizer year, which vary by country

Figure 2. Despite improved capability, global availability has been constrained in 2021



Source: IFA Short-Term Fertilizer Outlook 2020-21

However, the same cannot be said for supply chain resilience in 2021. Fertilizer supply in 2021 was characterised by availability concerns, driven by physical disruptions and high raw material prices.

Despite marginally higher capacity than in 2020, global fertilizer supply was constrained in 2021. This was due to several supply disrupters which have emerged across the major markets – from weather events and Europe's gas crisis, to sanctions on Belarus. Furthermore, the fertilizer industry operated against a backdrop of global supply chain disruption, including spiralling freight costs, trade protectionism and agricultural market bottlenecks.

As a result of these issues, the combined production of the most commonly consumed fertilizers – urea, ammoniated phosphates and potash – was estimated to be lower in 2021 than in 2020 (see figure 2). In 2020 the global production of these product groups totalled 156 mn t, growing more than 3% year-on-year compared with 2019. In 2021, however, the same measure was estimated to decline by 0.4%, or approximately 650 000 t.

The most disrupted product area in 2021 was nitrogen, with urea production estimated to fall by

The supply disruptions in 2021 were numerous and varied

2.6% year-on-year. Ammoniated phosphate production was estimated to experience a less severe decline, at 0.2% year-on-year. Potash was the standout performer, with production of MOP expected to grow by 3.7% in 2021 compared with 2020. However, this market has faced the looming threat of a supply shortage due to sanctions on Belarus, which introduced significant uncertainty in 2021.

High demand

The same trend applies to trade, with urea and ammoniated phosphate volumes expected to be lower or flat in 2021. This contrasts with potash trade, which is expected to have reached record levels in 2021, on the back of strong demand and as a function of the potash market's heavy reliance on traded supply.

When coupled with continued high demand throughout most of calendar year 2021, this presents a much tighter supply-demand balance across the fertilizer markets compared with the

last decade (see figure 3). As a result, fertilizer prices increased significantly over the course of 2021, prompting concerns over farmer affordability in the next season on top of supply availability concerns. In 2020 and 2021, the nitrogen market was at its tightest balance between capability (a measure of theoretically achievable production, based on capacity) and demand since 2011, while the phosphate market was in the tightest position since 2013. The potash market was less tight, however, with price increases driven by uncertainty surrounding the sanctions on Belarus.

The supply disruptions in 2021 were numerous and varied and spread across the entire global fertilizer market. The disruptions impacting fertilizer supply specifically can be split into three main categories: physical, economic and geopolitical.

Physical disruptions hit US nitrogen and phosphates production - A number of weather-related events in the late summer of 2021 caused temporary outages at fertilizer plants.

Several recent government decisions have affected fertilizer trade

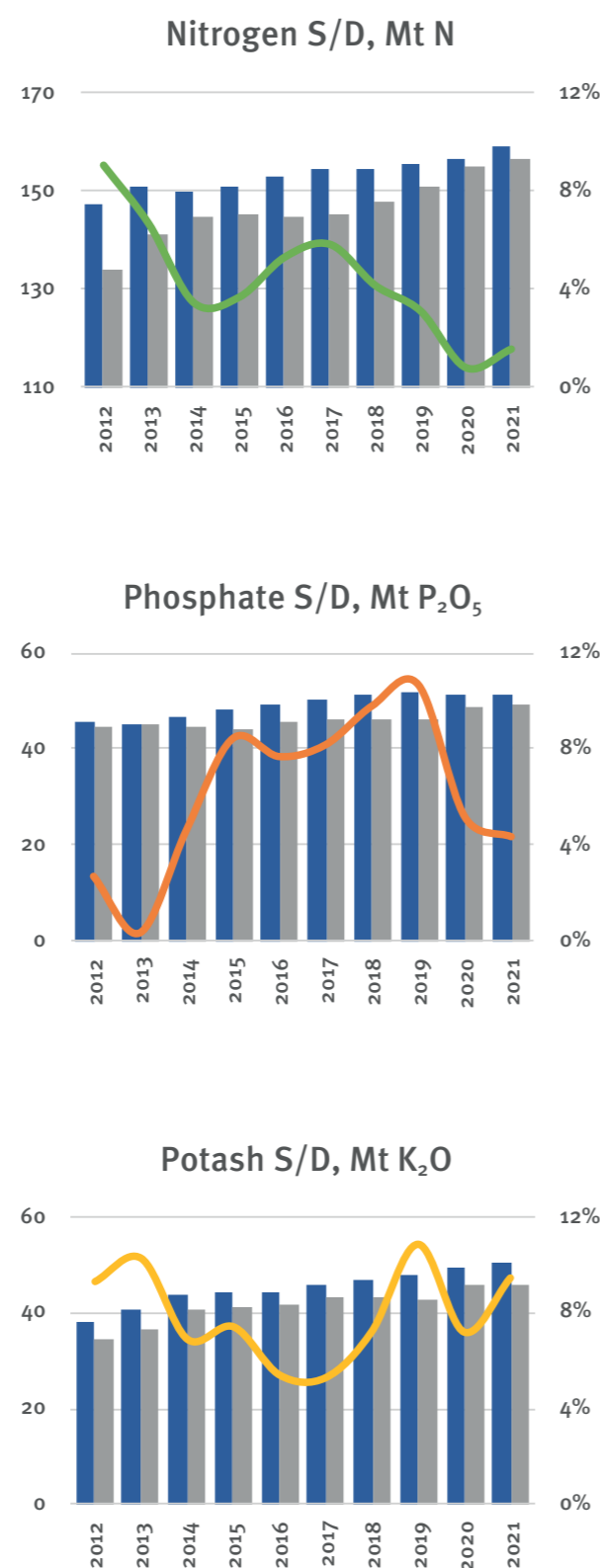
This was concentrated in the US Gulf region, where a series of strong hurricanes caused nitrogen and phosphate producers to shut their plants for several weeks.

Economic disruptions impacted nitrogen production in Europe -

Economic disruption was most severe in the nitrogen market. A tight energy market led to soaring energy prices, with the situation being particularly challenging in Europe where prices reached all-time highs in Q3 2021. Compared with the annual average European gas price in 2020, which was USD3.2 per MMBtu, regional production costs increased exponentially, rising above USD20 per MMBtu in Q3 2021. Nitrogen production costs also rapidly increased in China, where coal is the major feedstock. Producers in both parts of the world were forced to reduce production on economic grounds. For nitrogen fertilizers, this had a direct impact on production costs given the energy-intensive nature of production, but the severity of the situation had also began to spread to other fertilizer markets such as phosphates, which use energy-derived products – ammonia and sulphur – as raw materials.

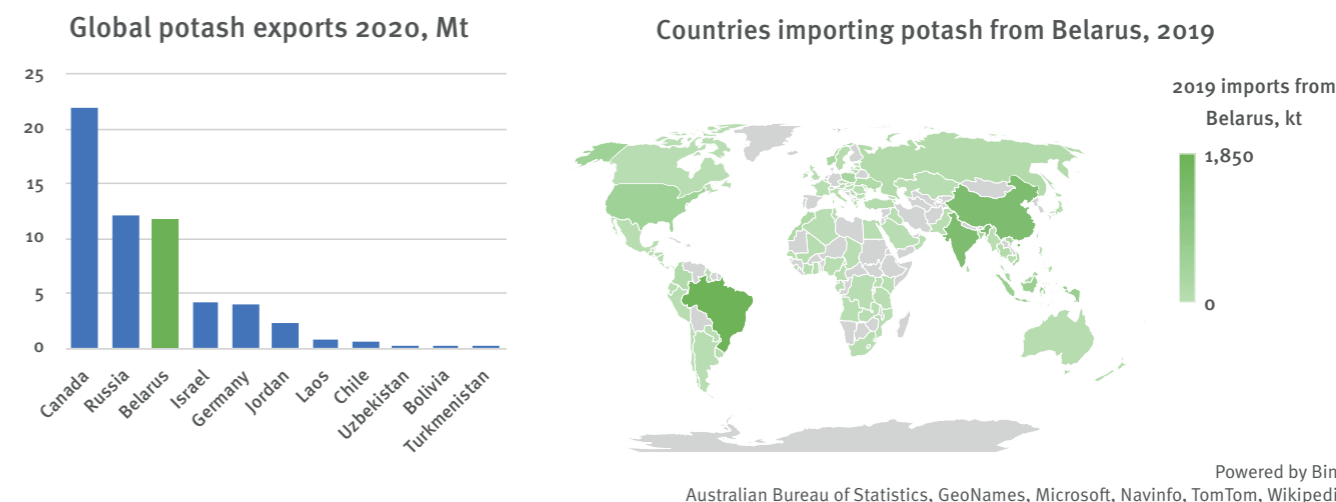
Geopolitical disruption loomed over the potash market - The most significant geopolitical disruption in the fertilizer market in 2021 was the imposition of economic sanctions on Belarus by the EU and the US. Belarus supplies almost one fifth of the world's potash and is the third largest exporter. The

Figure 3. The fertilizer markets were in a tight position in 2021



Source: IFA Short-Term Fertilizer Outlook 2020-21

Figure 4. Sanctions on Belarus have introduced uncertainty for potash



Source: IFA Short-Term Fertilizer Outlook 2020-21

Note: IFA generates maps using Microsoft tools and does not claim a view on international boundaries, which may be subject to unresolved claims by multiple jurisdictions

The industry was also impacted by international freight disruptions

potential removal of potash supply from Belarus prompted significant uncertainty in the market given the country's contribution to global supply (see figure 4).

Around 10% of Belarus' MOP exports were sent directly to EU countries in recent years, although the sanctions have wider implications because most non-EU exports from Belarus transit through the port of Klaipeda in Lithuania to reach the Baltic Sea.

Tighter sanctions from the US also pose a risk to Belarusian potash supply, especially if they impact the ability to accept financial payments in US dollars from other countries. There is a risk that any escalation of the sanctions could threaten global supply of potash and in turn, food security.

Fertilizer availability

In addition to these disruptions directly impacting fertilizer production, a number of underlying or adjacent disruptions have also hit the supply chain. In general, the global trade of agricultural commodities remains far more liberalized than in the past. However, several recent government decisions have affected fertilizer trade, such as countries limiting fertilizer exports to protect domestic supplies. High fertilizer prices have prompted several countries to strengthen self-sufficiency efforts and place trade restrictions on agricultural inputs in anticipation of potential shortages.

Fertilizer supply is often deemed a matter of national importance, given its impact on crop yields, and subsequently food supply. For example, China, Russia, Egypt and Turkey all introduced some level of export restrictions in the final months of 2021, in order to secure enough supply for the domestic market. The result of these domestic-focused policies is a further reduction in global fertilizer availability.

The fertilizer industry was also impacted by international freight

disruptions in 2021, which had implications throughout the supply chain. Covid-19 first triggered disruption in the shipping industry, increasing transit times and freight costs. In 2021, a rebound in economic activity and strong demand for manufactured products also led to a shortfall between shipping capability and demand, which disrupted supply chains and raised freight costs.

Looking back on 2021, it is understandable to ask whether disruption could be the new normal for the fertilizer supply chain. A unique set of disruptors hit the market, leading to unprecedented conditions for market participants. Despite this, there are reasons for optimism. For their part, IFA members are working hard to help meet demand sustainably by increasing their fertilizer production capacities, solving supply chain issues and investing in projects that improve access to fertilizers in developing countries. ■

This article was built from IFA's Short-Term Fertilizer Outlook 2020-21, which can be accessed by IFA members on IFASTAT.org

Advances in fertilizer cooling is the key to storage efficiencies

Vertical plate technology is improving plant operations and product quality

Written by

Jill Caskey, Global Sales Director, *Solex Thermal Science, Canada*

Advancements in fertilizer cooling technology are providing producers with an ever-more diverse and robust catalogue of storage solutions for their products before they are shipped to market. The cooling stage in the fertilizer production process represents one of the last opportunities to get it right, whether that's optimizing

operational efficiencies, ensuring a high-quality final product or improving safety measures.

In recent decades, this has led to more mainstream adoption of moving bed heat exchangers that use vertical plate technology to indirectly cool fertilizer due to their proven accuracy and consistency. In this article, we'll explore some of the different improvement opportunities producers are realizing at the storage stage as a result.

Anti-caking

For proper storage and transport, fertilizers must be cooled to a certain temperature so the final product temperature is within 10°C to 20°C of the ambient temperature. This prevents moisture migration from the air to the product that can lead to agglomeration or caking.

Caking during storage represents a significant challenge for fertilizer producers. Product agglomeration not only threatens product quality, but also leads to issues such as excessive

dust and increased safety risks when the product is being unloaded from storage due to the high temperatures. Most often, the cause of caking can be traced back to inadequate cooling.

Why does caking occur?

Fertilizers such as NPK, urea and MAP/DAP products are hygroscopic, as are fertilizer salts such as potash. This means they will start to absorb moisture from the surrounding air at a precise humidity – otherwise known as critical relative humidity (CRH). Moisture transfer from the air to the fertilizer, or condensation, will, when combined with dust, lead to product caking.

Where does this available moisture come from in the first place? Simply put, it comes from the air that is entrained within the fertilizer, filling the pore space.

For example, if the air enters at 75°C with a relative humidity of 35%, it will contain about 96 g of water per kg of dry air. As it is cooled, to say 40°C, the air will only be able to hold 49 g of

Fertilizers such as NPK, urea and MAP/DAP products are hygroscopic

water per kg of dry air at 100% relative humidity. This means 47 g of water per kilogramme of dry air will condense out of the air as it is cooled. This is where the moisture comes from. To prevent this, cooling the product to the required temperature for storage and transport is extremely important.

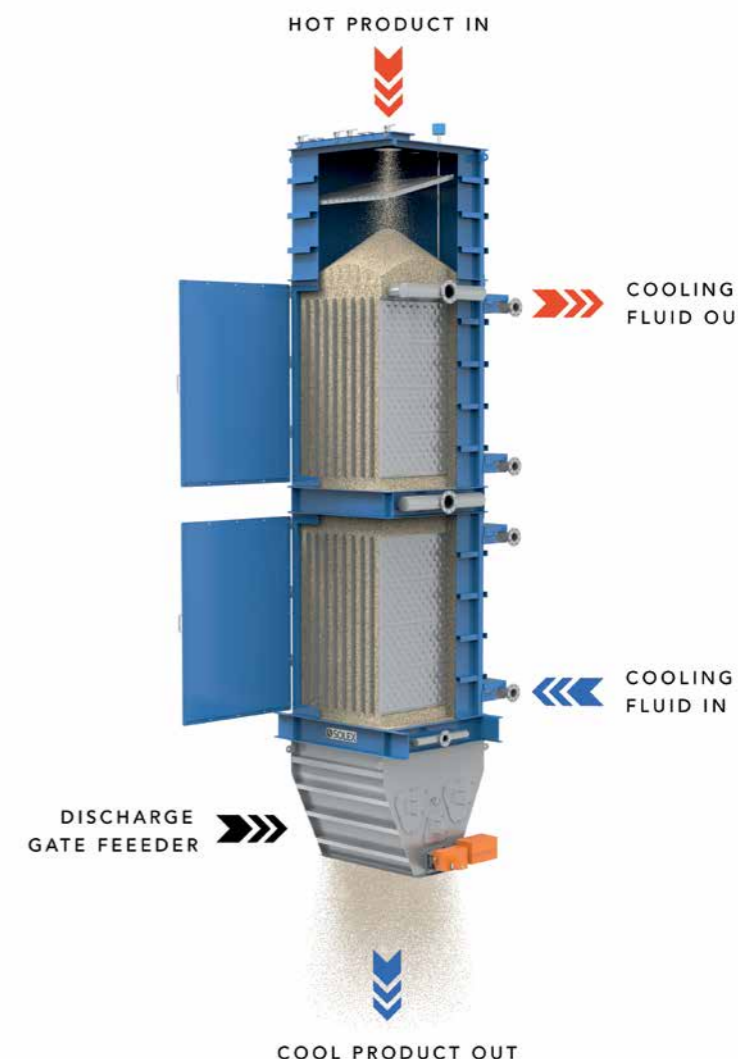
Moving bed heat exchangers that use vertical plate technology to cool fertilizers are well-suited to mitigate subsequent caking through a process that relies on conduction as opposed to convection (air cooling).

The product enters a vertically oriented heat exchanger and then flows by gravity through a series of parallel stainless-steel plates that contain cooling water or other fluid mediums. The plates absorb the heat and the product cools indirectly as it slowly and uniformly moves downward, with the flow rate controlled by a discharge feeder.

One of the keys to avoiding caking in heat exchangers that use vertical plate technology is air injection. By adding small amounts of purge air at target dew points – which are below the temperature of the fluid-cooled plates – operators can prevent condensation, and thereby caking, from forming in the heat exchanger.

It is important to note, however, that air is not used as the cooling medium in indirect plate cooling. In fact, less than 2,000 Nm³ (normal cubic metre cubed) per hour or 1,200 SCFM (Standard Cubic Feet per Minute) of purge air is needed at a particular location in the heat exchanger. The design ensures the water temperature profile and plate temperatures are always above the dew point of the air in the void space.

Figure 1. An example of a moving bed heat exchanger that uses vertical plate technology to cool fertilizer by conduction. The product flows by gravity through a series of parallel stainless-steel plates that contain cooling liquid. The plates absorb the heat as the product cools indirectly.



Source: Solex Thermal Science

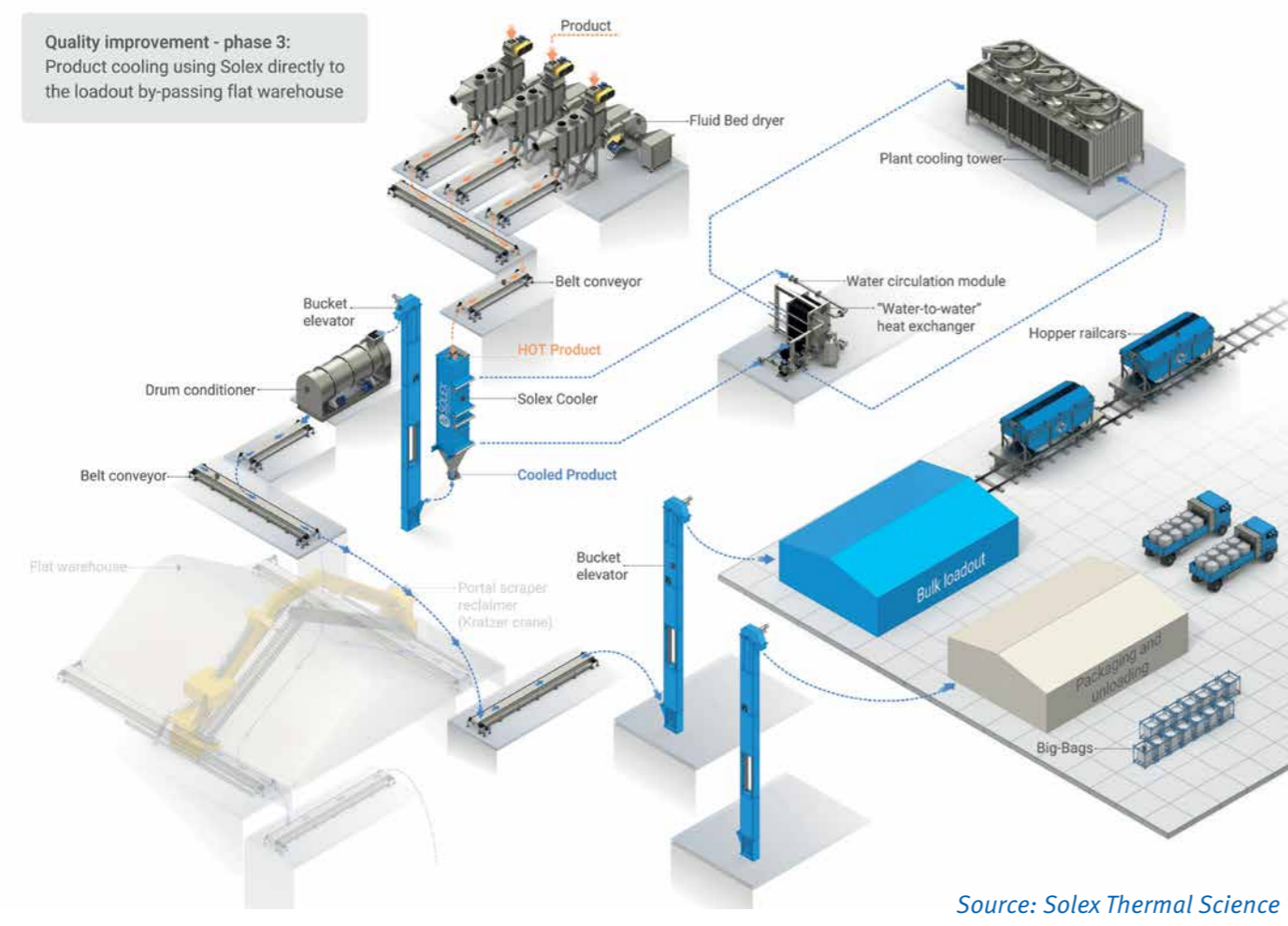
Another key point is the counter-current flow of the fluid inside the plates, which allows for greater thermal efficiency and, as a result, more effective cooling. In addition, the plate design provides more surface area to cool the product than other direct-contact alternatives such as fluid beds or rotary drums, and in a more compact space. The typical required footprint for a vertical heat exchanger is two metres by two metres.

Combined, these factors allow plant operators to evenly cool their product without the risk of condensation, excessive temperature changes and, ultimately, caking. It can also lead to higher throughputs while simultaneously mitigating the need for housing product in flat storage that relies largely on time to achieve the necessary cooling.



Jill Caskey, Global Sales Director at Solex Thermal Science
Source: Solex Thermal Science

Figure 2. NAK Azot used vertical plate heat exchanger technology at the cooling stage to eliminate its reliance on bulk storage, thereby recouping the three- to four-day final cooling time.



Improving storage practices

In many regions of world with hot and/or humid climates, certain cooling methods can be insufficient in keeping up with production demands. For example, the cooling capacities of direct-contact air coolers such as drums and fluid beds are often challenged and sometimes limited when the ambient air is too hot – which, for many parts of the world, can be upward of 48°C during the summer months. For reference, the typical temperature of fertilizer required for stable storage should be in the range of 40°C to 45°C. The capacity constraints of direct-contact coolers trace back to their

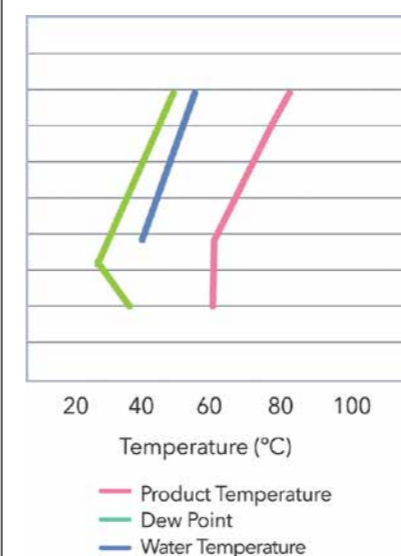
reliance on high volumes of air – not just for the heat transfer, but also for scrubbers or baghouses that must clean the air in accordance with local emissions tolerances. The load on these air-cleaning systems is often too much in these climates given the ambient air is too hot and/or humid to cool the fertilizer.

This creates a bottleneck that leads to inefficient bulk storage practices such as “stack-cooling” the hot fertilizer in warehouses. The resulting three-to-four-day cooling process complicates plant logistics – for example, demurrage and warehouse management. It also leads to scheduled planned production rate

reductions in which producers lower their throughputs so the cooling capacity can catch up. In doing so, they are leaving profits on the table by not fully maximizing the sale of their product to local and global markets. This can be significant given the volumes of fertilizer involved.

Moving bed heat exchangers that use vertical plate technology, however, allow producers to consistently cool their product prior to packaging and storage independent of ambient temperatures. Because it relies on conduction as opposed to convection, or forced air, to cool fertilizer, the technology is not influenced by ambient conditions.

Figure 3. To prevent caking from occurring, cooling the product to the required temperature for storage/transport is important.



Source: Solex Thermal Science

By doing so, producers can send cooled product directly to the loadout, thereby eliminating the need for inefficient warehouse cooling practices and avoiding planned production rate turndowns.

Improving safety

Safety represents an additional consideration when storing fertilizer. When throughputs exceed processing conditions and fertilizer is moved to large on-site storage facilities to stack cool, it can still pose significant handling risks even three to four days later.

That is because fertilizer is a great insulator. Even after sitting for extended periods of time, it can still

Case study

Novomoskovskiy Azot (NAK Azot), a subsidiary of EuroChem Mineral and Chemical Company, faced production constraints and product quality concerns due to inadequate cooling capacities at its granulated urea plant in Novomoskovsk, Russia.

Specifically, the second largest ammonia producer and the largest nitrogen fertilizer producer in Russia was seeking to debottleneck calcium ammonium nitrate production.

At the time, the process relied on three parallel fluid bed coolers designed to lower the post-granulation fertilizer temperature to between 65°C and 75°C. The product was then conveyed to a rotary drum cooler for secondary cooling before sitting in bulk storage for three to four days until the temperature dropped to its target range of between 35°C and 40°C.

However, the still-hot product heading into bulk storage was highly susceptible to drawing in moisture from the atmosphere, leading to caking. This forced NAK Azot to reclaim the caked product using two Kratzer-Crane scrapers, which led to variable grain-size distribution and a high percentage of fines.

To achieve better quality control, NAK Azot started by upgrading its rotary drum to allow for anti-caking additives to be injected into the hot fertilizer before sending it to bulk storage. This helped to reduce the amount and thickness of the caking.

The producer then turned to moving bed heat exchangers that use vertical plate technology to increase its cooling capacity. The process involved taking the product directly from the fluid bed dryer at a temperature between 65°C and 70°C, and then discharging it at an optimum temperature of between 37°C and 41°C.

The switch to vertical plate technology allowed NAK Azot to eliminate its reliance on bulk storage, thereby recouping the three- to four-day final cooling time. In addition, the producer avoided breakage or degradation of the fertilizer granules. Overall, the process allowed the granules to keep their form, resist caking and hold their integrity during storage and transportation.

Satisfied with the results with calcium ammonium nitrate, NAK Azot has since expanded its use of the vertical plate heat exchanger technology to also cool its high-density ammonium nitrate.

be dangerously hot in spots, and therefore potentially hazardous to operators and truck drivers at loadouts when the fertilizer is above the 40°C to 45°C range.

Moving bed heat exchangers that use vertical plate technology eliminate these hot spots from occurring by

providing producers with a consistent prescribed temperature that is safe to handle at the outlet. The uniform movement of product through the heat exchanger, controlled by a mass flow discharge feeder, ensures every prill or granule is accurately dialed in before being stored, or directly shipped to market. ■

About the author

Jill Caskey is a Global Sales Director at Solex Thermal Science, a North American-based leader in thermal and bulk materials engineering. She has an extensive background in technical equipment design (thermally and mechanically) within multiple different markets, notably nearly a decade with fertilizer-specific applications.

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Innovative tool for shipping draft surveys

Written by

P.J. Kwong and Teddy Katz, Communications Specialists, Think Redefined Inc., Canada

For the past 100 years, draft measurements have posed potential risks for companies trying to accurately weigh their cargo and trying to avoid costly disputes. Surveyors needed to scale down rope ladders to take measurements, but now there is a new method...

Early on in his former career as a surveyor Haritz Solachi found himself near the bottom of a rope ladder suspended 17 metres down the side of a vessel. He was trying to read the multiple draft marks painted on the side of a vessel. Once the task was completed, he tried to go back up the ladder to the safety of the ship's deck only to find that his arms were numb. He considered his other option which was to let go and fall into the water. With the encouragement of his colleagues from above, he rested for a few minutes until he regained his strength for the climb back up; the equivalent of scaling a five-story building.

The challenges come not just from the draft survey service work itself but also from the elements where wind, bad weather, wave swells and darkness can take their toll. Taking out a smaller boat to get alongside a vessel to obtain measurements, where the sea conditions are not always ideal, is not much of a solution. Very little has changed in over 100 years technologically or even with respect to crew safety in the draft survey process.

The rope ladders may have gone by the wayside for some inspectors, but

A draft survey establishes and records the vessel's displacement figures

the memory has stayed and there had to be a better way.

No longer an inspector, Haritz Solachi is now the Minerals Global Field Services Manager and Innovation Coordinator for Spain with SGS, one of the world's leading inspection, testing and certification companies. Drawing on his early experience, he was part of a team that started working in 2012 on a solution to the draft survey problem trying to modernize the process. This resulted in the first Draft Survey Tool (DST) prototype that could measure distance accurately and digitally with the help of technology.

Ultimately, the patented, calibrated and certified SGS Draft Survey Tool can be used from the vessel deck and uses the latest digital technology. This is a tool that can be adapted to all vessel shapes and measuring points. The algorithm allows for the removal of all of the waves from the reading which

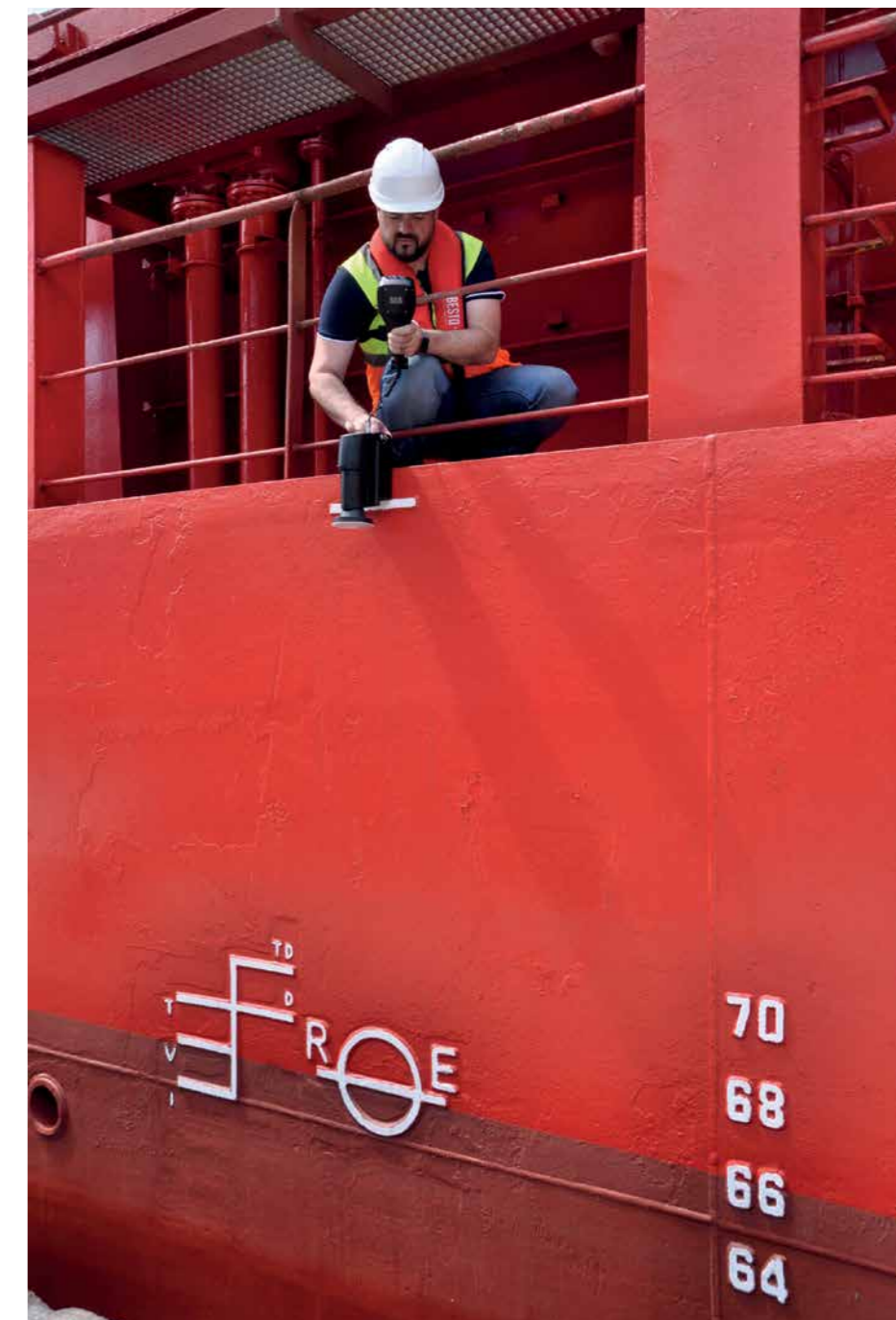
establishes the average. The 'Cloud' replaces pencil and paper and this is where all of the dot points needed to calculate the final draft in the device can be saved.

Accuracy is critical

The goal was to obtain accuracy and safety in readings. Performing draft surveys in the past was not something anybody would have called an exact science in the past. A draft survey establishes and records the vessel's displacement figures in empty and loaded conditions. For the customers and shippers having accurate information is essential in order to properly determine the transport cost of any cargo. The accuracy is so critical that, to put it into context, a deviation of one centimetre in a draft reading could result in a miscalculation of 100 t, which could cost hundreds of



(left) Previous method of taking a Draft Survey was for a surveyor to scale down a rope ladder; (right) A surveyor using SGS's new DST Draft Survey Tool from the ship's deck



thousands of dollars to either the shipper or the cargo buyer.

For the fertilizer industry, where push barges are confined to tight quarters in places like the Mississippi River, the technology had to be adapted further.

The DST Lite is the 'little brother' of the DST and is a small and portable system,

about the size of a mobile phone, that allows inspectors to take measurements in spaces as small as one inch. This is particularly helpful for coal and fertilizer barges, given the close proximity. This device is connected to the inspector's cell phone and allows for the recording and the management of the data reading through an application.

The DST Lite was used in a pilot project for 18 months in the USA starting in 2018 and is now available worldwide. The modern technology is a solution to a 100-year-old problem. It offers more precise draft mark readings for the industry, makes the job easier and safer for surveyors and eliminates costly disputes. ■

Interview: Growing diversity in the fertilizer sector

For a long time the fertilizer industry has been a domain mainly occupied by a middle-aged or elderly male workforce - but this is changing. Each edition this year, Fertilizer Focus will chat to young fertilizer industry executives about their positions and outlooks for the future. In this edition we speak with Jessica Diffey, Commercial Strategy Manager, Anglo American, UK.

Fertilizer Focus (FF): Could you outline your background and the journey you took to your current position with Anglo American?

Jessica Diffey (JD): After completing my Psychology BSc degree, I began my first role as a trainee Information Analyst for the NHS. I spent five years developing my technical skills and working my way up to a Senior analyst. In 2017, I made the decision to move to the fertilizer industry and joined the Woodsmith Project as a Market Analyst. I have now been with the project for over four years,

currently in the role of the Commercial Strategy Manager within the Sales and Marketing team for the Crop Nutrients business.

(FF): What are the areas that you look after? And what does your role involve on a day-to-day basis?

(JD): The key role of a Commercial Strategy Manager is to support and develop regional market entry strategies to enable the successful delivery of our sustainable crop nutrition product, POLY4. There is a strong focus on customer, competitor, and market intelligence,

driving initiatives to optimise our route to market strategy and seeking opportunities to support the development of the Crop Nutrients business.

(FF): Did you choose the fertilizer industry or did the position at Anglo American just suit your experience?

(JD): I made the decision to change industries because I was looking for a new challenge. My first role in the company as a Market Analyst suited my existing skill set which provided a solid foundation. Joining the company also meant I had the opportunity to work on a project that is so important to the local area where I have grown up.

(FF): Although the picture seems to be changing, the fertilizer industry still has a reputation of being the preserve of old, grey haired (or bald!) men. What's been your experience?

(JD): To this day, women are underrepresented in mining and agriculture. Anglo American recognises that this imbalance needs to be addressed, and a more inclusive culture embedded, if we are to remain a successful and sustainable business in the long-term and attract the most talented individuals. As such, Anglo American promotes gender equality as part of company's commitment to human rights. As a woman currently working in this industry, I feel

supported and encouraged to fulfil my potential and seek out opportunities for continued growth in my career.

(FF): What is the most rewarding part of your job? And what part is the most difficult?

(JD): I think the most rewarding aspect of the job is having the opportunity to be part of a project that has sustainability at its heart. POLY4, our flagship product, is an environmentally friendly, low-carbon fertilizer. Through POLY4 we are able to support and promote sustainable fertilizer practices, which helps the world move towards a greener future.

I think the biggest challenge of the job is working with colleagues in multiple time zones. The Sales and Marketing Team is a global team with colleagues based around the world, including Brazil and North America, to China and SE Asia. Despite this, I

think I am hugely fortunate to have the opportunity to work with such a diverse mix of people from multiple cultures and backgrounds. Our global approach means we are able to attract the most talented individuals.

(FF): Would you recommend the fertilizer industry to other women? And if so, what makes it attractive?

(JD): Absolutely! We are seeing big changes in the fertilizer industry as a result of the transition towards more sustainable agriculture. It's really exciting time to be a part of the industry.


(FF): What advice would you give to women who are just starting or considering a career in the fertilizer industry?

(JD): There are lots of opportunities for women to take on a range of roles within the fertilizer industry depending on your interest, experience and background. Many positions require transferable skills so it's always worth reaching out to discuss potential opportunities. It would be great to see more and more women represented in the industry! ■


Jessica Diffey is a Commercial Strategy Manager for the Sales and Marketing Team in Anglo American's Crop Nutrients business. With over four years' experience in the fertilizer industry and a total of ten years within data analytics, Jess is responsible for driving initiatives to optimise the company's route to market strategy in Europe, North and South Americas. Born and bred in North Yorkshire England, Jess is excited to be a part of a project that is so close to her local community.




Jessica Diffey, Commercial Strategy Manager, Anglo American




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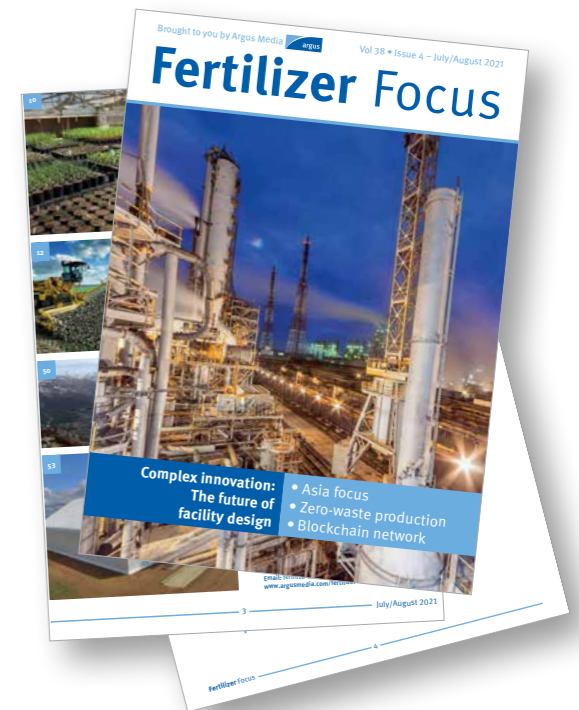
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Fertilizer Focus heritage

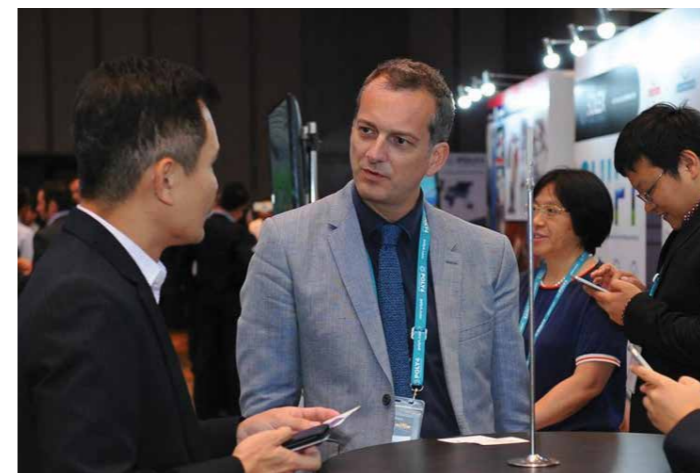
Argus produces the most comprehensive suite of pricing and market intelligence services available to the fertilizer industry

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:

- ▶ 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



Fertilizer Focus

Media pack 2022

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Fertilizer Focus

page 2

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Editorial schedule

January/February issue

Advertising due date - **3 December 2021**

SPECIAL FOCUS - INFRASTRUCTURE AND LOGISTICS

- ▶ Shipping crisis update
- ▶ Fertilizer storage innovation
- ▶ Supply chain risks

SUPPLEMENT - MIDDLE EAST

- ▶ Challenges and opportunities for Middle East fertilizer producers
- ▶ Sulphur production developments
- ▶ Profile of regional P and K sector

May/June issue

Advertising due date - **13 April 2022**

SPECIAL FOCUS - ADDED VALUE FERTILIZERS

- ▶ European biostimulant regulatory update
- ▶ Digital applications for fertilizers
- ▶ Emerging markets for AVFs

SUPPLEMENT - ASIA

- ▶ Trade routes in India
- ▶ China's fertilizer strategy and policy
- ▶ Improving ROI and crop yields in Asian crops

September/October issue

Advertising due date - **17 August 2022**

SPECIAL FOCUS - ENHANCED EFFICIENCY FERTILIZERS

- ▶ Enhanced efficiency market developments
- ▶ Seed treatment with microelements
- ▶ The developing market for water soluble fertilizers

SUPPLEMENT - EUROPE

- ▶ Supply and demand in key European markets
- ▶ European fertilizer regulation update
- ▶ Precision agriculture for improving crop yields in Europe

March/April issue

Advertising due date - **11 February 2022**

SPECIAL FOCUS - THE FERTILIZER ECONOMY

- ▶ Financial instruments in fertilizer trading
- ▶ Global fertilizer supply and demand
- ▶ Consolidation and acquisitions

SUPPLEMENT - AMERICAS

- ▶ Supply and demand in Brazil
- ▶ Trade routes in South and Central America
- ▶ Next generation farming

July/August issue

Advertising due date - **16 June 2022**

SPECIAL FOCUS - LOW AND ZERO CARBON AMMONIA

- ▶ Opportunities for nitrogen producers in new hydrogen markets
- ▶ Economics of low and zero carbon ammonia
- ▶ Regulatory environment for the development of low and zero carbon markets

SUPPLEMENT - AFRICA

- ▶ Fertilizer logistics in East Africa
- ▶ Finance options for the African fertilizer supply chain
- ▶ Agricultural transformation developments and strategies

November/December issue

Advertising due date - **7 October 2022**

SPECIAL FOCUS - FERTILIZER SUSTAINABILITY

- ▶ Role of organo-mineral fertilizers for plant nutrition
- ▶ The regulatory environment for improving fertilizer sustainability
- ▶ Measuring fertilizer producer ESG performance

SUPPLEMENT - INDIA

- ▶ Fertilizer transport and logistics
- ▶ The fertilizer subsidy programme in India
- ▶ India: Supply and demand



Distribution

Sector leading digital and hard copy distribution

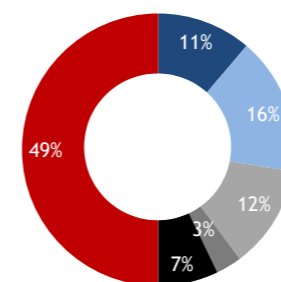
Published six times a year, the magazine is read by subscribers in over 90 countries. Fertilizer Focus has a unique, best in class distribution, benefiting from Argus' unrivaled presence in the fertilizer sector - **the digital circulation of the magazine in December 2021 was around 4500 and is growing substantially each month.** Around three quarters of our digital recipients are paying subscribers to Argus fertilizer market intelligence, news and analytics 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, plant contractors, government agencies and trade associations.

Our key magazine features are socialized to leading media platforms [facebook](#) [Twitter](#) [linkedin-in](#) [INSTAGRAM](#)

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

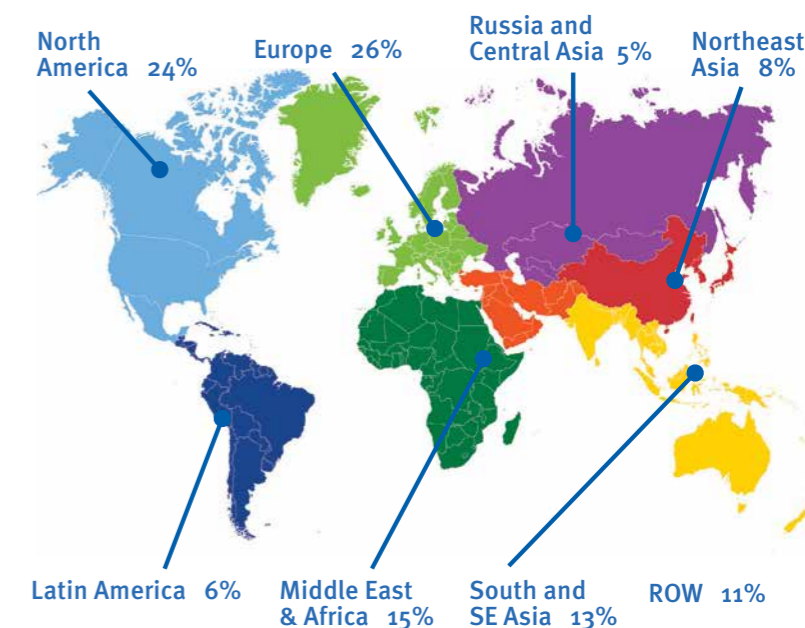
Fertilizer Focus is distributed to every one of the thousands of delegates attending Argus' fertilizer conferences around the world, and available at all of the major global and regional industry events.

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



Global and regional physical and digital industry events

- ▶ AFA Annual Fertilizer Forum & Exhibition, Egypt
- ▶ TFI Annual Meeting, USA
- ▶ Fertasa Annual Congress
- ▶ West Africa Fertilizer – Togo
- ▶ IFA Annual Conference
- ▶ Southwest Fertilizer, USA
- ▶ TFI World Fertilizer, USA
- ▶ IFA Crossroads
- ▶ FAI Annual Seminar, India

Argus events

- ▶ Fertilizer Latino Americano (FLA)
- ▶ Argus Asia Fertilizer
- ▶ Argus East Europe Fertilizer
- ▶ Argus Europe Fertilizer
- ▶ Argus Green Ammonia

Advertising rates 2022

Cover rates		
	EUR	USD
Outside front package	5,000	6,000
Inside front cover	3,000	3,740
Inside back cover	2,900	3,530
Outside back cover	3,360	4,080

Run of press rates	1 Issue		2 Issues (10% discount)		3 -5 Issues (20% discount)		6 Issues (30% discount)	
	EUR	USD	EUR	USD	EUR	USD	EUR	USD
Double page	5,320	6,460	4,790	5,748	4,250	5,100	3,720	4,464
Full page	2,600	3,120	2,340	2,808	2,080	2,496	1,820	2,184
Half page	2,200	2,640	1,980	2,376	1,760	2,112	1,540	1,848
Third page	1,550	1,860	1,395	1,674	1,240	1,488	1,085	1,302
Quarter page	1,450	1,740	1,305	1,566	1,160	1,392	1,015	1,218

For more details or to discuss our requirements please contact
Kate Shanley: Kate.Shanley@argusmedia.com



Advertising specifications

Editorial & advertising schedule 2022

Edition	Due date
January/February	3 December
March/April	11 February
Maj/June	13 April
July/August	16 June
September/October	17 August
November/December	7 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 more information, please contact:

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Kate.Shanley@argusmedia.com

Editorial :

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Stefan.Worsley@argusmedia.com

Oliver Hatfield

Oliver.Hatfield@argusmedia.com

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ISSN 2631-7591

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

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- 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 **Kate Shanley:**

kate.shanley@argusmedia.com

+44 (0) 7515 958 037

IN THE NEXT ISSUE...

SUPPLEMENT: AMERICAS

- Supply and demand in Brazil
- Trade routes in South and Central America
- Next generation farming

SPECIAL FOCUS: THE FERTILIZER ECONOMY

- Financial instruments in fertilizer trading
- Global fertilizer supply and demand
- Consolidation and acquisitions

Complimentary fertilizer market content from Argus

White papers | Production and trade flow maps | Webinars | Podcasts and Blogs | News



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Discover the Argus view on current and interesting market trends through our easy-to-digest podcast episodes and blog posts.



NEWS AND MARKET UPDATES

Keep your finger on the pulse of current market developments with a selection of the latest news articles from our global editorial team.



Argus' complimentary fertilizer market content is produced by our industry experts, and offers great insight into the market dynamics and outlooks for key fertilizer sectors.

Visit www.argusmedia.com/fertilizer to access our complimentary content.

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