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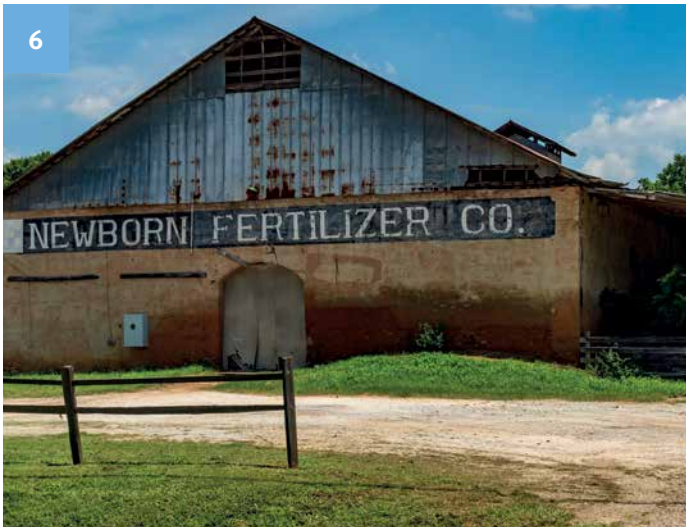

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All eyes on Asia

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

Welcome to the March/April 2024 edition of Fertilizer Focus! In this issue, Fertilizers Europe gives a forecast on food, farming and fertilizer use. As the world population continues to grow, the need for efficient and responsible use of natural resources becomes increasingly critical. When it comes to agriculture and food production, soil is the fundamental resource for farmers, supplying essential nutrients for plant growth.

In a related article, European Biostimulants Industry Council (EBIC) discusses the plight of solving climate related challenges through innovation. Climate change represents one of the greatest challenges for global food production, with its impact already being felt across agrifood systems worldwide. As temperatures rise and weather patterns become less predictable, the consequences for food security, agricultural livelihoods, and food system sustainability are profound and far-reaching.

We have a special focus section featuring a number of articles on Added Value Fertilizers (AVF). Firstly, the International Fertilizer Association (IFA) gives an assessment on the demand for special fertilizer products, which includes controlled-release fertilizers (CRF), stabilized-nitrogen fertilizers (SNF) and water-soluble fertilizers (WSF). The assessment covers 40 countries, collectively accounting for the majority of global consumption.

Meanwhile, FEECO documents ways in which the performance of fertilizers can be enhanced with additives and coatings. As technology has advanced, this market has become increasingly discerning, demanding high-quality products that meet their appearance, handling, and performance expectations.

In another article, Stamicarbon discusses the merits of smart urea. Urea is the most widely utilized nitrogen fertilizer, vital for increasing crop yields and using agricultural land more efficiently.

We also have a regional supplement on Asia. This supplement is a pre-cursor to the Argus Asia 2024 event, which will be held on 23-25 April 2024 in Abu Dhabi. Discover why sulphur is often referred to as the “fourth major crop nutrient”. Find out how fertilizer producers are adapting their product offerings to promote sustainable agriculture and ensure food security. And learn about the need for Asian fertilizer producers to know about the CBAM (carbon border adjustment mechanism) in Europe - why is it integral to the future success and international competitiveness of Asia’s fertilizer production and export business?

In this edition, we are also continuing the “History of the modern mineral fertilizer industry” series. In this instalment, Michael Freeman looks at the Fertilizer developments in the US and Germany.

I hope you enjoy the issue. ■

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History of the modern mineral fertilizer industry
Volume 2: 1900-1950 (Part 4)

Fertilizer developments in the US and Germany

In this fourth instalment of a six part series, Michael Freeman looks at the evolution of fertilizer capacities in both the US and Germany. (Please refer to all editions of Fertilizer Focus in 2022 for volume 1 covering the origins of the fertilizer industry)

World consumption of the three main fertilizer nutrients in 1950 was 15 mn t, made up of 4.2 mn t of N, 6.2 mn t of P_2O_5 and 4.6 mn t of K_2O. The distribution of demand by product and by region continued to reflect the way in which mineral fertilizer use had developed over the previous century. Thus phosphates still dominated the nutrient pattern when recorded as P_2O_5, but appear to be less important when shown in terms of the element P. Europe and North America remain the most important consuming regions, together accounting for more than three quarters of the 1950 total. The regions then described as "developing" or "under-developed" only consumed 5-6% of the total.

Over the next fifty years the consumption of mineral fertilizers underwent huge changes, reaching 200 mn t in 2000, the use of nitrogen expanded to become twice as important as either phosphates or potash, and the proportion of fertilizer consumption taking place in the global South grew to account for 63% of the world total, with China and India alone consuming 38% of the total.

Back in 1950, the United States was the biggest fertilizer user (30% of world total), followed by Germany (14%), USSR (8%), France (7%), UK (6%) and Japan (5%); the rest of the world accounted for 30% of the world total. The six big fertilizer consuming countries of that era are reviewed briefly in Table 1.

United States

The use of commercial fertilizers in the United States began in the middle of the 19th century, and had reached almost 400,000 short tons (st) nutrients by 1900. Phosphates, from US producers processing raw material mined in Florida and Tennessee, accounted for 60% of this total. Potash, the second major nutrient at this time, was almost entirely imported. Nitrogen in the third place, was mostly in the form of organic materials, including wastes from the meat processing industry. Other sources of nitrogen were sodium nitrate imported from Chile and small quantities of ammonium sulphate by-product from coke ovens.

Over the next fifty years, US consumption of nutrients in commercial fertilizers grew at an average annual rate of almost 5% - higher for N and K_2O and a little lower for P_2O_5 which was already well established by the start of the period. The experience of two world wars exposed the challenges of being dependent on foreign supplies of fertilizers, and US companies were encouraged to build synthetic nitrogen plants by adopting the technology developed in Europe, and also to begin exploiting domestic reserves of potash minerals. The availability of fertilizer products from these new sources helped to boost the use of N and K_2O, each of which reached 1 mn st in 1950, by which time P_2O_5 was close to 2 mn st.

A survey of the US fertilizer industry published in 1916 provides an account of the situation as it was just before the outbreak of WWI that included an estimate of the volumes of different fertilizer products consumed in 1913. P fertilizers, in the form of single superphosphate, were the biggest category, followed by potash fertilizers, mostly potassium chloride and lower-grade manure salts. The nitrogen fertilizers were equally divided between inorganic products, i.e. ammonium sulphate and sodium nitrate, and organic waste materials that contained nitrogen. Some 80% of these products were delivered to users as mixed goods, produced

Table 1. Fertilizer nutrient consumption in selected countries and years

	1913	1937[a]	1946/47	1950/51
USA	816	1,414	3,066	4,505
Germany	1,230	1,885	1,100	2,082
Russia/USSR	40	569	400[b]	1,261
France	419	746	861	1,064
UK	233[c]	291	562	829
Japan		569	368	773

Notes: a: average of 1936-1938, b: author's estimate, c: includes Ireland
Sources: USDA, NarKhoz, FAO

Table 2. US consumption of fertilizer nutrients ('ooo short tons)

	1900	1910	1920	1930	1940	1950
N	62	146	228	377	419	1,005
P_2O_5	246	499	660	793	912	1,950
K_2O	86	211	258	354	435	1,103
TOTAL	**394**	**856**	**1,146**	**1,295**	**1,766**	**4,058**

Source: USDA

Table 3. Regional distribution of US fertilizer mixing units in 1913

West	Midwest	Northeast	South
40 (3%)	90 (8%)	137 (12%)	914 (77%)

Source: US FTC Report on the Fertilizer Industry - 1916

Table 4. United States estimated consumption of commercial fertilizer products in 1913 ('ooo short tons)

	product	nutrient		product	nutrient
Sodium nitrate	260	38	Superphosphate	4,000	640
Ammonium sulphate	130	27	**TOTAL P_2O_5**	**4,000**	**640**
Calcium cyanamide	15	2			
subtotal	**445**	**67**	Potassium chloride	202	102
High-grade tankage	210	18	Potassium sulphate	33	16
Concentrated tankage	18	2	Manure salts 30	12	4
Dried blood	40	6	Double manure . salts	15	4
Dried fish scrap	50	5	Manure salts 20	197	39
Cottonseed meal	600	37	Hartsalz	38	6
subtotal	**918**	**67**	Kainit	446	55
TOTAL N	**1,364**	**135**	**TOTAL K_2O**	**903**	**226**

Source: US FTC Report on Fertilizer Industry - 1916

by some 800 businesses operating almost 1,200 production units, of which 256 were wet mixers making superphosphate, and the rest were classified as dry mixers. These units were distributed across the country, but the majority were in the South, especially the South Atlantic states, notably Georgia and Alabama, the main centres of agriculture at that time. Seven companies accounted for 58% of the total tonnage of mixed fertilizers sold in 1913; the two biggest – Virginia-Carolina Chemical Co. and American Agricultural Chemical Co. each sold more than 1 mn st and these two supplied one third of the total market.

An abandoned fertilizer plant in Newborn, Georgia, USA

US expansion

Superphosphate was produced in 256 plants, almost all of which also had NPK mixing capacity. The seven largest producers, who accounted for 46% of total SSP sales in 1913 were Virginia-Carolina Chemical Co, American Agricultural Chemical Co. (AAC), International Agricultural Co., Armour Fertilizer Works, Swift & Co., FS Royster Guano Co. and Baugh & Sons Co. Most of the big SSP producers were also involved in mining phosphate rock in Florida and Tennessee, and were generally self-sufficient in the supply of this raw material, having access to enough reserves to support the expansion of their SSP output.

Potash was supplied to US mixers by the German syndicate, but in 1909 a new German exporter signed a two-year contract with AAC at prices that were 25-38% below the Syndicate's levels. Schmidtmann, the new supplier, who controlled two mines that were outside the Syndicate, went on to sign up other big potash buyers giving him a 90% share of the US import market. This was unacceptable to the German government which forced the renegade mines to join the Syndicate and the contracts were renegotiated to bring the prices into line with Syndicate levels. When supplies from Germany were cut off in WW1, American Trona Co. began to recover potassium chloride from Searles Lake CA. In addition there were more than 100 small operations working brines or processing wood ash, but the total quantity was not enough to replace the German tonnage. A big increase in US potash output only became possible in the 1930 when mining of potash salts started in New Mexico. Domestic sales by the US industry started to exceed imports in the second half of the 1930s.

Ammonia capacities

In 1916 the US Government's National Defense Act authorised the President to investigate the best means of producing nitrates for munitions and fertilizers. Three small experimental units were built to test different processes and work on two more was cancelled in 1918. The initiative for establishing an ammonia industry passed to the private sector and by the end of the 1930s US ammonia capacity was 390,000 st/y NH_3, comprising two big plants built by Allied Chemical at Hopewell VA and Du Pont at Belle WV plus a handful of small units. There had not been a rush by the fertilizer industry to invest in the new technology and much of the early construction was driven by the needs of industrial users. This became evident at the start of WWII when the US Government, responding the need to expand output of munitions, commissioned the construction of ten new plants that tripled the available capacity to produce ammonia for industrial and agricultural applications. After the war, when the manufacture of munitions was scaled back, most of the new ammonia plants were sold or leased to private sector operators who moved into fertilizer production.

Despite the exigencies of the War, enough mineral fertilizers were available in the US to support a strong increase in consumption between 1939 and 1945 (+947 kst nutrients) and this growth continued in the post-War era adding 1.3mn st to the consumption total during the five years to 1950. Phosphate remained the most important nutrient, but the $N:P_2O_5:K_2O$ ratio became more balanced in this period going from 0.46:1.00:0.48 in 1939 to 0.52:1.00:0.57 in 1950. As the Green Revolution progressed over the following decades, US nitrogen fertilizer use continued to grow strongly so that it had overtaken phosphate by 1960, when the nutrient ratio was 1.07:1.00:0.84, and by the end of the century US farmers were using three times more nitrogen than phosphate or potash.

Germany

The main mineral fertilizers consumed in Germany in the early years of the 20th century were SP made with imported phosphate rock, sodium nitrate imported from Chile, basic slag and ammonium sulphate, both industrial by-products, and potash fertilizers from the mines in Germany. Fertilizer consumption statistics are rare for this period and the data reported for 1913/14 totalling 1.23 mn t nutrients, dominated by P_2O_5 and K_2O, probably represented the pre-war peak. Nitrogen, which was relatively unimportant at this time, was mostly consumed in the form of Chile nitrate and of AS from domestic and foreign coke ovens.

The first capacities for fixed nitrogen in Germany were the CCN plants at Knapsack and Trostberg, which added a few thousand tonnes to fertilizer supply when they started regular production in 1907/08. Meanwhile Fritz Haber had been developing a process for making ammonia that, in collaboration with Carl Bosch, he was able to bring to fruition in 1913. When Germany was cut off from Chile's nitrate exports during WWI, it was able to turn to these options for synthesising nitrogen compounds to supply the needs of agriculture and, no less importantly, the munitions industry. BASF built the first Haber-Bosch plant at Oppau in 1913 with an initial capacity of 20 t/d that was quickly expanded during the war years to 250 t/d. Its second ammonia plant at Leuna, near Merseburg, came on stream in April 1917 and was expanded over the next 18 months to 400 t/d. At this point in 1918 Germany was the only country in the world with industrial-scale capacity for making ammonia by fixing nitrogen, and it remained the centre of the world's biggest concentration of ammonia capacity for the following two decades, only to be overtaken when the United States carried out an emergency programme of ammonia plant construction in WWII.

After 1918 fertilizer nutrient consumption in Germany recovered quickly to reach the pre-war level by the early-1920s, but with a change in the nutrient balance: higher levels of nitrogen and potash use, but a temporary fallback in phosphates. The new synthetic ammonia industry made possible the production of a wide range of N fertilizers to supplement the by-product AS and replace most of the Chile nitrate that had been the consumption staples before the War. Basic slag had become the main phosphate fertilizer during the war years when SP manufacture had been depressed by the collapse of rock imports, and it remained an important source of P_2O_5 in the inter-war years. Germany was the only country where the consumption of basic slag exceeded that of SP. The highly effective promotion of its potash fertilizers conducted by the Potash Syndicate helped K_2O consumption to double between 1920 and 1940, so that Germany remained the world's biggest consumer of this nutrient. The principal potash products were the so-called Kali Dünger Salze, in particular the 40% K_2O salt.

Table 5. US ammonia industry capacity during WWII (ks.tons/y NH_3)

	Government	Allied Chem.	Du Pont	Others	TOTAL
1940	-	208	139	42	390
1945	800	208	169	54	1,291

Source: US FTC Report on the Fertilizer Industry – 1950

Table 6. German fertilizer nutrient consumption 1913/14-1950/51 ('000t)

	1913/14	1921	1930/31	1940/41	1950/51	*BRD*	*DDR*
N	185	256	339	676	555	*362*	*193*
P_2O_5	555	298	548	360	494	*418*	*76*
K_2O	490	721	776	1,366	1,025	*659*	*366*
TOTAL	**1,230**	**1,275**	**1,663**	**2,401**	**2,074**	***1,438***	***635***

Sources: Statistiches Jahrbuch, USDC Trade Information Bulletin no.753

Consolidation of ownership

After the end of WWI, Germany found itself with a surplus of production capacity for superphosphates and for potash salts, due to over-enthusiastic investment in the pre-war years and the collapse of SP production during the War. The immediate post-war years saw the foundation of Deutsche Superphosphate-Industrie GmbH and of Deutsche Stickstoff-Syndikat GmbH, as well as the re-establishment of the pre-war Deutsches Kalisyndikat GmbH. All three were designed to represent the interests of their respective fertilizer industry sectors and to coordinate their members' prices and sales within the German market. The potash and nitrogen cartels were more ambitious, looking to negotiate with foreign producers to stabilize the international markets for their products, in which the German producers were the dominant players.

There were seventy SP plants in the pre-war period when German production of this fertilizer peaked at 1.8mn t. It collapsed during the war years and afterwards crept back up to 600,000-700,000 t/y by the mid-1920s, by which time the number of active SP plants had been reduced to forty, as a result of the closure of mostly smaller units. There was also some consolidation of ownership and the construction of new plants to replace obsolete capacity.

The German potash industry had a huge surplus of capacity in the form of 221 shafts in 1921 when the government issued a decree that all unproductive shafts should be closed for a period of twenty years. The potash syndicate implemented the government instruction, negotiating the

Demand grew steadily until the outbreak of the war

closure of 120 shafts and designating another forty to be set aside as reserve capacity, leaving some sixty shafts operating as productive capacity, and the industry's average operating rate moved up to 90%. The demand for potash fertilizers in Germany was affected by the slump, but in general the industry was in good shape, allowing the syndicate to turn its attention to setting up agreements with new producers in foreign countries.

The 'Nitrogen Syndicate'

The German nitrogen cartel brought together the interests of the sole ammonia producer at that time, i.e. BASF, the two companies producing CCN in Germany and the group of coke producers that recovered AS, most of whom were represented by Deutsche Ammoniaks Verkaufs Vereiniging (DAVV). It faced a different problem from the other two fertilizer cartels in that it did not inherit a capacity surplus from the pre-war era, but it did anticipate the emergence of strong interest in investing in the new ammonia technology and the option of expanding the range of other N fertilizer products. The main player in Germany was BASF, later absorbed into IG Farben, which had built the first ammonia capacity employing the Haber-Bosch process at two sites, expanding it from around 250,000 t/y N in 1918 to 800,000 t/y N in 1934. Meanwhile other German companies showed interest in building ammonia plants, using the processes developed by Mont Cenis (Uhde), Casale and Nitrogen Engineering Corp.; the resulting capacity was controlled by the Nitrogen Syndicate. The situation of the cartel in 1930 is shown in the accompanying table.

Table 7. German nitrogen syndicate's capacity in 1930

		Capy KtN/y	% Share of total	Ammonia process	N Fertilizer products
IG Farben[a]	Merseburg	625	54	Haber	NH_3, AS, CN
IG Farben[a]	Oppau	125	11	Haber	Various
Norsk Hydro, Norway	Notrodden	90	8	Haber	CN, AN, SN, CAN
DAVV[b]					
• Gasverarbeitungs	Sodingen	55c	4.5	M.Cenis	NH_3, AS, AN, ASN
• Ruhrchemie	Oberhausen	35	3	Casale	NH_3, AS, NH_4Cl
• Bergwerks AG Recklingshausen	Scholven[d]	20	1.5	Mont Cenis	
• Gewerk. Ewald	Herten	e	0	NEC	NH_3, AS
• Stickstoffwerke	Waldenberg[f]	e	0	NEC	NH_3, AS
Bayerische Stickstoffwerke	Trostberg	55	9.5		CCN
	Piesteritz	35			CCN
AG für Stickstoffdünger	Knapsack	22.5			CCN
Synthetic N Total		**1062.5**	**91**		
DAVV[b]		90			NH_3, AS
Oberkoks		6			NH_3, AS
Gaskoks Syndikat		6			NH_3, AS
By-Product N Total		**102**	**9**		
GRAND TOTAL		**1,164.5**	**100**		

Source: USDC Trade Information Bulletin no.753
a: NH3 from these plants was also sent to other IG Farben plants to make various N fertilizers
b: Deutsche Ammoniak Verkaufs Vereinigung (DAVV)
c: leased by IG Farben in July 1930 and shut down in January 1931
d: Scholven capacity due to be expanded to 30 ktN/y in 1931/2
e: Ewald (20 ktN/y) and Stickstoffwerke (22.5 ktN/y) were admitted to the Syndicate later in 1930
f: Waldenburg is Wałbrych in modern Poland

Only Gewerkschaft Victor, in which the potash industry (Wintershall) was a shareholder, declined to join the syndicate when it commissioned a small ammonia plant employing the Claude process in 1928.

The total capacity of 1.1 mn t/y N (excluding the Norwegian plant) compares with an estimated production level of 680,000 t N of which 417,000 t were consumed in Germany and the rest exported. The economic crisis that emerged at the end of the 1920s had a negative impact on fertilizer use for a couple of years. In 1933 the German government passed a Compulsory Cartel Law that required industry cartel groupings to include all producers, which meant that Victor had to join the Nitrogen Syndicate. Among other measures to support the nitrogen sector, the government banned the construction of new capacity until the capacity surplus was eliminated.

The general fertilizer situation stabilized and demand grew steadily until the outbreak of war at the end of the decade. During the war years the German SP industry was again forced to cut back, but the supply of nitrogen and potash was maintained until 1945 when the situation deteriorated. The Allies supported the reinstatement of fertilizer supply to support food production, so that by 1950/51 nutrient use in what had become the two German states reached 2.1 mn t, not far short of the pre-war peak. ■

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Forecast on food, farming and fertilizer use

Written by

Cecilia Dardes, *Agriculture and Environment Manager,* ***Fertilizers Europe, Belgium***

Mineral fertilizers play a crucial role in our daily lives - they enhance soil fertility and supply plants with the essential nutrients needed to allow farmers to grow high-quality crops and bring food to European tables.

In 2022, mineral fertilizer demand suffered from the worst drop since 2008 putting European food security and strategic autonomy at the centre of the discussion. Despite some normalization forecasted in the long run, the situation remains volatile, and the industry still faces short term challenges.

Fertilizer consumption in EU27

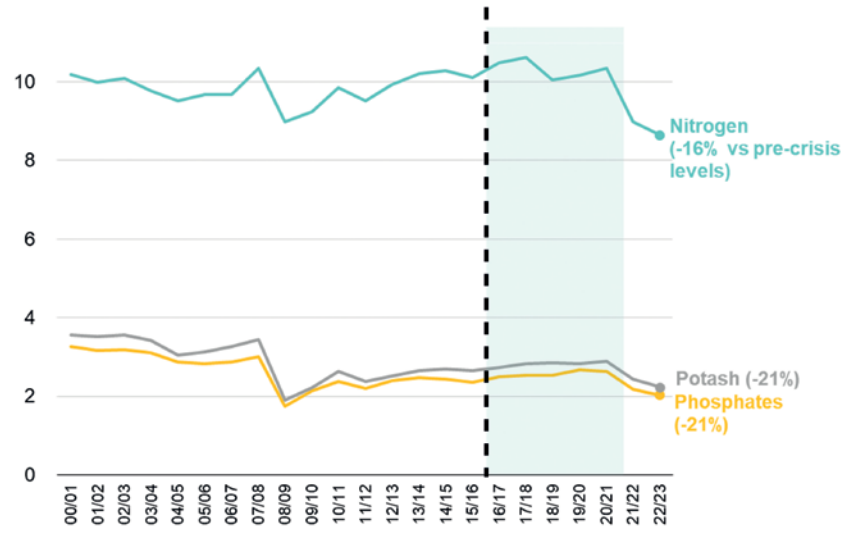
As the world population continues to grow, the need for efficient and responsible use of natural resources becomes increasingly critical. When it comes to agriculture and food production, soil is the fundamental resource for farmers, supplying essential nutrients for plant growth. The quality of the soil and the availability of nutrients are critical factors for agricultural productivity. Therefore, the EU's strategic autonomy in food production relies on the availability and affordability of fertilizers.

Currently, on European crop soils, a combination of 9.3 mn t of nitrogen (N), 2.3 mn t of phosphate (P), and 2.5 mn t of potash (K) from mineral fertilizers are applied on 123.8 mn hectares of farmland, with 38 mn cultivable hectares not fertilized.

In 2022, due to the energy crisis that followed the Russian invasion of Ukraine, demand for nitrogen fertilizers dropped by 16%, compared with pre-crisis levels ,while phosphate and potash consumption was reduced by 21%. Despite a normalization forecasted in the long term, it remains very difficult to predict short term trends due to the many uncertainties linked to the war in Ukraine.

After the 2008 economic downturn, the use of mineral fertilizers in Europe has remained stabilized. However, consideration of the economic outlook and anticipated Europe's cropping area, led experts to expect changes in annual fertilizer consumption by 2032/33. In the 10-year forecast, nitrogen will experience the steepest downturn, reaching 9.2 mn t of usage (-2% compared to the average of the last three growing seasons). Phosphate and potash will continue remaining below the levels recorded prior to the 2008 economic downturn, reaching 2.4 and 2.6 mn t of usage respectively.

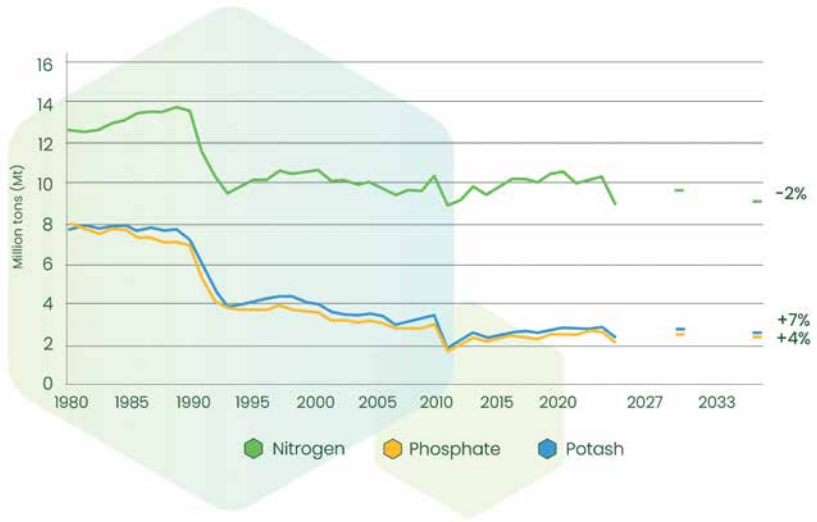
Figure 1. EU Fertilizer demand (mn t of nutrients)



Source: Fertilizers Europe

Mineral fertilizer consumption is characterized by significant differences across Europe

Figure 2. Mineral nutrient consumption in EU-27



The main drivers behind such a reduction include climate change, the increase of extreme weather events and the tightening of environmental measures aimed at reducing the environmental impact of agriculture (in line with the EU's Green Deal objectives and the related farm-to-fork strategy). Such restrictions are expected, on one hand, to directly limit fertilizer use, but on the other hand, they will have an indirect impact via changes in crop rotation and a shift between farming systems.

The increase in the frequency of extreme weather events is increasing the negative impact on agricultural productivity in specific European regions and therefore affects fertilizer use, with only a few regions taking agronomic profit from enlarged growing seasons due to climate change.

Changes in regional fertilizer use

Mineral fertilizer consumption is characterized by significant differences across the European territory. This is mainly linked to the substantial differences in the number of animals registered in European Countries. Critical N inputs are most strongly exceeded in regions with high livestock density, such as Ireland, the Netherlands, Belgium, Luxembourg, Brittany in France and the Po valley in Italy. Inversely, required N inputs to attain target crop yields are approximately 40% higher than current N inputs. In Eastern Europe, for example, there is a large potential to increase yields by increasing N fertilization, but this generally requires significantly improved N management, since critical N inputs are mostly lower.

In the 10-year forecast, increased or stable consumption of nitrogen is foreseen in half of the Eastern and Central European Member States (EU-13), while significant decreases are expected in the Western European Union countries (EU14). The biggest drops are expected in Italy, Ireland and the Netherlands. Among the main drivers, and in addition to national policies aimed at incentivizing a more efficient use of fertilizers, there are changing weather conditions and economic factors linked to the affordability of fertilizers.

For nitrogen, an average of -2% decrease is expected in both Central-Eastern and Western European countries. Phosphate consumption is expected to increase by 10% in Western European Countries and by 2% in Central-Eastern European countries.

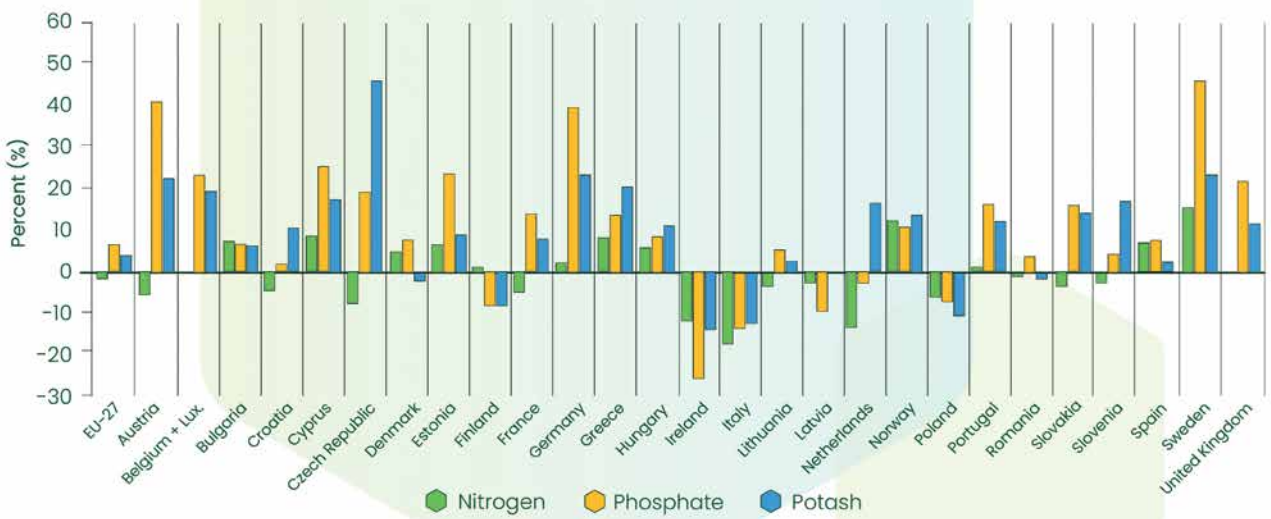
Organic nutrients availability in Europe

The objective of balanced fertilization is to ensure that the plant has access to an adequate supply of each nutrient at every growth stage to avoid any over supply or under supply. This enables crops to ensure a strong crop growth while reducing losses to the environment. An effective plant nutrition strategy must include inputs coming from both mineral and organic sources, which have to be viewed as complementary to each other.

Similarly with mineral fertilizers, the availability of organic inputs also varies significantly across the European territory depending on the differences in livestock distribution throughout the EU.

Higher availability is registered in Western European countries, with France, Germany, Spain and the United Kingdom confirming a higher level of consumption. Limited availability is registered in Eastern and Central European countries, where in 2022 1.7 mn t of nitrogen, 918 000 t of phosphate, and 1.9 mn t of potash from organic sources were consumed, compared with 6.7 mn t of nitrogen,

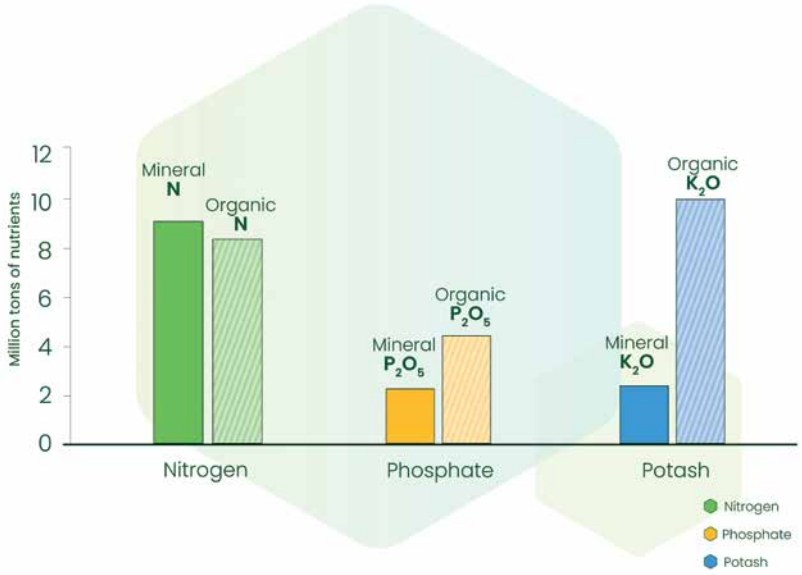
Figure 3. Changes in regional fertilizer use by 2033



3.5 mn t of phosphate and 8 mn t of potash from organic sources applied in Western European countries.

More than 50% of nutrients applied to European crop soils currently come from organic sources, with manure being the most exploited waste stream. Over the last 10 years, organic nutrient consumption has remained stable. In 2022 8.4 mn t of organic livestock-derived nitrogen, 4.5 mn t of organic livestock-derived phosphate and 9.9 mn t of organic livestock-derived potash were applied to European crop soils.

Figure 4. Mineral and organic nutrient consumption in 2022



Boosting sustainable nutrient management in Europe

The best fertilization practice is to use mineral and organic fertilizers in a complementary manner as they both play a crucial role in providing essential nutrients to crops and improving soil fertility. Precise fertilization and sustainable farming can make use of both mineral and organic fertilizers. At the same time, the fertilizer industry can make use of by-products and residues to use as raw materials for the production of mineral fertilizers with a balanced nutrient content. This allows fertilizers to also contribute effectively to the closing of nutrient cycles.

Precision fertilization, in combination with the promotion of advisory services aimed at ensuring optimized applications of fertilizers at farm level and new products formulations aimed at maximizing nitrogen use efficiency and reduce environmental emissions, represent the best ways to meet crop nutrient requirements. This strategy also helps to increase effectiveness and reduce nitrogen and phosphorus losses by 50%. ■

Weathering change

Solving climate related challenges through innovation

Written by

Sharon Kennett, *Communications,* ***Prospero & Partners, UK,***
on behalf of the ***European Biostimulants Industry Council (EBIC)***

Climate change represents one of the greatest challenges for global food production, with its impact already being felt across agrifood systems worldwide. As temperatures rise and weather patterns become less predictable, the consequences for food security, agricultural livelihoods, and food system sustainability are profound and far-reaching.

Extreme weather events such as drought and flooding are happening more often and with greater severity. Global temperatures continue to rise, with a recent announcement from the EU's climate service confirming that global warming has exceeded 1.5°C across an entire year from February 2023 to January 2024. Drought conditions have a significant impact on crop production, with plants succumbing to abiotic stress and irrigation systems unable to cope. The Spanish olive harvest in 2023 was a case in point: the Agricultural Ministry confirmed that a second year of drought amid record temperatures had reduced the four-year rolling average yield by a third and, in some regions, the total harvest was estimated at 40% below average.

Parts of Europe have suffered just as much with excessive rainfall. Greece, for example, suffered torrential rain leading to severe flooding in autumn 2023. This level of water decimates crops and erodes topsoil, causing further long-term issues for farm productivity. Much of northern France and southern Belgium has been under water since October with important disruptions to sugar beet harvest and winter wheat production in the area.

The European Environment Agency (EEA)'s 2019 report on climate change adaptation in the agriculture sector in Europe includes a high-end emission scenario which projects a 50% reduction in yield of non-irrigated

crops by 2050 and a reduction in farmland economic values of over 80% by 2100. This bleak outlook highlights the urgent need for solutions.

So how can farmers mitigate the challenges posed by climate change? Greater moves toward sustainable, regenerative farming will make a difference over time, but for more immediate respite many plant biostimulants support soil and plant resilience and improve crops' tolerance to and recovery from abiotic stress.

Sustainable food systems

Speaking at a recent climate change webinar held by the European Biostimulants Industry Council (EBIC), Carlos Rodríguez-Villa Förster, EBIC Vice President, said that crop losses due to abiotic stress dwarf those caused by pests and disease. "It is vital that we build resilient, sustainable food systems and plant biostimulants are part of the solution. They have a positive impact on nutrient use efficiency and abiotic stress resistance, both of which can contribute to climate adaptation for farmers. We see biostimulants not as a standalone solution but as part of a broader toolbox that farmers can use."

EBIC has long highlighted the need for farmers to have a diverse set of tools to help them meet the growing challenge of food security impacted by climate change. EBIC argues that the EU needs to get better at ensuring that agrifood innovations reach farmers. It says that whilst the Fertilising Products Regulation now recognises plant biostimulants, there are a number of biostimulant technologies that do not yet have access to the Single Market, for example most of those derived from micro-organisms or animal by-products. This creates an uneven playing field for famers from different countries, with hundreds of crop solutions stuck in regulatory pipelines rather than being available to farmers. This needs to change urgently.

Speaking in the same webinar, Jens Boyen, Plant Health Attaché, Food Safety, Foodstuffs, Animal Health,

(left) Climate change causes issues for crop production; *(above)* EBIC Summit brings together stakeholders across the food supply chain

Plant Health and Cosmetics at the Permanent Representation of Belgium to the European Union, agreed that policy actions are essential to help farmers adapt to climate change. He said this would provide the necessary resources, support, and incentives for them to implement strategies that enhance the resilience and sustainability of the food system, ultimately ensuring food security for the growing global population. During his presentation he highlighted biostimulants as one of eight adaption measures, alongside soil health, irrigation, water management, new genomic techniques, development of adapted crop varieties, effective pest control and biocontrol.

Biostimulant technologies

The adoption of plant biostimulants by farmers is growing, with the global market valued at more than USD3 bn in 2022 and predicted to triple over the next ten years (Future Market Insights, 2023). This market growth is attributed to the greater understanding that farmers have of the contribution plant biostimulants can make to improvements in crop productivity, soil health and climate change mitigation.

Felipe Cortines, speaking from a farmer's perspective in EBIC's climate change webinar, shared his interest in biostimulants. With increasingly regular extreme weather events in his home country of Spain, he believes that biostimulant technologies can help. He highlighted the need for farmers to have more knowledge and training on how to use biostimulants, in terms of timing of application for instance, to make the best use of them. He also reiterated the request for policymakers to ensure flexibility for farmers at national and local level, giving them access to innovative solutions to enable them to continue farming sustainably.

Plant biostimulants help mitigate climate challenges in several ways. First, they increase root biomass, allowing increased uptake of water and nutrients, which are then assimilated more quickly. Some types of plant biostimulants protect plant physiological processes, building resilience to abiotic stress and enabling a quicker recovery, whilst others improve soil health, structure and the ability to hold water. As Carlos Rodriguez-Villa Förster points out, "We don't know what the weather is going to offer us each season. Plant

biostimulants can act as an insurance against extreme weather situations by improving our soils, protecting our crops, and helping maintain yield in adverse conditions. And even if conditions are favourable, farmers can still see a return on investment because plant biostimulants support a healthy crop too."

In the panel discussion at EBIC's climate change webinar, a recurring theme was the need for collaboration. The plant biostimulants industry is seen as a solution provider and a source of innovative new ideas to deliver a more sustainable future for agriculture. During the discussion, Lisa Boulton, Ocean Regeneration Lead at Nestle Purina PetCare Europe, shared a specific project the company has spearheaded with other agri-food chain actors to further explore the potential of seaweed-based biostimulants to support ocean regeneration and regenerative agriculture more broadly. She highlighted the importance of continuing to generate data and information on the benefits of biostimulants, as well as the need for collaboration right across the agri-food chain.

Freedom to choose

One of the stated pillars of the EBIC strategy is to help create a level playing field for all biostimulants manufacturers in Europe. As Kristen Sukalac, Consulting Partner at Prospero & Partners, which manages and provides strategic consulting to the EBIC secretariat of which she is the Permanent Representative, explains: "There is often a gap between the EU's intention to improve food system resilience and the practical aspects of regulations. Whilst the application of the FPR (Fertilizing Products Regulation) was a key milestone for the biostimulants industry, it has not provided farmers with access to many innovative, but more complex products. There are many plant biostimulants that are proven to help crops tolerate abiotic stress more easily that are not currently covered by the FPR. We are still looking for policy and regulatory coherence that provides an enabling framework for agricultural innovation."

Farmers protest in Brussels in February 2024

The European Commission has recently launched its Strategic Dialogue on the Future of Agriculture, which aims to ensure farmers are fully equipped to safeguard European food security, sustainability and competitiveness. EBIC is striving to ensure that the voice of the plant biostimulants industry is heard during this process. "Supporting innovation is essential for a resilient agricultural sector," says Kristen Sukalac. "Farmers need access to a broad toolbox and the freedom to choose the inputs they believe will best deliver yield in their specific conditions. EBIC believes that the EU could have a competitive advantage when it comes to farmers' ability to adapt their practices, but it will only be possible with an enabling framework." ■

EBIC's 2024 Stakeholder Summit

One of the aims of the Strategic Dialogue is de-polarising debates around agriculture. To that end, partnership and collaboration will be at the centre of EBIC's 2024 Stakeholder Summit. This year's theme is 'Opportunities for more resilient food systems in the face of volatility,' with sessions on 'Ensuring food security and quality in times of turbulence' and 'Supporting farmers in times of turbulence.' In addition to a wide range of high-level speakers from across many agrifood value chain actors and stakeholder groups, the Summit will feature case studies showing how biostimulants are being incorporated into value chains to help them become more sustainable.

The challenges posed by climate change to food production may feel daunting, but they are not insurmountable. With concerted effort, innovation, and global cooperation across the food supply chain and with regulators, we can adapt our food systems to be more resilient and sustainable. In this way we can make sure they can withstand the impacts of climate change and continue to feed the growing global population.

Learn more at ***www.ebicsummit.com***

News in brief

NORTH AMERICA

Nutrien Reports Fourth Quarter and Full-Year 2023 Results

Nutrien Ltd. has announced its fourth quarter 2023 results, with net earnings of USD176 mn (USD0.35 diluted net earnings per share). Fourth quarter 2023 adjusted net earnings per share1 was USD0.37 and adjusted EBITDA1 was USD1.1 bn.

“We saw a continuation of strong fertilizer market fundamentals in North America during the fourth quarter driven by improved affordability, an extended fall application season and low channel inventories. Utilizing the strengths of our integrated business, we achieved record fourth-quarter potash deliveries, increased crop nutrient sales volumes across our global Retail network and generated strong cash flow from operations,” commented Ken Seitz, Nutrien’s President and CEO.

“As we look ahead to 2024, we expect to deliver higher fertilizer sales volumes and Retail earnings, supported by increased crop input market stability and demand. We continue to prioritize strategic initiatives that enhance our capability to serve growers in our core markets, maintain the low-cost position and reliability of our assets, and position the Company for growth,” added Mr. Seitz.

Canadian developer gets USD95mn loan for green H_2 plant

The Canadian government's export credit agency Export Development Canada (EDC) has agreed to loan CAD128mn (USD95mn) to project developer World Energy GH2 for a planned renewable hydrogen and ammonia production facility on the country's east coast.

A credit facility agreement between the two entities will support the development of project Nujio'qonik through to "its financial close of its long-term financing", World Energy GH2 said.

The project is expected to produce around 400,000 t/yr of ammonia from wind power in a first phase that is due to start next year. World Energy GH2 plans to eventually produce around 210,000 t/yr of hydrogen, or about 1.2mn t/yr of ammonia, in Newfoundland and Labrador for exports to Germany and other countries, although some supply could be used domestically as well.

The government's funding support will advance Canada's "commitments under the Canada-Germany Hydrogen Alliance" signed in Stephenville in August 2022, said minister of energy and natural resources Jonathan Wilkinson.

Some funding for Nujio'qonik's first phase will also come from South Korean energy firm SK Ecoplant which last year announced a USD50mn investment.

Fellow developer EverWind last year also secured a loan from EDC for a renewable hydrogen and ammonia production project in Nova Scotia.

SOUTH AMERICA

Petrobras, Yara eye new fertilizer frontiers

Brazilian state-controlled oil company Petrobras and Norway-based global fertilizer producer Yara signed a preliminary agreement on Wednesday to study new fertilizer initiatives in Brazil.

The companies will consider new business partnerships, especially to produce industrial products and decarbonize operations, they said.

The memorandum of understanding allows the companies to define specific terms in the future. The agreement is in line with Petrobras' 2024-28 strategic plan, which seeks to accelerate energy transition and invest in fertilizer production.

Petrobras signed a tolling contract with Brazilian petrochemicals group Unigel in January, enabling nitrogen-based production at Unigel's units in Sergipe and Bahia states.

MIDDLE-EAST

thyssenkrupp Uhde signs agreement with Delta Company for Fertilizer and Chemical Industries to recommission an ammonia plant in Dakahlia, Egypt

thyssenkrupp Uhde Egypt has signed a contract with Egypt-based Delta Company for Fertilizer and Chemical Industries to revamp an existing ammonia plant complex located in Dakahlia, Talkha, Egypt. Delta focuses mainly on sustainable and environmentally friendly fertilizer projects in the Arab fertilizer industry.

Responsible for the front-end-engineering-design (FEED), thyssenkrupp Uhde will provide engineering solutions for the revamp of the ammonia plant as well as the ammonia offsite and central utility units. The company will also supply its state-of-the-art technology for the production of ammonia and urea: the uhde ammonia technology.

The uhde ammonia technology is a world-leading technology that has been successfully implemented in more than 120 plants worldwide. Together with the FEED solution, this technology will enable the plant to be re-commissioned after a three-year shutdown, while at the same time increasing the plant’s capacity from 1275 to 1400 t of ammonia per day.

Thomas Kufahl, CEO of thyssenkrupp Uhde in Egypt: "We are very proud to have been selected as the partner to execute this project and enable the re-commissioning of the ammonia plant together with a capacity increase. Our proven uhde ammonia technology and our innovative engineering solutions guarantee the production of high-quality ammonia and urea worldwide."

Delta's ammonia plant recommissioning project is in line with the vision held by the Egyptian government and will provide significant impetus to the Egyptian economy during the reopening phase. The ammonia produced will facilitate expansion of the agricultural sector in Egypt.

Fertiglobe low-carbon NH3 plans unchanged by Adnoc sale

Abu Dhabi's state-owned Adnoc should complete its buyout of Dutch fertilizer company OCI's 50% stake in their Fertiglobe trading joint venture this year, but the funding and ownership structure of Fertiglobe's low-carbon ammonia projects in the Middle East will remain unaltered.

The deal, announced in December, will give Adnoc 86.2% in Fertiglobe. Completion remains subject to legal and regulatory approvals. The ownership structure of Fertiglobe's low-carbon ammonia projects in the Middle East is expected to be unchanged after the sale closes. These include the planned Ain Al Sokhna green hydrogen plant, which could yield up to 90,000 t/yr of green ammonia, and a 1mn t/yr carbon capture ammonia project in Ruwais, UAE.

OCI will retain ownership of its projects in the US and Europe. These include a 1.1mn t/yr carbon capture plant in Beaumont in Texas, and an ammonia and nitrogen complex in Geleen, Netherlands.

Fertiglobe will also continue to operate urea and ammonia plants in Egypt, Algeria and the UAE with a combined capacity of 5.1mn t/yr of urea, 1.6mn t/yr of ammonia (net) and 450,000 t/yr of Adblue/DEF. Fertiglobe made a profit of USD363mn in 2023, down by 72%.

AFRICA

Uganda to set up green H_2-based fertilizer plant

The Ugandan government plans to develop a renewable hydrogen-based fertilizer production facility in Karuma with Norwegian company Westgass Hydrogen and Kenyan investment management firm Industrial Promotion Services (IPS).

The partners will jointly develop a facility to produce 200,000 t/yr of fertilizers — specifically CAN 26 and NPK — using approximately 11,400 t/yr of renewable hydrogen, IPS told Argus.

Uganda's ministry of energy and mineral development has committed to supply 100MW of renewable electricity to the facility from the nearby Karuma hydropower plant. The project is expected to reach financial close in 12-18 months, after which it could take three years to build the plant, IPS said.

Required investments are estimated at around USD450 mn. IPS, an arm of the Aga Khan Fund for Economic Development, could invest more than USD100 mn in the project. The Norwegian government investment fund Norfund will also be co-financing the project through a convertible loan. The project has also received an undisclosed grant amount from Norway's development agency Norad.

Angola's Capanda green ammonia plant viable: Minbos

Australia-listed Minbos Resources has completed environmental baseline surveys into its planned Capanda green ammonia project in Angola, to be followed by a pre-feasibility study to study production of 250,000 t/yr of high-density ammonia nitrate.

The technical study found zero-carbon hydroelectricity at the Capanda dam was available at the most competitive tariff available to any green ammonia project in the world, Minbos said, meaning zero capital expenditure for new power generation capacity was required, while good quality water is plentiful.

The 250,000 t/yr plant could be scaled up if further electricity supplies can be secured, Minbos said. The firm projected in April 2023 that 1.17mn t/yr of ammonia production could be eventually developed at the site.

The plant intends to supply fertilizers as well as mining explosives for Angola's western copper belt, with the proposed facility 1,000km closer to the mining region than existing sources of explosives. The existing explosives market in the Western copper belt already fully consumes the proposed output of Capanda and is likely to rapidly grow, Minbos said.

Minbos said three unnamed development finance institutions are in talks to back the Capanda plant, which is to be built on land it already holds a 60-year lease for.

ASIA

Stamicarbon (MAIRE Group) awarded licensing and equipment supply contracts by Jiangsu Huachang Chemical Company

Jiangsu Huachang Chemical Company awards to Stamicarbon, the nitrogen technology licensor of the MAIRE engineering group, licensing and equipment supply contracts for a urea melt plant in China. The plant located in Zhangjiagang City of Jiangsu province in China will have a capacity of 1860 MTPD and use Stamicarbon's Ultra-Low Energy design with a highly efficient pool reactor concept.

This urea melt plant will serve as a replacement for an outdated facility of similar capacity and will utilize the existing prilling unit. Stamicarbon will provide the license, proprietary equipment, including high-pressure equipment made of super duplex stainless steel, and associated professional services.

The main advantage of Stamicarbon's Ultra-Low Energy Design, which will be utilized in this plant, is that the high-pressure steam is being used three times instead of two, making the process more energy-efficient than the conventional CO_2 stripping. This heat recovery scheme results in a 35% reduction in steam consumption and a 16% decrease in cooling water use. With two plants currently in operation, the Ultra-Low Energy design is demonstrating unparalleled energy savings in the market.

"Sustainability is at the core of our company, and when looking to replace our outdated urea plant, we were specifically seeking the most energy-efficient solution to help us reduce emissions and energy consumption. With Ultra-Low Energy technology, we expect to achieve a substantial reduction in steam and water consumption, contributing significantly to our sustainability goals. We look forward to a successful and mutually beneficial partnership with Stamicarbon as we work together on this project," said Mr. Hu Bo, the Chairman of Jiangsu Huachang Chemical Company.

"At Stamicarbon, we are committed to pioneering sustainable solutions, and Ultra-Low Energy design stands out as a testament to our dedication. We believe that this project marks a significant milestone in Jiangsu Huachang 's journey towards a more sustainable and efficient future. This project marks the ninth worldwide implementation of our groundbreaking technology, a testament to its global recognition as the industry's benchmark for energy consumption and efficiency," said Pejman Djavdan, Stamicarbon CEO.

AUSTRALASIA

Cyclone hits fertilizer output for Australia's Incitec Pivot

Australian fertilizer and industrial chemicals group Incitec Pivot (IPL) has revised down its guidance for the Phosphate Hill plants it operates in northwestern Queensland state, due to ongoing impacts from Tropical Cyclone Kirrily and maintenance activities. Interruptions to rail transport along the Mount Isa to Townsville line have hit the sulphuric acid supply chain - reducing output at Phosphate Hill, which has an annual DAP/MAP capacity of 975,000t - IPL said.

Production levels at Phosphate Hill for the year to 30 June 2024 are now predicted to be 730,000t-770,000t, down from a prior guidance of 780,000t-820,000t. An earnings impact of AUD8.5mn (USD5.5mn) for every 10,000t of lost production would be sustained, IPL said.

The firm's business planning will avoid a full shutdown at Phosphate Hill by using temporary product storage and road transport for finished fertilizer products. ■

MARKET ANALYSIS ›

Commodity updates • Shipping news • Price watch

Soft commodities: Wheat: Sellers edge down offers, buyers resolute

Information from **Agritel** – ***An Argus Media company***

Wheat summary

Sellers continued to offer into a vacuum, with very little buying interest for either spot or forward cargoes. Traders at Constanta/Varna/Burgas (CVB) ports dropped offer of 11.5% wheat back into line with Euronext May futures.

Continued competitiveness from the CVB region — even more so than Russian wheat — has diverted interest away from France's port of Rouen. French exporters were able to capture a sizeable share of the volume awarded under OAIC tenders for February-March loading, but as yet have next-to-no business fixed for April.

This has meant that traders had little incentive to take physical delivery of Euronext March futures, according to market participants. In the physical market, French exporters adjusted down offers of wheat fob Rouen for March loading in line with a declining spread between the March and May futures contracts. Offers for April loading held steady, at a slight discount to March loading.

Support for France's local market prices also started to ebb. Bids for April-May delivery cpt Rouen fell in premium terms to Euronext, after holding steady over the past month.

Meanwhile, Jordan's MIT awarded only a single 60,000t cargo under its tender to buy up to 120,000t of milling wheat for mid-May-mid-July shipment. The agreed price of USD240/t cfr Aqaba for shipment in the first half of July was only USD0.50/t below the closing price of Jordan's previous tender for May shipment.

The tender offers an early glimpse into tradeable levels for new crop. CVB sellers offered fob 11.5% wheat for July-August loading at a EUR6/t discount to Euronext September futures, broadly in line with spot market prices.

First bids for milling wheat in Ukraine's cpt deep port market have also showed little difference with spot levels.

Further afield, the outlook for US new-crop continued to improve. Latest United States Department of Agriculture (USDA) data showed further improvement in Kansas winter wheat conditions. The USDA increased the share of crop rated "good to excellent" by three percentage points to 57%, well above the five-year average for this time in the season. Just 13% is now rated "poor to very poor".

Corn and barley summary

Sellers raised their offers of Ukrainian corn delivered to Chinese ports, taking direction from firming buyer interest.

Offers of Ukrainian corn on a cif China basis rose by around USD15/t to USD245/t recently. Sellers raised their offers because buyers showed increased interest in booking volumes. Demand remained firm despite at least 15 cargoes of Ukrainian corn having already been booked for shipment to China over the last 10 days.

And China's corn prices could receive further boost, with the country's government aiming to support farmers' income to stabilise corn acreages for the 2024-25 season ahead of the start of planting in March.

The increase in activity in China's import market reflected earlier moves on Ukraine's cpt corn market. The spot price

Figure 1. Wheat price (USD/t)

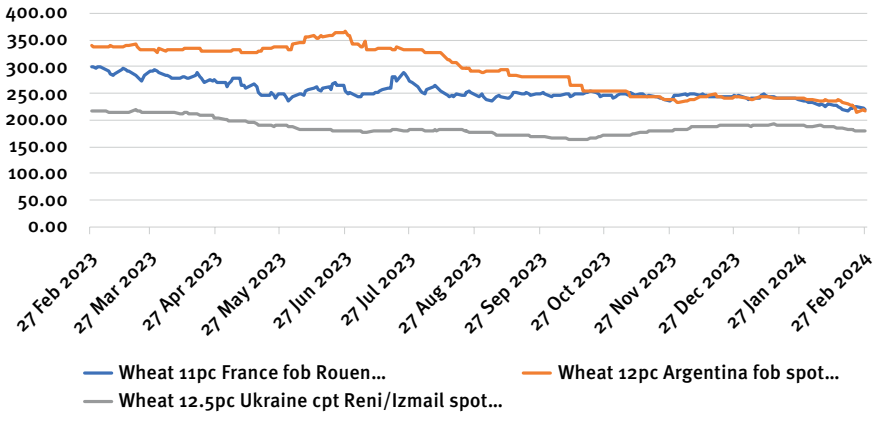


Figure 2. Corn price (USD/t)

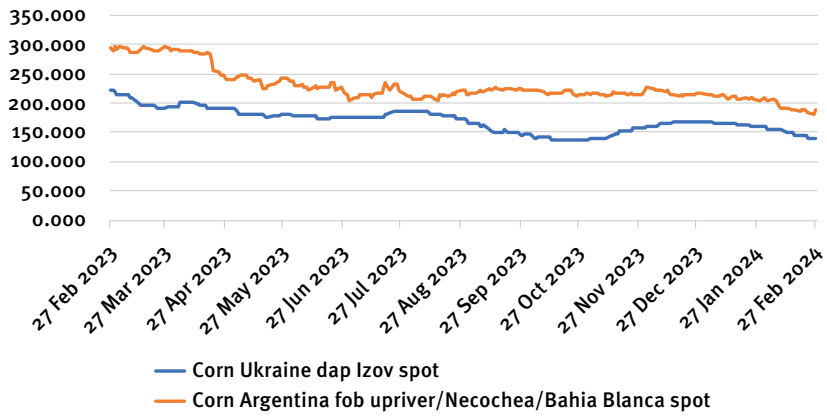
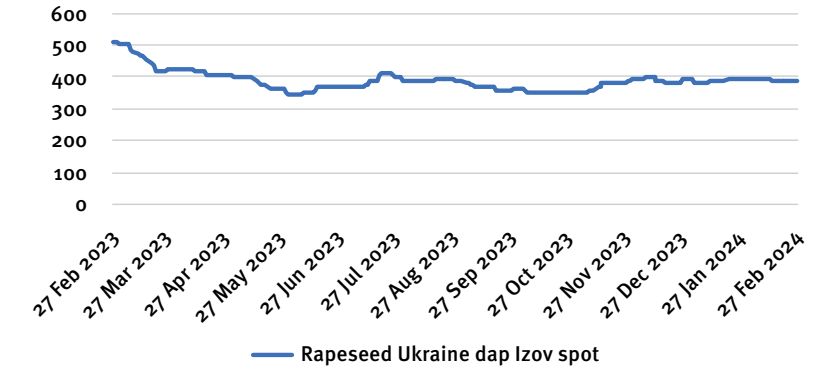


Figure 3. Rapeseed price (USD/t)



held firm, but the fob market did not see support, with buyers keeping their bids.

Meanwhile, European corn prices on an fob Constanta/ Varna/Burgas basis closed flat. The origin is likely to keep struggling to find demand because of larger supply of more competitively priced Ukrainian corn.

Elsewhere, Argentina's spot corn price firmed both on rising premiums and gains in the Chicago-listed corn May futures. Further out, the origin remained competitive against Brazilian corn, market participants said.

Similarly to corn, buyers also showed firm interest in barley for shipment to China. In response, sellers of Ukrainian product increased their offers by around USD10/t to around USD255/t for delivery to China.

But unlike corn, demand was not limited to Ukrainian origin product, with buyers seeking optional origin volumes, after booking around 1mn t of barley.

This could open an opportunity for sellers of French barley, although the origin would have to compete with Australian and Argentinian barley. Buyers raised their bids slightly on France's cpt Rouen barley market to a EUR14/t discount to the Euronext-listed milling wheat May contract, up by EUR1/t.

Sunflower and rapeseed oil summary

Sunflower oil (SFO) prices trading on a fob six ports basis lost value across the curve as market activity slowed down.

The spot SFO contract closed at USD905/t, some USD16/t lower than in mid-February. As for forward contracts, the AMJ (April-May-June) strip fell by USD17.50/t to settle at USD905/t, while the JAS (July-August-September) contract closed at USD916.50/t, some USD16/t lower.

Trading activity was limited in the spot market, with no deals heard. In the forward fob market, just one deal was heard, with the JAS strip heard changing hands at USD930/t.

Destination basis trading activity also declined. No deals were heard on a cif Turkey basis. Latest offers of SFO cif Mersin stood at USD840/t for March shipping, with bids at USD820/t.

Demand was a little firmer on a cif India basis, which traded at USD915/t for March shipment. One April-loading cargo was heard changing hands at USD910/t. This demand pushed values higher, with latest SFO cif India offers heard at USD930/t, while bids stood at USD925/t.

That said, demand is particularly focused on forward shipments, which are largely uncovered, market participants said.

In contrast, European industrial SFO demand is failing to draw support, despite a sharp downturn in palm oil imported volumes on Red Sea logistics issues, as record crushing levels in Europe have boosted domestic supplies.

Elsewhere, Egypt's state grains agency GASC booked over 60,000t of SFO in an international tender. The agency purchased five cargoes at USD920/t cfr with 180 days of credit.

European rapeseed (RSO) spot prices fell in the last reporting week, settling at EUR859.50/t fob Dutch Mill. The spot contract was weighed lower by declining RSO and soybean oil (SBO) futures, and held onto its losses in subsequent trading sessions.

US weekly soybean sales have reached their lowest level for the 2023-24 marketing year, according to latest US Department of Agriculture (USDA) data. With over 80% of target export volumes already sold for the year, US futures could face further pressure from a lower selling pace going forward. ■

Hard commodities: Red Sea bottlenecks complicate inflation's "last mile"

Written by

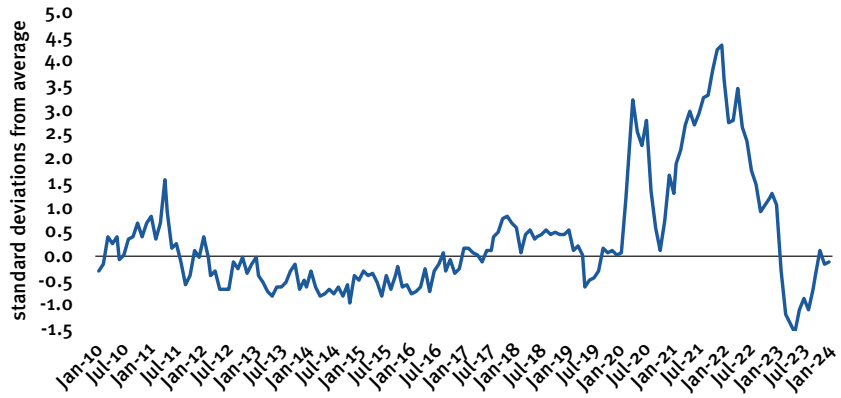
David Fyfe, *Chief Economist,* ***Argus Media, UK***

The USD Index is now close to three-month highs as markets grasp that monetary policy loosening in 2024 may be neither as immediate or rapid as first thought.

Initial irrational exuberance may underpin part of this change of mood, but so too is the potential prospect of prolonged disruptions on the Red Sea/Suez Canal waterway that acts as a conduit for 15% of global seaborne trade. Initial reductions in container traffic are now being replicated for refined oil products shipments, down by around 90% from late-November levels. From a European perspective diesel imports from East of Suez face shipping delays, something that, if sustained, could eventually drive both crude prices and inflation higher.

Advanced Economy central banks spent much of the last fortnight talking up a "soft landing" scenario, whereby prolonged, restrictive monetary policy avoids provoking sharp cuts in investment and activity levels and precipitous rises in unemployment. So far, the US Federal Reserve, ECB and Bank of England appear to be succeeding, at least in terms of unemployment. That said, January manufacturing PMI data show activity levels in Europe - not least Germany - and the UK have slowed much more dramatically than in the US. Notwithstanding these regional disparities, market participants on both sides of the Atlantic have been much more optimistic about the timing of initial rate cuts, and the pace of subsequent policy loosening, than have the policymakers themselves.

Figure 1. Global supply chain pressures nudge higher



Source: Argus Media, Federal Reserve Bank of NY

As things stand after the January/February round of Central Bank meetings, money markets are now pricing in April as the ECB's most likely "lift-off" point, May for the US Fed., and June for the Bank of England. However, it's still possible that initial rate cuts get deferred further, that the last mile in ratcheting down and holding consumer price inflation sustainably at 2% target levels proves a bumpy one and that end-year rates remain restrictive overall. The most recent "dot-plot" from the Fed's FOMC, for example, still envisages policy rates until well into 2025 that remain above the 3.8% average for the decade prior to the pre-Great Financial Crisis. This in part underpins an Argus assumption that advanced economy GDP growth remains anaemic in 2024.

Cargo disruptions

Central Bank policy makers have been at pains to explain that much of the fall in consumer price inflation since late-2022 can be attributed to easing supply chain pressures, which were initially caused by the Coronavirus pandemic of 2022-2021. However, since summer 2023, and particularly since October last year, this easing in global supply chain pressures has gone into reverse. A renewed phase of supply chain bottlenecks and higher freight rates has been caused

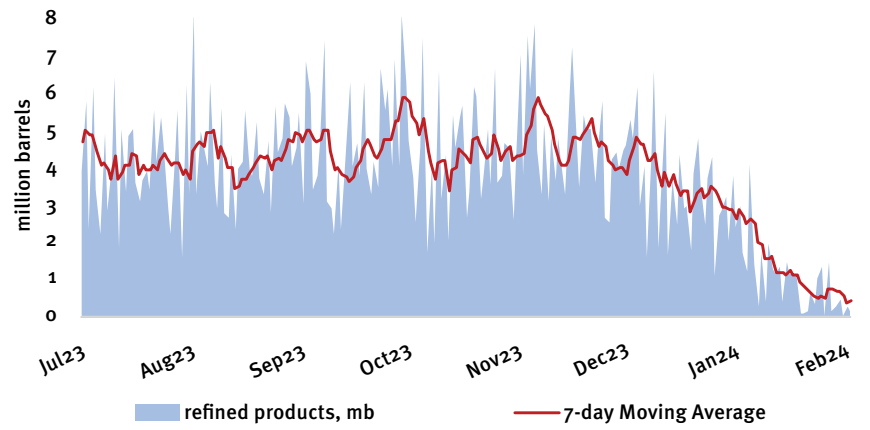
by attacks perpetrated by Houthi fighters from Yemen on commercial shipping in the Red Sea and which have intensified since late-November 2023. Originally targeting solely commercial shipping sailing to or from Israel, attacks have now broadened to include vessels flying the flag of member states of the military task force assembled by the US to provide vessel protection. The initial impact in terms of vessel diversions away from the Red Sea and round the Cape of Good Hope was concentrated on container shipping, with typical Asia-Europe container freight rates now between three to four times higher than they were in January.

In contrast, until recently raw commodity prices have been remarkably unaffected by disruptions on a waterway that nonetheless accounts for some 15% of global seaborne merchandise trade. However, without a speedy resolution, longer transit times, higher freight rates and increased war risk premia through mid-2024 could begin to augment consumer price inflation again towards the end of the year. Oxford Economics notes that it will take time for elevated shipping costs to move up the supply chain, with a peak end-year impact potentially raising core European CPI by 0.4%, albeit rather less for the USA. Clearly, were disruptions in the Red Sea to persist for another six to eight months (alongside separate ongoing delays due to low water levels on the Panama Canal), this could give Central Bankers significant pause for thought, possibly delay the onset of monetary policy loosening, and/or slow the pace of interest rate cuts thereafter.

Inflation rates

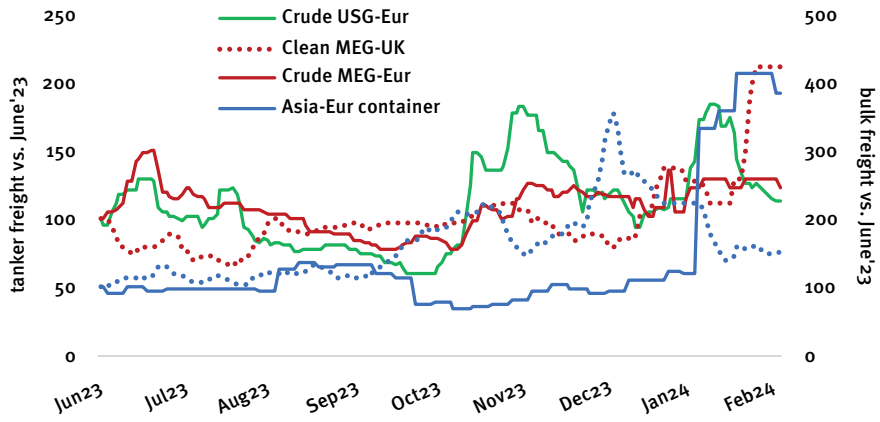
Red Sea disruptions are already affecting the near-9 mb/d of crude and refined products that typically transit the Suez Canal, pushing much of this traffic towards the longer route via the Cape of Good Hope. Voyages via the Cape can add 10-15 days sailing time for cargoes moving either way between Europe and Asia or the Middle East

Figure 2. Oil products shipments via Bab el-Mandeb



Source: Vortexa, Argus Media

Figure 3. Clean oil products freight follows containers higher



Gulf, compared to those via the Suez Canal. In terms of freight rates, westbound refined products cargoes have so far seen more impact than either eastbound sailings or those for crude oil. Moreover, with limited additions to the products tanker fleet expected in 2024, elevated freight rates could persist.

At early-February, total commercial cargo traffic via the Bab el-Mandeb straits had fallen by 70% compared to late-November levels, while refined oil products shipments were lower by 90%. Vortexa data suggest that while eastbound refined oil products shipments out of Russia are continuing, westbound products movements via Suez out of the Middle East and India have fallen sharply.

Little surprise therefore that Middle East to Europe refined oil products freight rates doubled in January and that European diesel cracks (the spread between diesel prices and crude) have recovered towards three-month highs of USD32/bl. The longer the attacks on shipping persist of course, the greater the likelihood that crude freight rates also move higher. Either way, a squeeze on Atlantic Basin diesel supplies could once again bolster the otherwise moribund trajectory for crude prices expected in 2024. And in so doing this could sustain inflation at rates higher than currently expected, delaying interest rate cuts and putting further downward pressure on advanced economy oil demand this year. ■

Shipping and trade news

Red Sea attacks drive OCP to seek European sulphuric acid

The increased risk to shipping in the Red Sea has resulted in Morocco's phosphate producer OCP to source most of its sulphuric acid requirements from European producers.

Appetite for European-origin acid cargoes has increased over the past two months as a number of attacks on commercial shipping in and around the Red Sea by Yemen's Houthi rebels has led to vessels taking the longer and slower route via the Cape of Good Hope, thus affecting spot demand for Asian-origin acid cargoes.

The January-February import sulphuric acid line-up shows a total of 421,500t of acid arriving to OCP's Jorf Lasfar port, of which nearly 90% originates from European ports — including northwest Europe, the Mediterranean, Black Sea and Turkish ports — Argus data show.

This is a sharp contrast to shipments in December, when Asian cargoes represented about half of the acid that arrived at the Moroccan port.

The attacks on commercial shipping in and around the Red Sea have been increasing in frequency, adding to the risk and the higher costs of shipping using this route.

The Chemroad Journey — the latest acid cargo of Asian origin for OCP — sailed from Two Lions' Zhangjiagang port at the end of December and is scheduled to discharge at Jorf Lasfar this week. The route diversion added approximately 10 days to the journey.

Chemical tanker rerouting has also reduced vessel supply by 7-8% while adding to tonne miles, according to Stolt Tankers.

Strong demand from OCP for European acid — the nearest supplier to OCP — has led to northwest European fobs to remain robust so far this year.

Rush for ammonia carrier newbuilds ramps up

Orders for very large ammonia and LPG carriers are dominating the newbuild market this year. The growing demand for very large ammonia carrier (VLAC) newbuilds is continuing as ammonia's role in decarbonisation efforts has led to shipowners forecasting higher tonne-mile requirements for ammonia cargoes in the coming years. Geneva-headquartered trading company Trafigura placed orders for six VLACs from HD Korea Shipbuilding & Offshore Engineering to be delivered in 2027, with a combined capacity of 528,000m³ and total cost of USD750mn.

Hyundai received orders from Japanese shipping company NYK Line for three VLACs to be delivered in 2027-28 for USD122mn each.

The orders from NYK Line and Trafigura, alongside two VLACs

FREIGHT RATES

POTASH	Price type	Units	Timing	Low	High	Date
Dry potash Vancouver - China 60-65kt	outright	USD/t	prompt	25	27	22-Feb-24
Dry potash Red Sea - WC India 25-30kt	outright	USD/t	prompt	45	52	22-Feb-24
Dry potash Baltic Sea - Brazil 30-40kt	outright	USD/t	prompt	45	61	22-Feb-24
Dry potash Baltic Sea - SE Asia 25-30kt	outright	USD/t	prompt	113	153	22-Feb-24
Dry potash Vancouver - SE Asia 25-30kt	outright	USD/t	prompt	65	67	22-Feb-24
Dry potash Baltic Sea - China 60-65kt	outright	USD/t	prompt	51	69	22-Feb-24
Dry potash Baltic Sea - US Nola 50-55kt	outright	USD/t	prompt	38	51	22-Feb-24
Dry potash Vancouver - Brazil 30-35kt	outright	USD/t	prompt	57	59	22-Feb-24
Dry potash Hamburg - Brazil 30-35kt	outright	USD/t	prompt	23	25	22-Feb-24

SULPHUR	Units	Low	High	Date
50-60kt – Vancouver-China	USD/t	26	28	22-Feb-24
Below all 30-35kt				
Mid East – EC India	USD/t	27	28	22-Feb-24
Mid east – North/River China	USD/t	31	32	22-Feb-24
Mid East – South China	USD/t	27	28	22-Feb-24
Mid East – Brazil	USD/t	29	30	22-Feb-24
Mid East – North Africa	USD/t	36	38	22-Feb-24
Mid East – South Africa	USD/t	24	25	22-Feb-24
Black Sea – North Africa	USD/t	45	65	22-Feb-24
Black Sea – Brazil	USD/t	56	70	22-Feb-24
Baltic – Brazil	USD/t	65	70	22-Feb-24
Baltic – North Africa	USD/t	45	65	22-Feb-24
35-40kt – US Gulf - Brazil	USD/t	26	28	22-Feb-24

ordered by Greek shipowner Alpha Gas earlier in January, means Hyundai has secured deals for 11 VLACs so far this year at a total cost of USD1.37bn.

NYK Line also placed orders for three Medium Gas Carriers (MGC) from Japanese shipyards — two to be built by Nihon Shipyards and one by Japan Marine United, all to be delivered in 2026.

Four tankers were ordered in January. Norwegian shipping investor Kjell Inge Rokke ordered two very large crude carriers (VLCC) from South Korea's Hanwha Ocean to be delivered in the second half of 2026 for USD127.5mn each, with options for two more. Euronav added to its expanding VLCC orderbook by ordering one ammonia-ready 319,000 dwt tanker from Chinese shipyard Qingdao Beihai for around USD114mn, with an option for two additional vessels. There was one order outside of the VLCC market, a Suezmax from Eastern Pacific.

Activity in the dry bulker newbuild market was muted last week with only one deal signed. Chinese shipowner Zhoulian Shipping ordered two Panamax bulkers from Chinese shipyard Wanlong Shipbuilding to be delivered in 2025-26, with options for two more.

The demolition market saw more action last week with four vessels sent for recycling. These included one Handymax bulker, the 46-year-old Song, which was sold into Bangladesh. Three smaller vessels were sent for recycling — the small gas carrier Tomson Gas was sold into India, the 2,217 dwt tanker Fukuda was sold into Bangladesh, and the 22,160 dwt bulker Xin Xiang An was sold into Bangladesh for USD490/light displacement tonne (ldt).

Danish Shipping backs EU deal on ship pollution

Trade organization Danish Shipping is backing an agreement between the European Council and European Parliament to crack down on marine pollution from ships.

The provisional agreement, announced on 15 February, would extend the scope of the International Convention for the Prevention of Pollution from Ships (MARPOL) to include more types of pollutants from vessels, including wastewater and waste discharged into the sea, and would increase penalties for violators.

Danish Shipping said the agreement would codify international standards for ship pollution into EU legislation, safeguarding that the competitiveness of European shipping.

"The new measures strengthen the directive, particularly in terms of effective enforcement and sanctions, and contribute to pollution prevention," Danish Shipping executive director Nina Porst said. "Thus, EU rules can support equal shipping conditions internationally."

Danish Shipping is a consortium of Denmark's maritime industry including Maersk, Torm and Hafnia Tankers.

The preliminary agreement needs to be formally approved by the European Council and European Parliament to become law. EU member states would then have 30 months to adopt the measure into their national laws.

The proposal is part of a series of legislation proposed last year that would curb pollution from ships and update EU maritime safety rules, including policies related to investigating accidents at sea.

NITROGEN/UREA		Units	Low	High	Date
Middle East - US Gulf	45kt	USD/t	32	34	22-Feb-24
Middle East - Thailand	30kt	USD/t	22	24	22-Feb-24
Middle East - Brazil	40kt	USD/t	23	25	22-Feb-24
Baltic - Brazil	30kt	USD/t	55	59	22-Feb-24
China - India	60kt	USD/t	19	21	22-Feb-24
Algeria - Brazil	30kt	USD/t	28	29	22-Feb-24
Algeria - French bay	12kt	USD/t	25	28	22-Feb-24
Baltic - EC Mexico	30kt	USD/t	55	60	22-Feb-24
Baltic - WC Mexico	25kt	USD/t	93	100	22-Feb-24

PHOSPHATES		Units	Low	High	Date
Morocco – Brazil	30kt	USD/t	23	25	22-Feb-24
Tampa – Brazil	30kt	USD/t	27	29	22-Feb-24
Saudi Arabia – EC India	30kt	USD/t	23	25	22-Feb-24

AMMONIA	Units	Latest	Date
Ras al Khair - Ulsan, 23kt	USD/t	83	27-Feb-24
Ras al Khair - Kakinda, 23kt	USD/t	45	27-Feb-24
Ras al Khair - Kandla, 23kt	USD/t	23	27-Feb-24
Point Lisas - Ulsan, 23kt	USD/t	138	27-Feb-24
Point Lisas - Houston, 23kt	USD/t	36	27-Feb-24
Point Lisas - NW Europe, 23kt	USD/t	60	27-Feb-24
Bontang - Ulsan, 23kt	USD/t	37	27-Feb-24

Euronav to build clean fleet with CMB acquisition

Belgian tanker owner Euronav plans to acquire UK-based cleantech firm CMB.Tech for USD1.15bn as part of its strategy to expand its fleet of zero-emission ships.

Euronav would take control of the firm's offshore power and hydrogen businesses as well as its several marine divisions, which include 60 operational ships and 46 new builds. Half of the fleet is powered by hydrogen or ammonia, but many of the container ships still run on diesel.

Euronav aims to expand CMB's zero-carbon fleet up to 120 ships, split evenly between ammonia and hydrogen fuel. Because hydrogen is inefficient for long-distance shipping, it will fuel tugboats and unmanned surface vehicles while bulkers, container vessels and tankers will be fueled by ammonia.

The new firm created by the acquisition, to be named CMB.Tech with stock exchange listings in New York and Brussels, will also aim to expand its hydrogen and ammonia supply chain with 185,000 t/yr of renewable ammonia production in Namibia and potentially 1mn t/yr of hydrocarbon-based ammonia sourced via offtake agreements with US companies. It is eyeing another 100,000 t/yr renewable ammonia offtake deal from Europe.

Upper Mississippi ice report cancelled on warm weather

An annual US government ice measurement programme for shipping on the upper Mississippi River was cancelled this year because of unseasonably warm weather.

The US Army Corps of Engineers (Corps) said it would not issue regular measurements on the depth of ice on Lake Pepin south of Minneapolis because the ice has already started to break up and would be a hazard to equipment and crews.

The annual Lake Pepin ice reports are seen as a key gauge of when commerce can resume on parts of the river. This is the first time the reports have been cancelled in the 30 years since they started.

At its thickest, the ice appears to currently be 8-10 inches, according to the Corps.

Locks on the upper Mississippi River starting around mile marker 437 near New Boston, Illinois, are to remain closed for winter maintenance until their planned opening dates (15 March). The Corps will revaluate need-based movement on the upper Mississippi River if conditions change.

The river's towing industry is ready to handle traffic through the ice along the upper Mississippi River, the Corps said.

Industry sources said the El Nino weather pattern is to blame for the Lake Pepin ice conditions. El Nino is expected for the next several seasons, according to the National Weather Service.

Price watch

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

AMMONIA

Healthy supply in Asia and the Middle East

Global ammonia prices have fallen rapidly in the past two months on weak fundamentals — the fob Middle East bench-mark has plunged by USD158/t on a midpoint basis since early December. Supply has been robust and demand seasonally low since oversupply re-emerged in November, as production outages were resolved and peak autumn demand faded. Coupled with unexpectedly weaker European gas prices since December that have reduced pressure on marginal producers, there have been few factors to support prices. The exception is healthy upgrading margins for urea, but there is limited potential for ammonia producers to switch to urea, reducing the impact on prices. All major benchmarks have fallen, with Asian prices under particular pressure in the absence of major demand, except from India in January, and with supply ample.

Logistical problems persist as the Red Sea to Suez Canal route is effectively closed to ammonia shippers, limiting Middle Eastern flows to Europe and Morocco. A quarter of the 4mn t produced in the Middle East last year was shipped through the canal to west of Suez markets. Price dislocations have opened up between markets on either side of Suez, with the east Asia cfr price falling to parity with fob Middle East this month. Creative solutions are being deployed to limit the effects of extended shipping routes around the Cape of Good Hope, with Ma'aden recently completing a ship-to-ship transfer with OCP to divert supply to Bulgaria. Such actions are almost unprecedented in the market, but more may occur in the next few months, if the disruption in the Red Sea continues.

Yara and Mosaic's Tampa contract fell by USD80/t to USD445/t cfr, less than the USD100/t drop a month earlier, but still a significant decline. A price drop of this size despite the tighter markets west of Suez highlights just how well supplied the market is at present, with few pockets of substantial demand. The seasonal rise in demand from the US and Europe during the fertilizer spring application season will begin from March, but we do not expect this to be significant enough to shift price sentiment in the region, which will remain weak in the first half, given the new supply we expect to come to market.

Gulf Coast Ammonia's (GCA) unit and a second seaborne export route from Russia are expected to come on line this year. GCA's start-up is now expected around March-April, a year behind the original schedule. The 1.3mn t/yr unit will flood the market with surplus ammonia from a relatively low-cost base. Uralchem says shipments from its export terminal at the Black Sea port of Taman are expected to start by the summer, although market sources say the terminal is only 60% complete. Any new supply from Taman will weigh on the market, but we only expect minimal additional volumes from August.

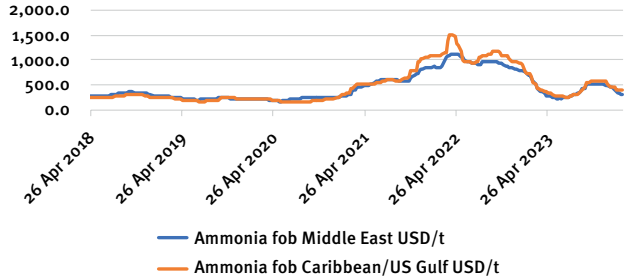
The east of Suez market is well supplied, despite India lining up imports of 246,000t in January. Most would-be buyers are well stocked, and the country's phosphates producers usually use the early part of the year to undertake plant maintenance, all of which will weigh heavily on demand and prices in the months ahead. Minimal support for Asian pricing is expected before the kharif planting season begins in earnest in April.

Overall, we expect global prices to rapidly fall in the next two-three months, especially as current fob prices leave healthy margins for producers in many parts of the world. The declines will only slow as non-European marginal producers in Indonesia and Algeria begin to be squeezed and production is put in jeopardy. We expect prices to approach a floor from April, bottoming out at USD230/t at the low end of the fob Middle East range in June, rolling into July.

Further out, we expect managed production and the re-emergence of seasonal demand as the northern hemisphere summer draws to a close to enable prices to rise towards the end of the year. A weaker European gas outlook for 2024 and 2025 has reduced our price forecast ceiling into the winter, while supply additions during this year will further help to limit the tightness normally seen in the fourth quarter.

Our forecast is subject to several key risk factors — the timing and quantity of new supply added to the market, the ability of Europe's producers to maintain production as prices fall, and the floor reached by major benchmarks. A supply shock could occur if price falls exceed expectations,

Ammonia historical pricing



forcing European and southeast Asia producers into mass curtailments, or if a few major producers suffer outages. Minimal unused merchant capacity, except in Russia, where there is only one viable route to export, means prices are susceptible to supply-side shocks, despite the current apparent abundance of product.

PHOSPHATES

Indian DAP subsidy package lower

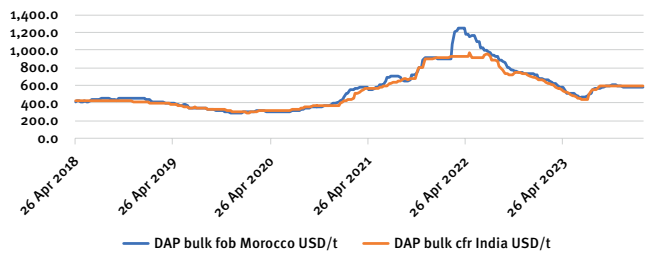
Raw material supply challenges, a tight global market and emerging phosphate demand east and west of Suez is expected to cause modest firming over the next two months. Indian buyers are grappling with poor import economics under the current subsidy regime and have held delivered DAP prices steady for several months. The news on the cut to the Indian phosphate and potash subsidy budget for the upcoming 2024-25 season will likely temper import demand until further clarity around how funds will be distributed to each nutrient is presented. This will allow Indian buyers to keep the DAP cfr at USD595/t over the next month, but by April rising supplier prices will challenge this threshold. Meanwhile, Pakistan has managed to recover stock levels slightly and import demand will be subdued until Indian signals become clearer.

Saudi Arabia and Morocco continue to service markets to the east of Suez, particularly in the absence of Chinese tonnes. The subcontinent but also east Asia and Australia are expected to be key outlets over the next couple of months. But once Chinese tonnes are reintroduced from May onwards, there will be sufficient supply for buyers to grind down DAP prices, particularly in the third quarter. Overall we anticipate more typical seasonal pricing developments to take place across the phosphate market for much of this year.

Looking west of Suez, European demand is gradually emerging but still remains relatively muted. We estimate DAP purchases will ramp up over the next month, but overall price support from European markets will be faint. Meanwhile, barge prices in the US softened over the past month, but this downward pressure is expected to be short-lived. Emerging demand over the next month will put pressure on pre-existing supply concerns in the US. In a tight global market, we estimate that this will cause DAP barge prices to firm through to April but some softening is expected once the spring season demand wanes. Yet supply concerns will remain a consistent feature in the US phosphate market in 2024, which will likely result in international prices playing a more significant role in moving barge prices.

The US market continues to hold a premium over other DAP and MAP markets, with the spread to Brazil being historically high. If this premium persists, Moroccan producer OCP may opportunistically ship into the US market. We also continue to project Morocco regaining a portion of Indian DAP import demand this year, which should boost overall Moroccan exports. Russia is expected to prioritise major import markets, with the bulk of its MAP heading into Brazil. Prices have held stable as a result of limited activity, but the MAP market is tight and we anticipate more material demand emerging in the coming weeks which will cause delivered MAP prices to firm modestly. But again, once Chinese tonnes return, we forecast a sustained global MAP surplus across the bulk of the year which will gradually erode MAP prices. The MAP market is more concentrated and well-supplied and as a result MAP prices will experience fewer periods of support, allowing for a smoother a continuous decline over the outlook period.

Phosphates historical pricing



POTASH

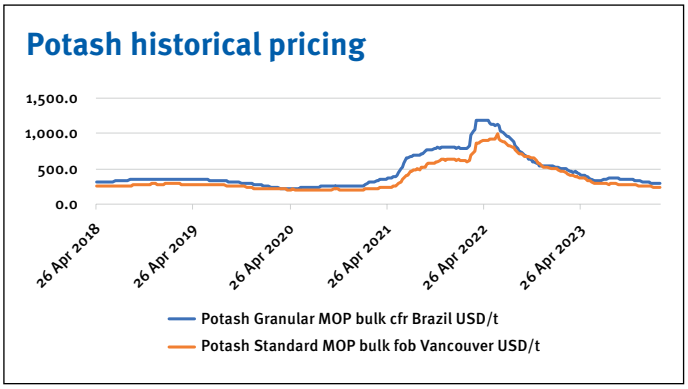
Stable to firm in Brazil, elsewhere stable to soft

Summary - Prices in Brazil are stabilising for March as interest rises but suppliers want higher prices for April as more demand emerges for safra. Low demand elsewhere will keep placing downwards pressure on prices, although this may be offset by the strength of Brazilian demand.

China - Domestic MOP prices eroded slightly as demand did not improve significantly after the lunar new year holiday and supply is ample. Port-side 62% MOP prices are around CNY2,450/t ex-warehouse, down by CNY50/t compared with the pre-holiday level, while prices for 60% Laotian MOP are at a maximum of CNY2,300/t ex-warehouse, down by around CNY100/t from the high end of the pre-holiday range. QHSL has held its first-stop prices for 60% standard powder/crystal MOP at CNY2,860/t for February delivery.

Southeast Asia - Trade activity has yet to pick up following the lunar new year holiday. The region is still in a seasonal lull, which is reflected in the low demand.

High inventories in Thailand and Vietnam have also pushed some granular MOP offers down, which has reduced the low-end of Argus' granular MOP assessment for these two markets to USD320-350/t cfr.



Europe **-** European trading activity remains relatively slow as adverse weather conditions in recent weeks has hindered fieldwork. Low liquidity has kept prices flat with standard MOP at EUR320350/t cfr and granular MOP at EUR350-380/t cfr though there are higher offers.

Europe remains a premium market and buyers are continuing to push for lower prices to close the price gap between Europe and other markets. There are some concerns that if prices do not reduce, it may hurt demand.

Brazil **-** The Brazilian granular MOP price has ticked up by USD5/t at the low-end to USD285-290/t cfr after the price had been on a steady decline since mid-August last year which finally reached the bottom two weeks ago. An increase in import demand has helped to drive up the price as buyers accept that a floor price has now been reached, although the strength of demand has not quite matched the strong domestic demand seen in recent weeks. Importers are primarily seeking product for prompt or March shipment. Beyond this, there is less interest.

Suppliers have hinted that cargoes for April onwards will likely be priced higher. Indeed, offers for April and May have been reported at USD300/t cfr and some negotiations are taking place around this level. But for February/March shipment, suppliers are still targeting levels around USD290/t cfr and most are rejecting bids below this level.

US Granular US MOP barge prices held steady this week, but transactions remained somewhat muted as buyers have already secured the supply they need for the spring.

SULPHUR

Seasonal firming in the short term expected

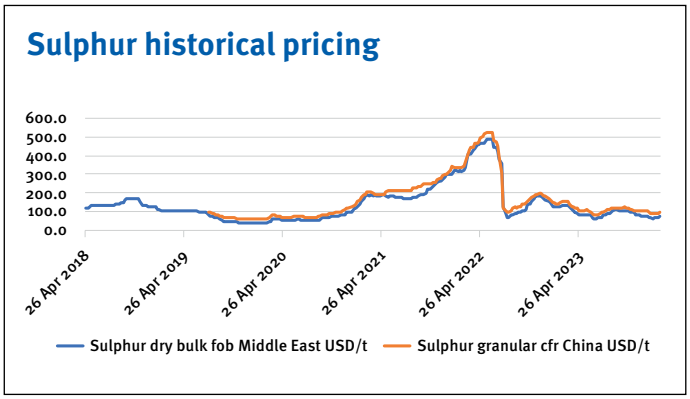
The sulphur market is undergoing seasonal changes, with some supportive pricing factors including the forthcoming fertilizer application season, the Red Sea conflict and the traditional post-lunar new year holiday spike in market activity pulling demand and subsequently prices up in the short term. But the ongoing downside pressures still cannot be ignored, including the rapid decline of sentiment in the metals market and the slightly less bullish outlook for the phosphate sector.

Yet price indications are firming as the lunar new year holiday comes to a close, following a period of softening. As China re-enters the market an uptick in pricing will be noted, as expected year-on-year at the end of the first quarter.

Seasonal fertilizer application season is also drawing nearer, bringing up demand, particularly in south Asia with the start of kharif, but also in the US as phosphate fertilizer production and demand is set to ramp up in the second quarter. There is currently some tightness of supply in the region, with a refinery-maintenance-based decline in output from US producers bringing expectations that tonnes will be sourced from Canada, and that Canada will replace the US in exporting tonnes to South America. This will increase trade activity temporarily, and provide some price support. Also for buyers in the Mediterranean and north Africa there is pricing support coming from the lack of Russian available granular product for the rest of this quarter, because of production difficulties. This is adding to the upwards momentum in both regions on a cfr basis, and is also supporting fob Med prices as there is increased competition for these tonnes, albeit temporary.

But the Red Sea conflict is adding pressure both upwards and downwards, depending on if you are on the fob or cfr side of the deal. Suppliers are not willing to absorb the entire elevated freight rate cost associated with the Red Sea delays and diversions so consumers are having to now absorb some of the cost to ensure product delivery, particularly from the Middle East where price indications are already rising. Sulphur producers are also arguing that phosphate-producing sulphur consumers can pay a bit more as phosphate prices are stable, nudging firm, while ammonia prices are falling. But the logistical difficulties associated with the conflict could end up adding downwards pressure to prices in the east if Middle Eastern suppliers decide to limit tonnes sent to the west in order to avoid the route. This may cause an oversupply of sulphur in the east, bringing potential for prices to come down.

Another downside factor to consider is the sharp decline of the metals market, where prices for nickel in particular have reached historic lows, causing multiple mines, predominantly in Australia, to be placed on care and maintenance and production halted. This is because the mine sites cannot afford to keep producing under high



operating costs and strict environmental regulations. This countrywide scale back of metals projects has significantly reduced demand from the Australasian region and weighed on export pricing. Demand from the metals projects in the Copper Belt has also been subdued so far as a result of logistical difficulties as well as the weak metals market outlook, impacting on operating rates and sulphur consumption. Indonesia is inevitably being impacted by the decline in metals pricing but is staying afloat with small but steady demand of crushed lump sulphur to maintain operations. The cheaper price point for lumps over granular tonnes is also helping operational margins.

These push and pull factors are influencing current market dynamics. Yet we must acknowledge many are largely seasonal changes which bring upticks in pricing and demand growth, which could point to the market returning to some sense of normality and seasonality for the first time in years. But to conclude, sulphur prices have been on a steady decline since October last year, and aside from the seasonal buying interest and subsequent short-term support to prices discussed, there is not much to support a prolonged upside in the medium-term forecast. The firming market is temporary, and following the uptick, prices are expected to return to the stable-to-soft trend.

NITROGEN/UREA

Urea prices are forecast to decline further into the fourth quarter

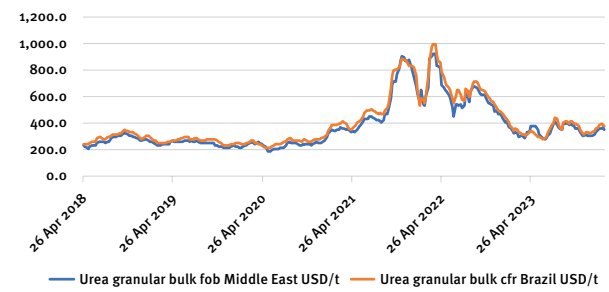
Prices rose by USD50-75/t over the past month in all areas apart from China, where the government has blocked exports in an attempt to force prices down in the local market. An uptrend was forecast in our last report and prices have now met and surpassed our projections for February shipments.

Several factors have combined to tighten urea supply and push up prices. The lack of Chinese urea is being felt most keenly in Asia-Pacific, where many regional buyers are reliant on small cargoes. Recurring plant problems in Malaysia and a delay in issuing export licences for Indonesian urea exacerbated the supply tightness and pushed up fob prices as high as USD400/t for February-loading urea.

Export licences were issued in Indonesia at the start of February so some of the heat has come out of the market, with the latest sales in the low-USD380s/t fob. There are suggestions that Chinese urea could start to move for export in the second half March or April. But China exported only 200,000t in March-April over the past two years, so a lifting of the export ban will probably not effect regional supply that significantly.

Egyptian producers adopted their customary tactic of raising prices by USD5/t with each successive sale and have managed to push fob prices to USD410/t fob. Egyptian urea appears fully priced for European markets, where

Urea historical pricing



importers are trying to raise fca prices to equivalent levels and there is competition from Russian suppliers. But European demand will continue for another two months and further increases are possible.

Rising prices pulled buyers in other regions into the market, which helped keep up momentum. Brazilian cfr prices have moved up to USD390-400/t cfr, despite unfavourable fertilizer to crop price ratios. Mexican buyers have paid over USD400/t cfr for granular urea and USD375/t cfr for prilled urea. The US has seen prices move up to USD370-375/t cfr equivalent and needs prices to rise further to ensure March-April arrivals.

Much of the urea available for February loading has been sold and the focus is now switching to March, which should see higher prices. Our trade balance forecast shows a very tight market throughout April and further increases in pricing is likely. But the bulk of the price increases expected in the first quarter will have taken place already. Prices are heading above USD400/t fob in several regions and so trading companies and consumers will hesitate before purchasing. Trading firms still have long positions to place taken at prices below current prices.

Further ahead, the urea market is expected to see a large correction in price during the second quarter, reversing the gains seen over the past month. There may be some overshoot on the downside — as happened last year — leading to a rebound in July and the market remaining volatile.

Crop prices are mildly disappointing and are unlikely to prompt any general demand increase. Gas prices in Europe, where the swing producers are now located, are relatively low, supporting continued production at most factories in the region. Gas is trading at USD8-9/mnBtu on the Dutch TTF hub, the level last seen in summer 2023.

The urea market is also having to cope with higher exports from Russia, following new plant start-ups. Russian producers increased urea exports to 9mn t in 2023 from 7.5mn-8mn t/yr previously, despite sanctions put in place following the invasion of Ukraine.

The need to sell increased quantities of urea likely accounts for some of the large price discounts available for Russian urea — fob Baltic prices were 24% below Egyptian fob prices on average in 2023, compared with 11-12% in 2020-21. ■

Special focus

ADDED VALUE FERTILIZERS ›

IFA Special Products Assessment

Affordability pressures dent demand for controlled-released, stabilized-nitrogen and water-soluble fertilizers

Written by

Grace Chilande, *Fertilizer Demand Analyst,* ***International Fertilizer Association***

The International Fertilizer Association (IFA) conducts an annual assessment of the demand for special products, which includes controlled-release fertilizers (CRF), stabilized-nitrogen fertilizers (SNF) and water-soluble fertilizers (WSF). The assessment covers 40 countries, collectively accounting for a majority share of global consumption. The data is gathered from interviews and surveys with specialty fertilizer producers and traders, consultations with industry experts, and analysis of third-party resources such as customs data and national statistics.

In 2022, the global specialty fertilizer market segment was characterized by significant shifts in demand. In IFA's in-depth analysis of the demand for controlled-release, stabilized-nitrogen and water-soluble fertilizers, there was a decline in all major markets with the exception of East Asia.

The global demand for CRF, SNF and WSF was estimated at 15.8 mn t in 2022, a 7% decline compared to 2021. Consumption of SNF declined by 8% year-on-year, accounting for almost 70% of the total decline in special products. WSF declined by 7% and CRF by 2% year-on-year. The key drivers of the demand decline were affordability pressures for these premium products and higher raw material costs, which impacted both producers and farmer operations.

China experienced a growth in demand, albeit at a modest rate

Urea and sulphur price surge

CRFs are fertilizers that release nutrients at a controlled rate relative to a "reference soluble" product, achieved by modifying readily available nutrient forms with recognized physical mechanisms such as coatings.

In 2022, global demand was estimated at 1.3 mn t, with North America and East Asia accounting for 90% of consumption.

There was a ~90 kt decline in North American demand primarily driven by higher urea and sulphur prices in 2022 which impacted affordability, coupled with severe drought in several parts of the country.

By contrast, China experienced a 10% increase in demand, increasing its consumption to 440 kt. This was driven by a rapid increase in demand for CRFs on high-value crops, and a steady increase on grain crops across the country.

Chinese demand for CRFs is expected to continue rising despite recent challenges including coating costs and increased demands for polymer degradability.

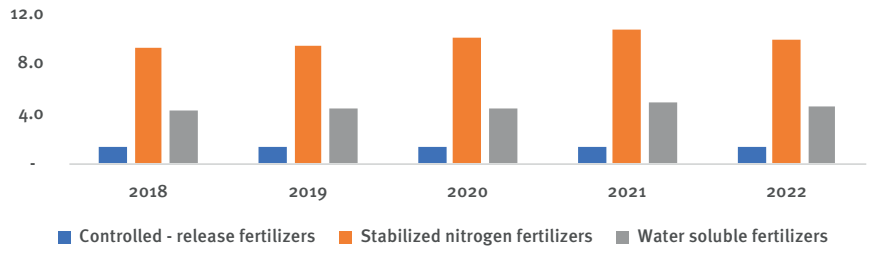
Stabilized-nitrogen fertilizers

SNFs are fertilizers which include the presence of either a urease or nitrification inhibitor. On some occasions, the two inhibitors can be added to the same fertilizer product.

Global SNF demand in 2022 was estimated at 9.9 mn t, with urease-inhibited (UI) fertilizers accounting for 74% of the total SNF consumed.

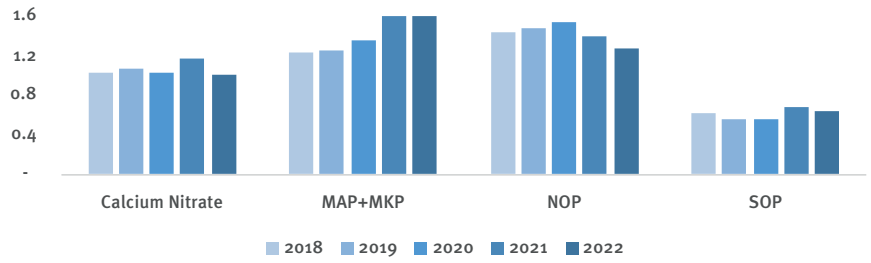
West Asia was the fastest growing region in 2022, with a 7% increase year-on-year

Figure 1. CRF, SNF & WSF global demand (mn t)



Source: IFA

Figure 2. WSF global consumption (mn t)



Source: IFA

West and Central Europe (WCE) were the primary contributors to the absolute decline in UI, estimating a 22% year-on-year decrease driven by affordability and availability constraints. North America was the largest contributor to the absolute decline in nitrification inhibitors (NI), falling by 11% year-on-year. There was a significant decrease in consumption on the turf and ornamentals segment in North America, reported to be more than a 20% decline in 2022.

China experienced a growth in demand, albeit at a modest rate of 2%, bringing SNF consumption to 1.2 mn t. This was driven by local price stabilization of urea treated with inhibitors and growing efforts on farmer education.

Water-soluble fertilizer demand

The WSF products considered in this assessment refer to crystalline fertilizer products containing one or more primary nutrient, whose solubility in water is close to 100%, allowing its application in fertigation and foliar nutrition. Products covered are calcium nitrate, potassium nitrate (NOP), potassium sulphate (SOP), mono-potassium phosphate (MKP) and water-soluble (or technical) mono-ammonium phosphate (MAP).

Global WSF demand declined to 4.5 mn t in 2022, with West and Central Europe emerging as the largest contributors to the absolute decline in WSFs and accounting for a total decrease of 22% year -on year. A key driver of the decline was the closure of greenhouses triggered by record high gas prices in the region, as well as overarching fertilizer affordability pressures.

West Asia was the fastest growing region in 2022, with a 7% increase year-on-year despite only accounting for 4% of total demand. This was driven by increased production of high value crops (e.g. tomatoes in Turkey) in response to a production shortfall in other markets (e.g. Spain).

A key driver of lower WSF demand in Latin America was reduced product availability from exporting markets such as China, despite expectations that Latin America would be a key growth market following pre-buying in late 2021.

Chinese WSF demand grew to 2.2 mn t, with calcium nitrate, SOP, MKP and MAP consumption all showing growth rates between 6-10%. However, demand for NOP declined by about 6%, driven by the substitution of potash sources by the tobacco sector from NOP to SOP due to local affordability.

The market for special products faced a challenging year in 2022, with fertilizer affordability pressures and surging input costs for high-value crop farmers leading to a 7% contraction compared to 2021. However, this rapidly developing market holds the key to unlocking productivity gains in various crop sectors and is expected to return to growth in the coming years. ■

If you would like to learn more about IFA's work in this area or contribute to its next assessment, please contact Grace Chilande: ***gchilande@fertilizer.org***

Incorporating beneficial additives and performance enhancers through coating

Written by

Michael Eidge, *Process Sales Engineer,* ***FEECO International, USA***

Efforts to improve nutrient management have continued to push demand for specialty fertilizers and those geared toward crop- or even site-specific nutrition needs. Furthermore, as technology has advanced, the market has become increasingly discerning, demanding high-quality products that meet their appearance, handling, and performance expectations.

One way in which producers have been able to adapt their operations to these changing demands is through the addition of a coating step.

Instead of manufacturing a completely new formulation, coating allows producers to add a step at the end of their production line to incorporate the additives necessary to meet the desired objective.

The following information covers the ways in which coatings have become essential to the increasingly discerning market, as well as how the coating process works and factors to consider in incorporating a coating step into an existing line.

The new role of coatings

Coatings were once reserved for the most premium of products, but today, they have become the standard for incorporating additives to meet a variety of needs:

Incorporating nutrients: Fertilizer manufacturers can easily incorporate additional nutrients into their formulations via coating. This is most commonly seen with the inclusion of secondary and micronutrients; producers can take a standard nutrient product and through coating, upgrade it to a customized formulation, including sulphur, iron, magnesium, calcium, copper, zinc, or otherwise. Other desired additives may also be incorporated through coating.

Enhancing Nutrient Use Efficiency (NUE): Another way in which coatings have become so vital is through changing the rate at which the active ingredient is delivered to crops. By creating a barrier between the nutrient and the environment, producers can control or slow nutrient delivery to deliver results over time instead of all at once - a tool that has become vital in nutrient management efforts and the fight against runoff.

Improving performance and handling: Beyond nutrient management and fertilizer performance, coatings also provide a way to improve product perception and handling.

Appearance: The use of a coating can create fertilizer granules with a refined, polished appearance. Coatings can be used to control surface quality of granules, colour, and more.

Flowability: Not surprisingly, the addition of a coating can also improve a product's flowability with implications at every step throughout its lifecycle.

Caking: Caking can have disastrous results, including product loss, handling challenges, and not least of all, a risk

Urea before (left) and after (right) coating with an anti-caking agent

to employee safety for those working around fertilizers in bulk. Coating has long been used as a way to mitigate these risks, again by creating a barrier between the nutrient and the environment, which discourages moisture absorption (the root cause of caking).

As coatings have advanced, they continue to play a critical role in managing the potential for caking during storage and transport. Coatings commonly employed as anti-caking agents include oils, waxes, polymers, clays, diatomaceous earth and talc.

Dust suppression: Similarly, dust suppression is another issue the industry has long dealt with through coating. By coating fertilizer granules with de-dusting agents, producers can reduce the potential for product breakdown and attrition, particularly when it comes to granules produced through compaction, whose jagged, irregular edges are prone to rubbing together and breaking down. This approach to dust suppression is commonly seen with products such as MAP, DAP, sulphur and potash.

By enlisting the help of coatings, the handling of fertilizer granules is greatly improved; granules are flowable, not clogging equipment, they are not caking during storage, they are not causing dust issues, and they are easily applied in the field.

Oils, waxes, polymers, and specialty chemical coatings are often enlisted in dust management applications.

Choosing the right equipment

One often-forgotten aspect of coating is the attention that should be paid to its application. Fertilizer producers can spend hundreds of hours and thousands of dollars developing a coating that works exactly as desired. But if it is not uniformly applied, it is all for naught. Even the most advanced coatings cannot deliver the expected results unless they are uniformly applied to granules. As a result, the coating drum has become the preferred device for many fertilizer producers.

Coating drum in fabrication

How coating drums work

Coating drums are based on long-proven rotary drum technology. Solids are tumbled in a rotating drum set at a slight angle at a predetermined speed. A spray system sprays the coating onto the tumbling bed of material.

The action occurring in the tumbling bed promotes an even distribution of coating through granule-to-granule contact, as shown in the diagram overleaf (figure 1).

Coating on a conveyor belt

Coating material as it moves along on a belt conveyor, while somewhat common, is largely ineffective. A few factors are at work here. First, material is stationary on a belt conveyor, meaning the sprayed coating can only contact the surface layer of material. To counter this effect, many producers will increase the coating spray rate, saturating the pile. This results in the top-most portion receiving significantly more coating than the interior of the pile (for this reason, producers that switch to a coating drum often notice they are utilizing less coating agent). Further, this approach can also result in overspray on the conveyor, leading to cleaning and maintenance issues. Overspray onto the conveyor also occurs when material feed rate is reduced.

Coating with a ribbon mixer

The ribbon mixer is another common approach to coating. The ribbon mixer improves upon belt coating, due to the mixing of materials and coating that occurs as the charge moves through the mixer. And while the ribbon mixer can offer a cost-effective approach in some settings, it is not a fit for all applications.

When working with heat-sensitive materials, or when material fragility is a concern, the ribbon mixer may not be the best option, due to the friction that occurs within the mixer.

Ribbon mixers also tend to have higher maintenance requirements and are not likely to accommodate the higher throughputs and longer retention times that a coating drum can achieve.

Coating drum process development

A number of variables contribute to successful coating in a coating drum. Various material-specific parameters (e.g., granule shape, PSD, etc…), as well as coating characteristics, will influence how these materials behave during the coating process and therefore how to design the drum for best results.

Figure 1. The tumbling motion that occurs inside a rotating coating drum encourages uniform coating distribution throughout the bed via granule-to-granule contact

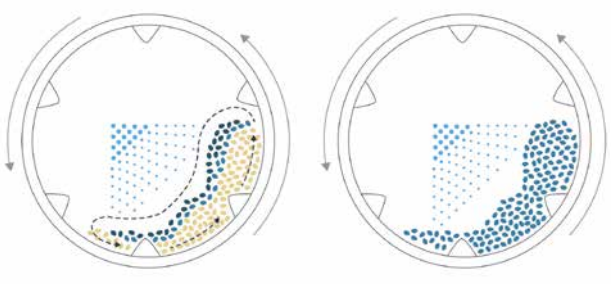
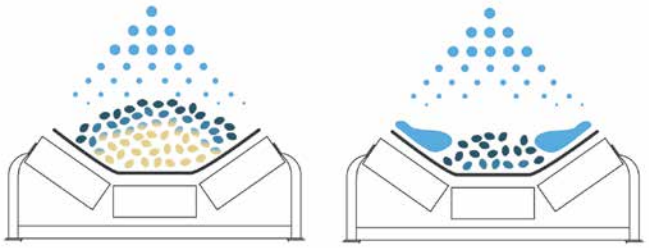


Figure 2. Coating on a conveyor often results in non-uniform coating (left), while overspray (right) can cause maintenance issues



Through testing programs such as those conducted in the FEECO Innovation Center, engineers can define essential process criteria for a commercial-scale operation, including:

- Coating and product feed rates
- Drum speed
- Drum slope
- Retention time
- Spray rate
- Spray locations
- Nozzle type
- Coating and material temperatures
- Bed depth
- Internals (use of tumbling flights, top hats, etc…)

Interior view of a pilot-scale coating drum with tumbling flights used for testing in the FEECO Innovation Center

Additional considerations

While the addition of a coating drum to an existing fertilizer production line is relatively simple in comparison to building an entirely new line, there are a few factors to take into consideration.

Space requirements: Fertilizer producers looking to incorporate a coating step will need to have floor space available after the drying step (or cooling, if applicable). For a coating drum, this could mean anywhere from a 4x10 foot space, up to a 14x30 foot space and may require some adjustment to existing infrastructure.

Coating infrastructure: Fertilizer producers will also need to dedicate some infrastructure to storing, preparing, and feeding the coating to the unit. The feeding system differs depending on the type of coating. In the case of liquid coatings, which are most common, it typically consists of a liquid storage area, heater, filtration system, compressed air, and pumps (in addition to the spray system inside the drum).

A feeding system such as a troughed belt conveyor, bucket elevator, or other material handling equipment will also be required to transport product from drying (or cooling) to coating. The handling equipment can be connected with a volumetric or gravimetric feeder for controlled metering of solids and simple measurement of throughput. In turn this allows for easy integration with a controls system.

Additional maintenance: In addition to the routine maintenance associated with rotary drums, the coating drum may require more frequent inspections and measures to prevent potential build-up. Measures such as rubber liners or exterior knockers can be incorporated into the drum design to minimize the potential for build-up to occur.

Operator training: Operators may require additional training to become familiar with coating drum operation, troubleshooting, and maintenance.

Improving performance

Coating has become the industry standard for meeting changing market demands. From incorporating additional nutrients and beneficial additives, to improving performance and handling, producers are increasingly turning to coating to reach their product objectives.

Thanks to its high throughput and the uniformity it can achieve, the coating drum has become the industry's preferred equipment. For best results, the coating drum should be designed around the specific characteristics of the solids and coating, with process development testing being an essential step. ■

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Enhancing efficiency with smart urea

Written by

Nikolay Ketov, *Public Relations Officer,* ***Stamicarbon***

As the global population continues to grow, the urea market also expands and evolves. With a global production of approximately 200 mn t annually, urea is manufactured in numerous locations and is transported and traded worldwide.

Urea is the most widely utilized nitrogen fertilizer, vital for increasing crop yields and using agricultural land more efficiently. At the same time, like many other global industries, despite advancements in production technology, modern industrial developments, and digitalization, combined with worldwide efforts to reduce emissions, the nitrogen fertilizer industry still stands as a major consumer of fossil fuels and a contributor to greenhouse gas emissions. Recognizing this challenge, urea manufacturers are continuously increasing efforts to optimize their production and reduce emissions. However, these measures can only partly improve the situation, as the efficiency of pure granulated urea as a fertilizer remains unchanged.

Sustainable technology solution

While the use of urea is crucial for enhancing crop yields, its nutrient efficiency is fairly low. Once applied into the soil, the nitrogen that is not absorbed by plants can either volatilize into the air as ammonia and N_2O or leach into the surface and groundwater as nitrates. These losses not only lead to environmental issues such as air pollution, fine dust, elevated nitrate levels in drinking water, and eutrophication of surface waters, but also result in unnecessary energy consumption and industrial emissions.

A solution to minimize nitrogen losses is using controlled-release fertilizers

One solution to minimize nitrogen losses is the use of controlled-release fertilizers, which are the most efficient nutrient delivery systems available. They offer precisely calibrated nutrient release, ensuring that crops receive the nutrients they need over an extended period.

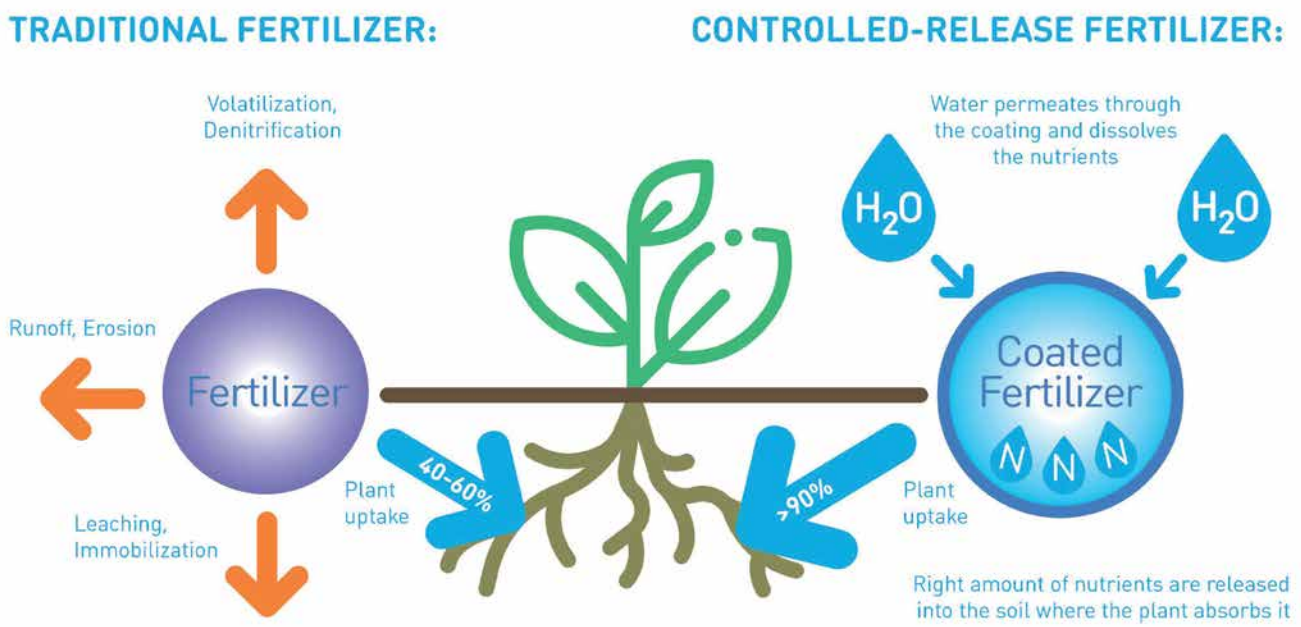
Stamicarbon, nitrogen technology licensor of MAIRE Group, has accepted these challenges and is therefore focusing its innovation efforts on sustainable fertilizer technologies: specifically on the production of fertilizers based on renewable energy, technologies for specialty fertilizers that are more efficient and effective, and digital transformation of current urea plants. As a part of this ongoing development Stamicarbon is constantly developing and improving fertilizer systems to increase urea's nitrogen use efficiency. The most promising product innovation opportunities identified include a coating for control release, micronutrient addition, sulphur addition, and better urease inhibitor. This article will explore coatings as one of the most viable and highly beneficial methods to enhance fertilizer efficiency and decrease its environmental footprint.

Minimizing losses

The conventional way to use fertilizers is to apply them a few times per growing season such that the continuous need for nutrients is met as much as possible during the plant's growing cycle. Given the rapid loss of nutrients to the air, water, and soil, farmers often apply more than necessary to ensure maximum yield. This oversupply means that between applications, excess nutrients are wasted. Consequently, the overall efficiency of nutrient use frequently falls below 50%. This inefficiency leads to unnecessary expenses for the farmers and a significant environmental impact.

A smart fertilizer, in contrast, behaves very differently. Coated with a polymer membrane, it is able to unlock and release nutrients to match the nutrient demands of the crop. In this way, nutrient release is attuned to the needs of the crop, creating a perfect balance between nutrient supply and

Figure 1. The benefits of controlled release fertilizers

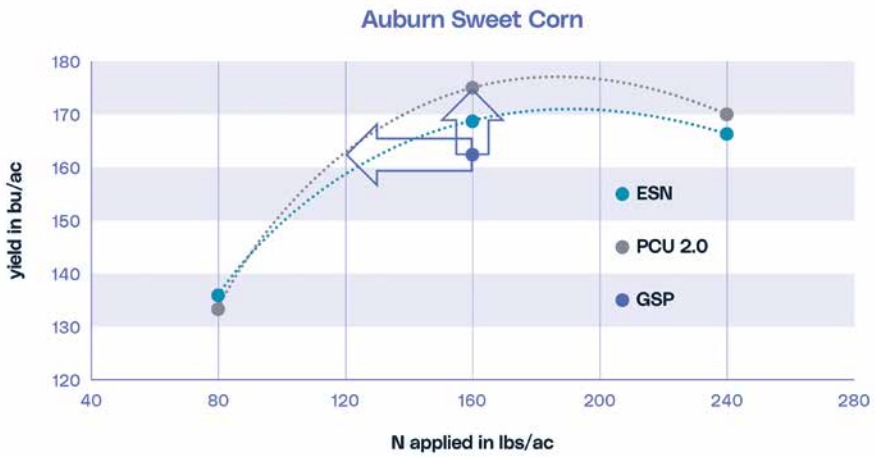


plant uptake, preventing losses of nutrients to the environment. Ideally, optimal nutrient use efficiency can be achieved by adjusting the release curve of the fertilizer so it corresponds precisely with the nutrient demand curve of the crop (see figure 1).

Smart urea

Controlled-release urea is produced by coating the urea granule with a coating acting like a membrane to seal the urea from the environment. The manufacturing process involves coating a readily available fertilizer substrate, such as urea, with a polymer coating. Polymer-coated urea (PCU) is designed to release nutrients based on osmosis and diffusion through the coating. The hygroscopic nature of urea will attract water (rain, moisture) into the membrane, which passes through the polymer outer layer and dissolves nutrients inside. Release rate and longevity are controlled by coating thickness and soil temperature. By using different coating materials and thicknesses, as well as blending different coated fertilizers with different nutrient release characteristics, it is possible to match the needs of different crops or regional specifics. As a result, losses to the environment, whether it be air or water, are prevented, and maximized nutrient use efficiency is achieved.

Figure 2. Field trials with polymer-coated controlled-release urea in different cropping systems, such as sweet corn, have shown that significant increases in nutrient use efficiency are achievable



Smart fertilizers offer farmers the flexibility to choose between two optimal strategies: achieving higher yields with a similar application rate, accommodating higher fertilizer costs, or securing similar yields with a lower application rate, thus requiring less of the higher-cost product. Field trials with polymer-coated controlled-release urea in different cropping systems, such as field corn, sweet corn, and potatoes, have shown that

At the heart of the Controlled-Release Fertilizer Design is a modular coating plant

Figure 3. The first commercial Controlled-Release Fertilizer Design reference plant, Sylacauga, Alabama, USA

significant increases in nutrient use efficiency are achievable (see figure 2). A single application of controlled-release urea provided 5-10% higher yields against a split application of conventional fertilizers when applied at the same overall application rate. Alternatively, controlled-release urea provided similar crop yields when applied at 75-85% of the total application rate of conventional fertilizers.

A business case analysis showed that the higher yield target allowed for a USD150-800/t premium (depending on the crop) for controlled-release urea over regular urea, whereas the lower application target allowed for a USD60-110/t premium for controlled-release urea over regular urea. This excludes the additional benefits of a single application, such as less labour and fuel.

Installation and production

Stamicarbon offers a complete technology package called "Controlled-Release Fertilizer Design" for smart fertilizers that includes unique polymer composition and innovative coating technology PurActive. This technology was developed by the US-based company Pursell Agri-Tech, in which Stamicarbon holds a stake. This synergic collaboration combines Stamicarbon's global network and technological capability with Pursell Agri-Tech's leading expertise in coated fertilizers.

The production package, based on a batch coating process in a high-intensity mixer, is able to encapsulate a wide variety of different fertilizer products with a new kind of polymer coating. Fertilizer granules can be coated within an extremely thin and durable membrane. The controlled release of nutrients can be adjusted over a time span of between 30 to 360 days, regulated by the weight of the applied coating. The novel polymer used in the production process is exclusively supplied by a major global polymer producer. The equipment manufacturer, also working in exclusive cooperation, is able to supply customers with complete production installations on a 'Lump Sum Turn Key' basis.

At the heart of the Controlled-Release Fertilizer Design package is a modular coating plant. It has a relatively low investment cost and a compact design, making it possible to erect such plants close to existing logistics facilities near end-user markets. The first commercial Controlled-Release Fertilizer Design reference plant, operating on a 24-hour, five-days-a-week regime, is running in Sylacauga, Alabama, USA (see figure 3). It has the capacity to produce up to 100,000 t/a of controlled-release fertilizer and is being operated by Pursell Agri-Tech. The current coating line can coat nearly all fertilizer grades, including granular and prilled urea, DAP, MAP and NPK.

The opportunity

Stamicarbon's latest innovation demonstrates a significant step in the fertilizer industry towards achieving food security and improved nutrition and promoting sustainable agriculture. The Controlled-Release Fertilizer Design allows for the production of smart fertilizers for broad-acre agriculture at an economical scale. This innovation gives fertilizer producers and distributors the opportunity to offer a variety of new products for optimized fertilization to the market. The wider application of controlled-release fertilizers reduces the environmental impact associated with nutrient loss to air and water.

Note: Controlled-Release Fertilizer Design™ and PurActive™ are trademarks of Stamicarbon ■

Supplement

ASIA FOCUS ›

Doubling fertilizer use efficiency in India

Investments and innovations

Written by

Dr. Yashpal S Saharawat, *Senior Scientist,* **Dr. Upendra Singh,** *Vice President of Research,* ***International Fertilizer Development Center (IFDC)*** and **Dr. RS Paroda,** *Board Member,* ***IFDC***

It cannot be disputed that the transformation of Indian agriculture from a food-deficit country in the 1960s to a self-sufficient country in 1990s and net-exporting country from early 2000 is an attribution to enhanced use of fertilizers along with adoption of high yielding varieties, investments in irrigation facilities and skilled human resource. This impressive achievement of increasing food grain production by more than six times from 51 mn t in 1951 to 316 mn t in 2022 (see figure 1) is achieved with surmounting consumption of fertilizers.

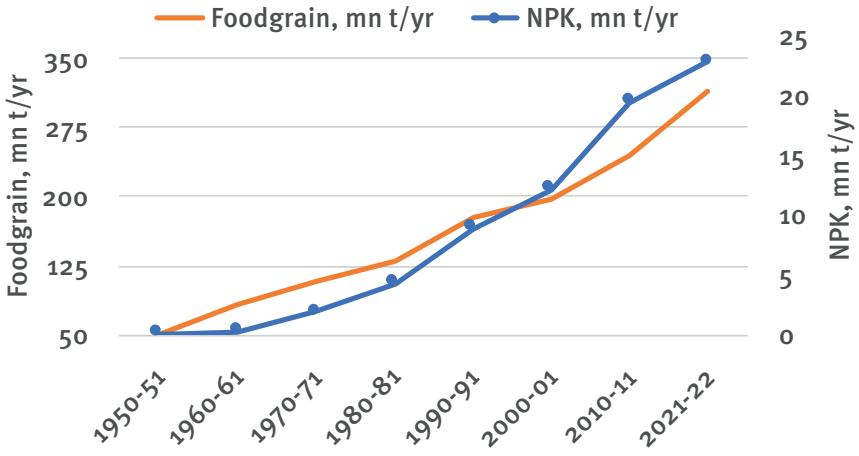
Incidentally, the staple food grain crops, rice and wheat, take up 78% of the NPK (nitrogen/phosphate/potash) fertilizers and contribute 75% of total food production in the country. The significant enhancement in rice and wheat production is the backbone of India's food self-sufficiency and fertilizers contributed between 40-50% to this miraculous achievement.

Fertilizer subsidy and soil health

To promote fertilizer use, the Government of India introduced the 'Fertilizer Subsidy Scheme' in the 1950s for assured supply of fertilizer products to farmers at reduced prices. With increased fertilizer use and pertinent subsidy policy, the annual monetary burden on exchequers increased from USD1 bn in 1991 to USD28 bn in 2022. Over time, subsidy policy support leaned more towards urea N, which accounted for more than 65% of the total subsidy investments. This selective and non-scientific policy support to urea N is leading to an imbalanced fertilizer use in the suggested NPK ratio of 7.7:3.1:1 in 2022 and significantly increased P and K fertilizers costs. The N partial factor productivity declined from 32 kg foodgrain per 1 kg of N applied in 1970s to 12 kg per 1 kg of N applied in 2020, reducing the efficiency as low as 30% and phosphorus 20%. Low efficiency and energy intensive urea production emits around 119 mn t CO_2 equivalent annually in the country.

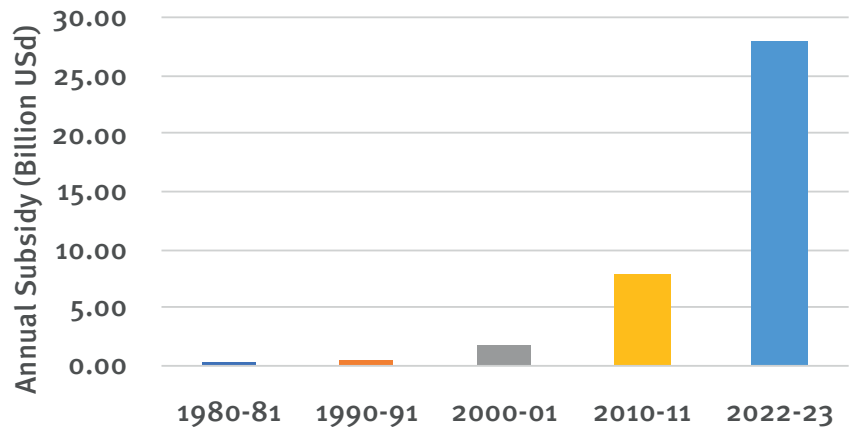
Fertilizer technology has led to increased food production, but it has also exacerbated agro-eco-environmental challenges through the over-exploitation of natural resources such as soil, water, and biodiversity. This has resulted in decreased Nutrient Use Efficiency (NUE) and

Figure 1. NPK consumption and food grain production in India



India has been working gradually to decrease fertilizer consumption

Figure 2. Indian fertilizer subsidy (Billion USD)



factor productivity, depleted soil health and increased climate aberrations.

The country's heavy external dependence on P and K nutrients makes its position in the international market quite fragile. Price fluctuations and supply uncertainties have been major concerns for Brazilian producers. The global interconnections between conflicts, energy, fertilizers, and sustainability create a highly complex situation where expensive inputs are imported and often underutilized. The financial costs and inefficiencies of fertilizer technologies are a burden, not only smallholder farmers and the country's exchequers, but also on the environment. Studies have shown that a 1% reduction in urea-N subsidy would decrease soil health degradation by 3%. Therefore, there is a pressing need to rationalize fertilizer use without compromising production growth and the health of natural resources. These issues are of paramount concern for industry stakeholders, farmers, researchers and policymakers.

India has also been working gradually to decrease fertilizer consumption by introducing limited innovations in value-added products, such as zincated urea (ZU), neem-coated urea, and other micronutrient-fortified fertilizers, which simultaneously supply nitrogen (N), zinc (Zn), and other micronutrients to plants. Additionally, innovations such as urea super granules facilitate placement in paddy soil, while sulphur-coated urea (SCU) reduces uptake, neem-coated urea inhibits nitrification, and water-soluble fertilizers enable nutrient supply through drip irrigation. The government has initiated several schemes including the Soil Health Card (SHC), the National Mission for Sustainable Agriculture (NMSA), the National Policy for Management of Crop Residue (NPMCR), Customized Fertilizers (CF), the National Biogas and Manure Management Program (NBMMP), and Pradhan Mantri Program for Restoration, Awareness, Generation, Nourishment, and Amelioration of Mother Earth(PM PRANAM), all aimed at improving soil health and nutrient use efficiency. However, limited research and development and skewed fertilizer policies are major reasons for the limited adoption by farmers.

The way forward

There is an urgent need for steps to address existing challenges and constraints and to enhance fertilizer/nutrient use efficiency by restoring and sustaining soil health and the environment. This would require multipronged research, development, and policy interventions involving all stakeholders, including ministries, R&D institutions and the private sector.

The country needs to increase investments in novel research and state-of-the-art infrastructure for fertilizer technology, innovation, research, and extension through a factory-to-fork (F2F) approach to double fertilizer/nutrient use efficiency by 2030. This investment is necessary for developing efficient fertilizer products (such as organo-minerals, multi-nutrient granules and slow-release fertilizers) and technologies that will significantly reduce the subsidy budget, reduce the carbon footprint, and provide additional income to farmers and industry through carbon farming/green credit markets.

Establishing a 'Centre of Excellence on Fertilizers (CoEF)' in a Public-Private-Producer-Partnership (4P) would provide a one-stop solution to understand all needs and promote innovations in fertilizer technologies with the support of international organizations such as IFDC. It would also address the skill and knowledge development needs of different stakeholders, particularly the youth of India.

To encourage higher private sector research investment, incentivizing the fertilizer industry to develop and scale up new innovations is necessary in the Indian fertilizer sector.

Reorienting the current fertilizer subsidy into an incentive-oriented policy by better utilizing existing government schemes is another significant step needed at the policy level. A framework is also needed to reward and incentivize researchers, the industry, and farmer producer organizations (FPOs). It will help to work towards the development, promotion, and adoption of climate-smart and scientifically proven fertilizer products. District-wise soil health maps with continuous monitoring every five years will help move towards 'One Health' and maintain soil organic carbon (SOC) above 0.5%. Revisiting the Fertilizer Control Order (FCO) to expedite the registration process of new fertilizer carriers/molecules through a scientifically backed data system, while ensuring compliance with norms to ensure quality and adequate quantity of product in the market for easy availability, accessibility, and affordability, is also a focus. In addition, it would be beneficial to incentivize nutrient recycling (such as organo-minerals) through industrial processing of wastes such as sewage sludge, poultry manure, and distillery spent wash, with a target for the generation of 1.0 mn t per year of recyclable nutrients through indigenous or industrial processing of wastes linked with an enabling policy on 'Integrated and Site-Specific Nutrient Management'.

Maximizing efficient fertilizer use

The acid soils, covering around 50 mn hectares, suffer more from sulphur (S), boron (B), and molybdenum (Mo) deficiencies. There is a need to strengthen strategies for integrated nutrient supply and management and enhance the availability of custom-made fertilizers to ensure the balanced management of these nutrient deficiencies, as well as to understand the science of ammonia-based fertilizers in acid soils. To promote the application of the best fertilizer management practices for maximizing efficient fertilizer use, there is a need for a comprehensive awareness and educational program for extension/field workers. This would help popularize the art and science of 4R (right source, right rate, right time, and right place) nutrient stewardship with the goal of promoting site-specific nutrient management using available decision support systems and artificial intelligence, among others.

There is an urgent need for research to understand the impact of increased mineral fertilizer use on soil acidity

Concerted efforts are needed to promote the use of alternative sources such as NPK, single superphosphate (SSP), triple superphosphate (TSP), and nano-urea/DAP to reduce the demand for imported fertilizers. To promote crop-specific grades instead of generic grades, there is a need for tailor-made compounds from existing carriers by adopting wet or dry granulation processes in a decentralized system. For science-driven efficient fertilizer management, Krishi Vigyan Kendras (KVKs) need to enhance knowledge sharing and promote resilient nutrient management practices and nutrient support systems among communities, extension workers, and farmers.

There is also an urgent need for new research to understand the impact of increased mineral fertilizer use on soil acidity and align with the contemporary need for alternative fertilizer sources and application technology. Disseminating technical advice on lime treatment by State Agricultural Universities and ICAR Institutes is necessary.

For efficient soil testing facilities, the creation of accredited private laboratories by well-trained young entrepreneurs under the Government scheme of Soil Health Cards (SHCs) is urgently required.

Strengthening cooperation

Intensive research on the agro-economic evaluation of specialty fertilizers must be undertaken by strengthening cooperation between public sector institutions and the fertilizer industry to advance innovations from the laboratory to the field for commercialization. Updating and revising the package of practices, including climate-smart fertilizers such as specialty fertilizers by state agricultural universities would facilitate faster scaling out of these products. There is a need for focused research in the context of natural farming, conservation agriculture and regenerative agriculture to make fertilizer research more holistic, ensuring both economic and environmental sustainability.

Concerted efforts are required for the mechanization of fertilizer deep placement by redesigning and innovating multi-crop, multi-utility machinery for deep placement of fertilizers to reduce losses and the carbon footprint. Intensive research needs to be undertaken to promote one-time deep placement vis-à-vis repeated top dressings. Fertilizer deep placement has the potential to double NUE by 30-60%, which could save more than 10 mn t of fertilizers. Therefore, there is a need to provide incentives for fertilizer-cum-seed drills/planters.

A new agri-business model-oriented approach needs to be adopted to understand fertilizer-based innovations from a business perspective with scalable adoption and markets. Additionally, to become self-sufficient in urea production, enhancing recovery efficiency by upgrading existing plants is also a necessity. ■

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Nitrogen

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

Ammonia

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

Phosphates

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

Sulphur

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

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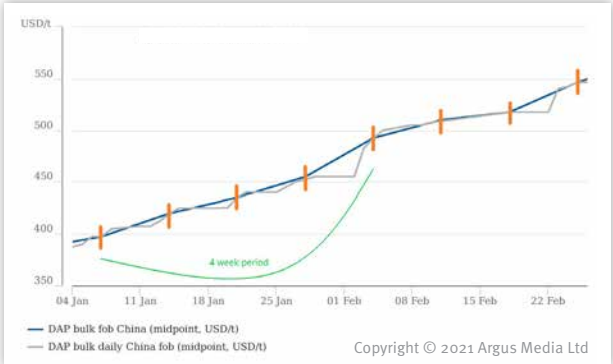

Over the highlighted 4 week period (7 Jan to 4 Feb 2021) the price of DAP fob China grew from $397.50/t to $492.50/t, an increase of 24%. The blue line on the graph, marked by the 5 weekly prices over this period (orange) clearly highlights this price growth. However, the 21 daily prices over this same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

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What happened to the Australian SOP wave?

Written by

Matt Shackleton, *Managing Director & CEO,* ***Australian Potash Limited, Australia***

The identification of the potassium rich nature of the brines in the inland lakes and lake drainage systems in Western Australia really kicked off in the early 2010s. Companies such as Australian Potash and Salt Lake Potash really lead that charge, with peer companies Agrimin, Kalium Lakes and much later Trigg Mining, all following.

The concept of producing sulphate of potash (SOP) from highly potassium enriched brines using solar evaporation was introduced to the Australian investment and exploration communities by Reward Minerals, ably lead by Dr Mick Ruane. That company was very much first out of the blocks, but then ran headlong into the suite of issues that comes with the complex native title regime that governs a lot of how minerals developments are progressed. In Rewards case, they were stalled for many years.

The brines in Western Australia are found in potentially commercial quantities in two settings: in the lakes themselves and in the palaeochannels that feed or drain these lakes. The latter geology can provide a more certain resource base for extraction of the brines, by virtue of the more porous and permeable gravels and sands that are found in deeper hydrogeological systems.

Notwithstanding the simplistic concept of pumping brines to the surface and evaporating the excess water to crystallise potassium bearing salts, the devil is, as they say, very much in the detail. The basis of the

The need for good quality potash is indisputable

SOP from brine production process is the hydrogeological model. It is this complex, data intense, mathematical and statistical model that predicts flow rates and volumes from any particular unit within an aquifer system. Get this wrong and the 'mining model' is wrong with dire financial consequences. To demonstrate the sheer amount of work required to drive accurate forecasting out of the hydrogeological model, Australian Potash populated its model with more than 60,000 metres of drilling data, more than 700 kilometres of passive seismic data, thousands of chemical assays and months of pump test data.

Premature developments

The need and demand for good quality potash – and SOP is arguably the best form of potash – is indisputable. However, these are not project developments for the faint of heart: they are big projects more akin to a large infrastructure project than your typical gold, lithium or nickel mine. There are complex, long term commercial supply (off-take) agreements that are needed to attract development debt, and the time to 'free cashflow' – a favourite metric for project comparisons – is in the 3-4 year bracket. They are slow developers, but they run for a long, long time. In fact, the resource base at Lake Wells is predicted to produce potash for more than 70 years. But time costs money, and this is money on top of the mid-sized capital expenditure budgets to develop large evaporation ponds, extensive bore-field and pumping networks, and processing plants.

By 2018, there were two players in the Australian SOP space who began talking about pushing through to development on the back of definitive feasibility studies (DFS) – the studies that ultimately settle on the design and cost parameters for full development. The two companies were Salt Lake Potash, at its Lake Way project in Wiluna, and Kalium Lakes, at Beyondie Lakes near Newman. Once a bank has backed the DFS, it becomes in effect a bankable project. The murmurings of pending developments struck some in the sector as premature and made several participants nervous. "How could they be at that stage so quickly"?

The potash sector in Australia was, and still is, immature. There is still not the critical mass of technical expertise in this country to confidently state that these operations can be developed successfully. It was, however, very exciting and the story behind it bordered on romantic: an essential,

(left) Solar evaporation potash production is cheap, highly effective and very long lived; *(right)* Brine sourced from ancient river systems (palaeochannels) that criss-cross Western Australia provide reliable, high-quality potassium enriched brines from which sulphate of potash can be made

non-substitutable home-grown fertiliser that could replace the 100% imported product. There were lots of eyes on the sector and it attracted a lot of capital. And with that capital – by most estimates somewhere north of AUD1.2 bn – came expectations.

So we have a perfect storm brewing. We had what many agreed were overly-ambitious statements about DFS programmes and the immediate commencement of development, a critically under-skilled technical workforce and an extraordinary amount of capital deployed to untried processes managed by untested and inexperienced teams. Plus Covid. What could go wrong?

Mistakes were made

The first two developments that attracted the requisite debt and equity capital almost immediately ran into the classic hurdle. The hurdle that demonstrates clearly that development commenced too early: they both ran out of money. That is, they did not understand the cost – both in time and capital – of developing their projects.

They both then ran into the second most common hurdle that fells minerals project developments: they did not understand their resource. Both early mover projects failed to 'get' the brine – their hydrogeological models were not sufficiently accurate (i.e. were not data dense enough) to predict the failure of the aquifer's production profile. And as is almost always the way, they did not under-estimate the production capability of their aquifers. Nope, they of course over-estimated it.

And thirdly, once the 'ships began to list' there was not a captain in the country who could right them. Not only did Australia simply not have this expertise – the country has never produced potash, let alone potash from a solar evaporation development – but Covid put paid to bringing those skilled operators in to assist.

So poor financial estimates weakened by limited understanding of the mining models and resource and a lack of skilled operators.

The outcome

To the rest of the players in the sector who had continued to de-risk their projects with continued technical work on the financial models, the hydrogeological models and the labour model, the tsunami was visible a long way out. But nothing could be done to stop it.

By the time the operators of Lake Way and Beyondie Lakes called time on their folly the damage had been well and truly done. Over a billion Australian dollars has been written off the nascent/collapsed SOP sector in Western Australia. At this stage, the investment community had become tired listening to and following the promises of overly-eager promoters. Those promoters absorbed any capital available to the sector and having blown it up so spectacularly, so publicly, ensured that there was not going to be any more available to the other sector participants: potentially forever, but certainly for this iteration of the minerals development cycle.

As at the date of writing, Lake Way has been rescued from liquidation by a private equity firm from Europe having changed hands for something rumoured was close to 5% of its development cost. Beyondie Lakes is the subject of another rescue endeavour, again at a value approximating AUD0.05 in the dollar invested. In both cases, shareholders have been left with nothing, and the debt lenders have been forced to 'take haircuts' in order to walk away with anything.

Australian Potash has surrendered its mining leases at Lake Wells, and Trigg Mining has re-focussed its exploration efforts on gold in another state. Only Agrimin continues intact out of the pool of pure potash plays. Niobium anybody? ■

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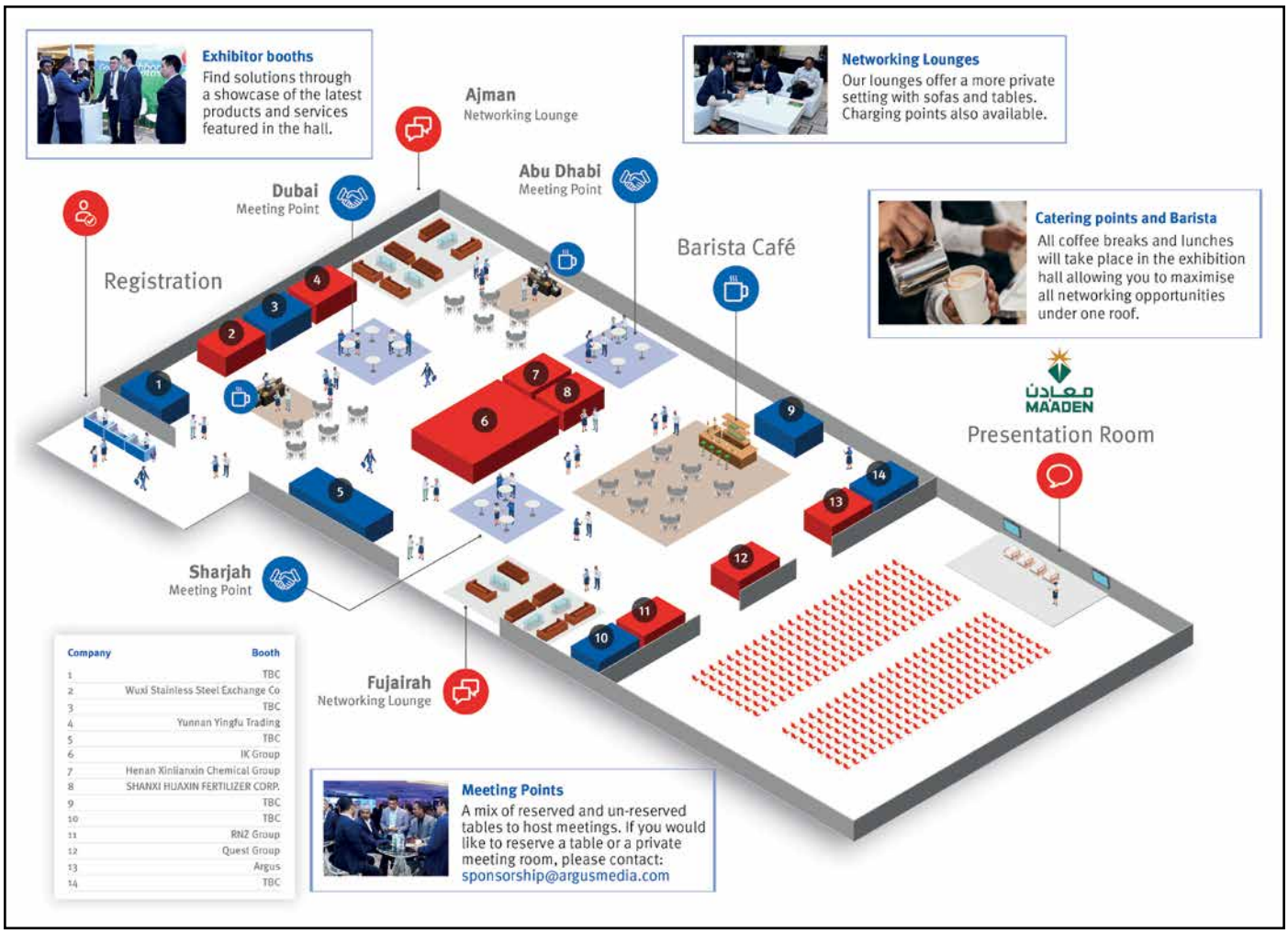

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Tuesday 23 April: Sulphur markets focus day

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- Learn about markets adjacent to sulphur — dive into the relationship between sulphur and phosphate fertilizers and discover opportunities for expansion into new markets, such as metals.
- How does the metals industry work? The hot topic for the sulphur industry, get a focused insight into the metals industry and its views on the use of sulphur. Could competition from this sector affect sulphur availability for agricultural industries?

Wednesday 24 April

- How are fertilizer producers adapting their product offerings to promote sustainable agriculture and ensure food security?
- What role will specialty fertilizers play in the future of the Asia region's development?
- Ags and grains across the Asian continent — how is fertilizer demand evolving alongside major crop production such as rice and palm oil at the country and regional levels?
- **Argus fertilizer fast track — designed for those looking to boost their fertilizer market knowledge with in-person presentations from Argus market specialists.**

Thursday 25 April

- Why do Asian fertilizer producers need to know about the CBAM (carbon border adjustment mechanism) in Europe and why is it integral to the future success and international competitiveness of Asia's fertilizer production and export business?
- How are major international food and beverage companies targeting sustainability and what impact will this have on the Asian fertilizer markets and fertilizer products in demand?
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India: Fertilizer growth perspectives for 2024

Written by

Dr MP Sukumaran Nair, *Industry & Policy Analyst, Director,* ***Centre for Green Technology & Management, India,*** formerly *Secretary to Chief Minister, Kerala State & Chairman, Public Sector Restructuring & Audit Board,* ***Government of Kerala, India***

Unlike other periods in contemporary Indian history there has been no famine in the country for more than half a century. Agricultural production witnessed a steady increase from the 1970's to the present and now stands at 329.7 mn t of grain production. In India, several factors contributed to this big achievement, the foremost among them being the use of mineral fertilizers in the farmlands.

Globally, India is the second largest producer and consumer of fertilizers only after China. As of now, the fertilizer manufacturing industry in India is a robust venture, utilization of installed capacities is good and the profitability of the businesses has improved. The situation was different just five years ago when government subsidies were inadequate and not available to the manufacturing units in time resulting in heavy financial strains to maintain operations of the unit. Frustrated, some of the major players left the scene as they found other investment options more lucrative.

In India, farming and the production of food grains is not a big-ticket business

Domestic production

Urea, DAP, NP and NPK complex fertilizers, ammonium sulphate, potash and single super phosphate (SSP) are the major fertilizer products used in Indian agriculture. India has a high dependency on imported fertilizer raw materials, intermediate inputs and finished products.

The additional urea capacity of 6.5 mn t created through brownfield projects since 2021 has contributed to substantially reduced urea imports. Commissioning of the Talcher fertilizer plant based on coal gasification is scheduled for this year.

In India, farming and the production of food grains is not a big-ticket business being operated at the industry level. Though there are large farm holdings owned by some houses, the bulk of the Indian farmers are small and marginal who cultivate for subsistence and are to sell whatever surplus to the market. Therefore, there is a heavy dependence on government support systems which are available in the form of fertilizer subsidies and a minimum support price for procurement of grain by government agencies.

Food, fertilizer and fuel subsidies constitute a big chunk of government finances in the budgets presented to the parliament every year. Following the Ukraine war and development of a troubled geo-political situation in the Middle East there has been a complete

Table 1. Installed capacity & production of fertilizers

Year	Nitrogen (N) (mn t)				Phosphate (P_2O_5) (mn t)			
	No of plants	Installed Capacity	Production	Capacity Utilization %	No of plants	Installed Capacity	Production	Capacity Utilization %
2021/22	56	15.35	13.87	91.9	119	7.1	4.71	68
2022/23	60	17.28	15.74	95.2	122	7.28	5.01	70.6

Table 2. Production, import and consumption of fertilizers

Year	2021/22 (mn t)				2022/23 (mn t)			
Nutrient	**N**	**P_2O_5**	**K_2O**	**Total**	**N**	**P_2O_5**	**K_2O**	**Total**
Production	13.87	4.71	-	18.58	15.74	5.01	-	20.75
Import	5.38	2.78	1.66	9.82	5.22	3.76	1.46	10.44
Consumption	19.44	7.83	2.53	29.80	20.21	7.92	1.72	29.84

disruption in the fertilizer industry supply chain. Consequently, prices of fertilizer raw materials and finished products went sky high.

Imports of fertilizers

The highest import dependence is for potash for which no domestic sources are available. Efforts are underway to recover potash from spent lye from the sugar industry and from seawater bittern. In the case of phosphatic fertilizers, raw material (phosphate rock), intermediate (phosphoric acid) and finished products (DAP and NPK complex fertilizers) need to be imported from other countries. Available phosphate deposits in Jhamarkotra in Rajasthan contain only a lower P_2O_5 content suitable for making SSP only. Around 30% of the country's urea requirement is also met by imports. Every year the government earmark a sizable quantum of foreign exchange for the above imports.

Fertilizer subsidies

Under the Indian fertilizer subsidy regime, producers are asked to sell fertilizer materials - particularly urea under the Retention Pricing Scheme (RPS) - to the farmers at a price fixed by the government that is affordable to them. The price differential between cost of production together with a reasonable return on investment and the market realization for every tonne of product dispatched from the plants is paid to the manufacturer as a fertilizer subsidy. Urea is the largest fertilizer consumed in India in terms of volume and it comes under the subsidy regime. Phosphate, complex and potash fertilizers have been partly decontrolled from pricing in 1992 and placed under a nutrient based subsidy (NBS) scheme since 2010. A fixed subsidy amount depending on its nutrient content (N, P, K, and S) is allowed for these products. It is revised by the Department of Fertilizers from time to time and thus the government still has a say in fixing the prices of complex and potassic fertilizers.

Following the shift in the geopolitical situation in Europe the cost of domestic production increased heavily and so did the subsidy burden on the government. To sustain production, the Government of India absorbed the price and thus during 2022/23 the subsidy bill went as high as INR2.51 trillion.

Table 3. Fertilizer subsidies

Subsidy budgeted (INR trillion)	2022/23	2023/24	2024/25
Urea Subsidy			
Indigenous	1.253	1.021	1.003
Imported	0.434	0.300	0.226
Nutrient Based Subsidy			
Indigenous	0.500	0.324	0.265
Imported	0.360	0.279	0.185
Total (less recoveries)	**2.513**	**1.889**	**1.641**

The highest import dependence is for potash for which no domestic sources are available

Nutrient efficiency

Even though per hectare consumption of fertilizer nutrients in India is much lower than Japan, China, Egypt and Korea (Rep), the fertilizer use efficiency is lower still. Serious efforts were made to scientifically analyze the nutrient demand of the soil and administer the requisite quantum of nutrients to the crops. The government has issued soil health cards to farmers to promote integrated nutrient management for improving soil fertility and increase productivity. Farmers are advised to use a judicial mix of chemical, organic, bio-fertilizers and other innovative fertilizers as recommended by the soil health card. Together with fertigation, drip irrigation, proactive soil nutrient and water management,

In the present context of advancing decarbonization, existing operators may have to adopt carbon capture sequestration and storage (CCSS)

the fertilizer use efficiency is being improved and wastage of valuable crop inputs is reduced to some extent.

Farmers are also encouraged to use coated, modified, and fortified fertilizer materials for better nutrient administration and to reduce pollution from leaching of nutrients to the environment. Encouragement was also given to the use of secondary fertilizers and micronutrients. Water soluble fertilizers (WSFs) are also produced and marketed by several producers. It dissolves completely in water and the nutrients are more efficiently absorbed by the plant through fertigation. Additional subsidy is provided under the NBS scheme for fertilizers fortified with boron and zinc.

Nano urea and DAP

A major turning point in the Indian fertilizer sector is the development of nano urea and DAP by agriculture scientists. These are nano technology products in liquid form which can be used as foliar spray for top-dressing instead of conventional soil based application of urea and DAP. The country's major fertilizer producer in the cooperative sector IFFCO started industry scale manufacturing of the nanoproducts and that is made available to the farmers. Initial results indicate promising gains from the foliar application of nano products to the crops and its long-term implications are being studied.

Being an agrarian country, India has a large reserve of biomass. The use of biomass for fertilizer application is being promoted in a big way. Composted municipal waste is also being used widely by Indian farmers. Of late, gasification of biomass to produce ammonia is also being explored by manufacturers.

Decarbonization of the industry

The fertilizer Industry is both energy and carbon intensive. The carbon intensity has been substantially reduced from the shift in the feedstock from coal and liquid petroleum components to natural gas. The Indian industry is highly optimized on the energy consumption front over the years and has incorporated these developments in unit operations, energy conservation, waste reduction, reactor revamp technologies, use of innovative equipment and catalysts, as well as improving overall plant safety. Most of the Indian plants were built prior to 1995, but a number of retrofits and revamps have taken place in each of these plants as part of modernization, energy conservation and efforts to better safety and environmental aspects.

In the present context of advancing decarbonization, existing operators may have to adopt carbon capture sequestration and storage (CCSS) or other technologies to fall in line with the national agenda towards net zero emissions. In the coming years, water electrolysis using renewable power to produce green hydrogen is slated to become the technology for ammonia synthesis. India's National Green Hydrogen Mission (NGHM), National Solar Mission, National Bioenergy program, Ministry of Renewable Energy and Bureau of Energy Efficiency are partners in this pioneering program.

Serious carbon reduction programmes are already being taken up by the world's most renowned fertilizer producers across the globe and the Indian industry has also to fall in line with the above to ward off the adverse impacts of climate change.

Outlook for the sector

Fertilizer is a strategic input to agriculture and therefore it is still one of the prime considerations of the government. The industry, which was mostly a public sector activity in the 1980s, is now dominated by the private sector due to a change in the Government of India's public policy towards state owned industries. The government has made serious attempts to disinvest the public sector fertilizer units, but so far has not succeeded. Of late, the disinvestment of the public sector fertilizer units is not a priority item.

Decarbonization of the industry to produce green fertilizers will certainly add on to the cost of production which can be overcome by diligent application based on the 4R concept (right source, right rate, right time, and right place) and by increasing nutrient efficiencies.

The Indian population now stands at 1.43 billion and is growing at the rate of 0.92% per annum. Around 68% of the people belong to a working age group and thus India is a young nation. Food demand is going to increase in the coming years and therefore a stable policy for sustainable agriculture duly supported by optimized production, effective delivery and utmost diligence in its use efficiency are extremely important for the country. ■

People and events

CEO for new Agri-Tech Centres announced

In the autumn of 2023 three Agri-Tech Centres – Agri-EPI, CHAP and CIEL – formally announced their intention to merge in April 2024 to form an integrated business spanning the entire agri innovation ecosystem. This position was supported by Innovate UK, who, recognising the importance of the agri industries sector, invited the Centres to develop plans to become an Agri-Tech Catapult. This work is progressing well, and the Chief Executive Officer for the new business has now been appointed – an important step to expedite the successful delivery of the merged business, which will provide a major boost to UK agri-tech.

Dr Peter Quinn, Chair of the Transition Board responsible for the merger and the future Agri-Tech Centres, said: "I am delighted to announce that Phil Bicknell will be the CEO for the new Agri-Tech Centres business from 1 April. We conducted a comprehensive recruitment process, internally and externally, to identify the best candidate to lead the business. Phil clearly demonstrated his vision for the future, along with the experience, skills and energy he will bring to the role.

"This appointment represents an important step in our process, as we move into the final weeks before the merger. There remains a lot to do, in collaboration with our partners, but our talented teams are looking forward to the opportunity to make a real impact in the future through innovative agri-tech."

Commenting on his appointment, Phil Bicknell, future CEO of the Agri-Tech Centres, said: "The transition to a single agri-tech business is a pivotal move to accelerate innovation for our sector and I feel privileged to have been asked to lead the organisation.

"By combining the Centres' UK-wide capabilities, with their world-class research facilities, investment and innovation expertise and extensive networks, the new business will be a hub for UK agri-tech to thrive. This merger will simplify the landscape, be completely inclusive and make it easier to navigate. That applies to everyone we engage with, here in the UK and internationally - meaning we all work smarter and more efficiently, removing sector and technology silos. It is the catalyst to think about the bigger picture, to challenge our food and farming systems, and to think further forward.

AlgaEnergy and Nutrient TECH welcome Tyler Grenzow as President for North America

AlgaEnergy and Nutrient TECH, both companies fully owned by the De Sangosse Group, have announced the appointment of Tyler Grenzow as their new President for North America. In this pivotal role, Tyler will take responsibility of De Sangosse's nutritional and biosolutions business in the United States and Canada, channeled through both companies, which will unify their efforts and reinforce the position of De Sangosse as an industry leader.

Tyler brings to the team over 25 years of vital experience in the sector, having dedicated the majority of his career to the distribution of plant nutrition products, where he gained a comprehensive understanding and unique insights as the link between agricultural input suppliers and farmers. In the last lustrum, he made a switch towards agricultural input suppliers and worked for well reputed companies covering both nutritional products and biologicals. This combined experience makes Tyler the perfect fit to lead De Sangosse's project of consolidation in the North American region.

Hy2gen welcomes Paolo Donadio as Head of Centre of Competence Engineering

Hy2gen, a global project developer, financier, builder, owner, and operator of plants for the production of renewable hydrogen and hydrogen-based e-fuels, is proud to announce the appointment of Paolo Donadio as the new Head of Centre of Competence Engineering. Donadio, a seasoned professional with extensive experience in the energy sector, joined the Hy2gen team in January 2024.

Donadio expresses his enthusiasm about his new role, saying, "I'm thrilled to start my journey at Hy2gen and look forward to working with this exceptional team of experts. The engineering tasks for the complex plants we are currently planning are challenging. Power-to-X technologies are key components in the energy transition, closing the gap between electrification and burning fuel in a jet or a ship, which makes them so valuable for lowering carbon emissions on a global scale. I'm really eager to contribute my skills to the company and to have the opportunity to shape the energy economy of the future."

Donadio's background includes a degree in Mechanical Engineering, and a decade of experience in the energy sector. His career-highlights include roles at Bertsch as a Construction Manager for power plants, and at INP as Technical Lead in Mechanical Engineering and Project Manager in the Hydrogen sector, focusing on PEM electrolysis. He completed his academic journey with a Master of Science in Engineering from FH Burgenland. ■

Conference review:

The International Fertiliser Society Conference

Written by

Steve Hallam, *Secretary,* ***International Fertiliser Society (IFS), UK***

The International Fertiliser Society (IFS) conference In December 2023, continued the success of the previous year, featuring presentations on crop nutrition, fertilizer production, and related topics. A total of twenty-one papers were presented, along with a panel discussion on the future of commodity fertilizers.

The agronomic papers discussed organic fertilizers, sustainable crop management, wheat protein prediction, and innovative crop nutrient management technology. Production papers covered low-energy urea production, urea prilling, granulation technology, process control, gas detection, N_2O abatement, low-cadmium phosphate fertilizers, and sulphur extraction. Other papers addressed nitrogen recycling, new fertilizer types, emissions reduction and nanofertilization.

Presentation round-ups

Ludwig Hermann from the European Sustainable Phosphorus Platform discussed recycling nitrogen for fertilizers. With the natural gas supply crisis, there's a focus on recycling nitrogen from waste to create "White Ammonia." Various methods exist, such as recycling organic waste in agriculture. However, there are challenges such as nitrogen loss and inefficient use. Possible routes for recycling nitrogen to organic fertilisers which can be stored, transported, applied and used by crops include; biomass production, plasma N fixation, and CO_2 – N fixation in organic materials. The main method to recover nitrogen as mineral fertilizer involves converting gaseous ammonia or nitrogen oxides into acids. But this results in dilute solutions that are hard to recycle, except in specific cases. Concentration technologies face economic obstacles. Extracting ammonia from liquid or gas streams is possible, but compressing it for transport and recycling remains a challenge.

Mike Bradley from the Wolfson Centre for Bulk Solids Handling Technology discussed future fertilizers and their impact on established businesses. The use of bio-based materials is increasing, offering new residue-based fertilizers. These materials have different handling properties, affecting production, storage, and application methods. This shift requires evaluating new options and developments to reduce reliance on primary materials for soil fertilization.

The event provided a wealth of technical information for those involved in fertilizer production and crop nutrition

Soren Husted from the University of Copenhagen discussed the potential of nanofertilization. Despite progress in fertilizer development, poor nutrient use efficiency remains a challenge in agriculture. Conventional fertilizers' inefficiency is due to the chemical properties of plant nutrients. Agriculture needs more effective solutions for sustainable intensification. Nanotechnology offers promising tools for precise delivery of agrochemicals. Recent advances, particularly in biomedical research, can benefit agriculture. The presentation highlighted how nanotechnology has been used in plant nutrition, focusing on hydroxyapatite nanoparticles. It cautioned against overstating nanofertilization's importance, noting limited evidence of its superiority over conventional methods. More high-quality studies with controlled conditions are needed to fully explore nanofertilization's potential.

Chuanbo Gao from Stamicarbon discussed their Ultra-Low Energy Plant Operation. This innovative design significantly reduces steam consumption compared to traditional methods. Two plants in China have been operating with this concept since early 2021, meeting performance expectations.

Marianne Ytterbø from Yara International introduced a digital system for NPK fertilizer production plants. This system records and stores data on successful production batches, aiding plant operators in the future. Yara developed the 'Golden Batch' tool, which monitors and saves successful production runs to help operators maintain high production rates and achieve stable production more quickly.

Simon Bunegar from Grandperspective discussed a system for detecting and locating ammonia and other gas leaks over large areas. Traditional sensing methods struggle to quickly identify and manage accidental ammonia releases. He presented a novel ammonia warning and mapping system implemented in the Chemelot industrial park in the Netherlands. This system uses passive spectroscopic technology (FTIR) to detect ammonia emissions in real-time, providing early warnings and pinpointing the source of the leak. The infrared optical sensing technology automatically monitors large areas around each sensor, covering entire industrial parks with just a few sensors, simplifying the system.

David Inward from SICK AG presented on Nitric Acid Emission Monitoring. Nitric acid production requires monitoring emissions of nitrogen oxides and ammonia to comply with regulations. Additionally, reporting requirements for greenhouse gases add complexity to continuous emission monitoring systems. The unique composition of tail gas from nitric acid production means that conventional emission monitoring methods may not be suitable. Recent advancements in abatement technologies and the implementation of global carbon trading schemes have significantly changed expectations for emissions reporting. This paper examined these evolving requirements and assessed a hot extractive multi-component analyzer for measuring emissions. It found that a single hot wet extractive infrared analyzer, combined with an ultrasonic flowmeter, is well-suited for monitoring emissions from nitric acid production. This technology is flexible and can measure additional components like carbon monoxide, carbon dioxide, and methane if needed for a tertiary N_2O abatement system.

Toon Nieboer from Kreber discussed adding micronized sulphur to urea prills. Kreber tested the prills on three criteria: particle size distribution, bulk crushing strength, and caking tendency. The results suggested that there are potential benefits for commercial-scale processes, though further testing is needed.

Nicolas Van Lierde, Prayon Technologies, discussed simpler, cost-effective methods for obtaining low-cadmium phosphate fertilizers. These methods involve double crystallization and single filtration, which improve process yield and weak acid strength without the need for double filtration. One major advantage is the significant reduction of cadmium content in the final acid through co-crystallization with calcium sulphate. By adjusting process parameters like sulphate excess and solids content, the DA-HF process achieves low cadmium levels in concentrated acid without additives.

Agnes von Garnier, Metso Outotec, Germany, talked about the impact of global trends on sulphuric acid production and pathways to a circular economy for sulphur. Climate change concerns have prompted organizations to rethink energy infrastructure, affecting global commodities like sulphuric acid. With reduced fossil fuel usage, sulphur availability will decline, while acid demand will rise due to population growth and increased metal extraction for the energy transition. Future sulphuric acid production will likely shift to diverse feedstock sources such as metallurgical off-gases and pyrite tailings, requiring digitization, feedstock diversification, and waste avoidance in production processes. Optimizers and monitoring solutions will be crucial for meeting operational targets. ■

Conference review:

Third Summit of the Organic and organo-mineral Fertiliser Industry in Europe (SOFIE3)

Written by

Veronica Santoro, *Brussels Representative,* ***European Sustainable Phosphorus Platform, Belgium*** and
Chris Thornton, *Secretariat,* ***European Sustainable Phosphorus Platform, Belgium***

The SOFIE3 summit in January 2024 brought together the European carbon-based fertilizer sector, after the first and second editions in 2019 and 2023, respectively. The meeting was organized by the European Sustainable Phosphorus Platform (ESPP) with support of EUROFEMA, Fertilizers Europe and International Fertilisers Society.

The conference attracted over 170 participants from industry, regulators, stakeholders and R&D (in Brussels and online) and discussed policies to support organic fertilizers, markets, research and innovation and regulation, in particular:

- European Commission fertilizer supply policies
- Industry, farmers and market perspective for organic fertilizers
- Innovation and agronomy: EU Soil Deal for Europe mission, mineral – organic fertilizers synergy, agronomic value and challenges of organic fertilizers
- EU Fertilising Product Regulation: the guidance document for technical documentation, possible new materials and processes to be included, experiences from Notified Bodies and consultant experts

Policy, market, and industry perspectives

Organic and organo-mineral fertilizers can enter the EU Single Market thanks to the EU Fertilising Products Regulation, effective since July 2022. These fertilizers are recognized for their specific benefits in enhancing crop growth and soil quality. They play a crucial role in improving nutrient use efficiency and recycling objectives, aligned with the Common Agricultural Policy (CAP).

Fabien Santini (European Commission, DG AGRI) reported that the Commission has established the EU Fertilizers Observatory and Agri-Food Data Portal. These platforms gather and provide data on fertilizer supply and prices. Recent data shows a 121% increase in nitrogen (N) fertilizer imports from 2022 to 2023, while phosphate fertilizer imports decreased by nearly 30%. Despite this, fertilizer prices remain 1.5 to 2.0 times higher than in 2020.

These price increases have led to a reduction in the use of nitrogen (N) by 16%, phosphorus (P) by 21%, and potassium (K) by 21% in Europe. However, this reduction has not affected crop yields but has impacted quality, particularly protein content, as noted by Antoine Hoxha from Fertilizers Europe.

While mineral fertilizers incur significant distribution costs, resulting in European farmers paying nearly 50% more than bulk prices, organic waste and manure face even higher expenses. These include processing, pelletizing, local logistics, and transportation costs. Moreover, organic fertilizers have a lower nutrient-to-bulk ratio compared with mineral fertilizers.

To address these challenges, improving the efficiency of manure recycling is crucial. This involves enhancing storage, processing, and application methods. Additionally, there is a need to tackle technical and regulatory hurdles to promote better utilization of recycled nutrients, as highlighted by Dominique Dejonckheere from Copa-Cogeca.

Combining manure with mineral fertilizers

Farmers commonly use organic fertilizers, especially manure, alongside mineral fertilizers in European agriculture. Fresh manure contributes to about half of the N, 65% of P, and 80% of K used in farming, though proportions vary by region. However, a smaller amount of nutrients from sewage sludge and household organic waste is currently recycled.

Long-term studies conducted over 65 years in Germany have demonstrated that combining fresh farmyard manure with mineral fertilizers can enhance crop yields, increase farmers' income, and improve water utilization during rainfall.

Policies should incentivize the use of organic fertilizers and recycled nutrients

According to Lucile Sever from the European Biogas Association, biogas and biomethane production in Europe annually produces 30 mn t of DM/y, containing nutrients equivalent to 15% of the EU's synthetic fertilizer use, with 11% for P and 6% for K, along with approximately 9 mn t per year of stable organic carbon.

Research indicates that a significant portion (70-90%) of the organic carbon in digestate, a byproduct of biogas production, remains in the soil three months after application, which is higher compared to manure or plant residues. However, only about 15% of EU digestate undergoes upgrading processes such as solid-liquid separation, drying, and nutrient recovery, with most being applied to fields without prior processing.

Nutrient losses

The EU Green Deal's "Implementation Plan" (2021) notes that soil organic carbon is declining at an average rate of 0.5% per year, with about 60% of Europe's soils currently deemed unhealthy, a situation worsened by climate change. Nutrient overapplication is common, with Europe's soils harbouring surplus N of around 50 kg per hectare and P of about 2 kg per hectare. This excess leads to nutrient loss, with over half of applied nutrients lost in many regions, posing a risk of eutrophication in surface waters.

Improving soil health and management is critical, and initiatives such as the new EU Soil Monitoring Law, Soil Deal Mission in Horizon Europe, and EU Soil Observatory aim to address this. The Soil Monitoring Law, which includes the objective of achieving healthy soils by 2050, was presented by Kerstin Rosenow of the European Commission DG AGRI.

Organic fertilizers can contribute to soil health improvement, but addressing nutrient management challenges is essential. John Williams from ADAS, UK, highlighted the importance of farmers assessing crop nutrient needs, understanding nutrient sources from manure, plant materials, and residual nutrients in the soil from previous fertilization. Utilizing organic fertilizers presents additional challenges as nutrient availability depends on microbial activity influenced by climate and moisture. Accurate application control requires knowledge of the nutrient and dry matter content of organic fertilizing materials, which can be challenging with manures and slurries. Proper spreading equipment is also necessary for effective application.

Future growth

Combining organic and mineral nutrients is increasingly seen as the best approach to ensure effective nutrient delivery to crops, boost farmers' income, enhance soil health, and reduce nutrient loss, all while promoting nutrient recycling. Despite the availability of extensive knowledge and innovation, there is still room for growth. The EU Fertilising Products Regulation has opened up the EU-wide market for organic fertilizers, but further development opportunities remain untapped.

Policies should incentivize the use of organic fertilizers and recycled nutrients, and there is a need for a comprehensive EU strategy on fertilization that covers both production and use aspects. Research and innovation efforts need to translate into practical applications on farms, and more emphasis should be placed on facilitating the nutrient Circular Economy at the local level.

According to Robert Van Spingelen, President of the European Sustainable Phosphorus Platform (ESPP), the key challenge lies in integrating European expertise and methods with decentralized local production, distribution, and farmer education. This approach will facilitate the adoption of processed organic and organo-mineral fertilizers tailored to precision nutrient management, instilling farmer confidence in their quality and safety. ■

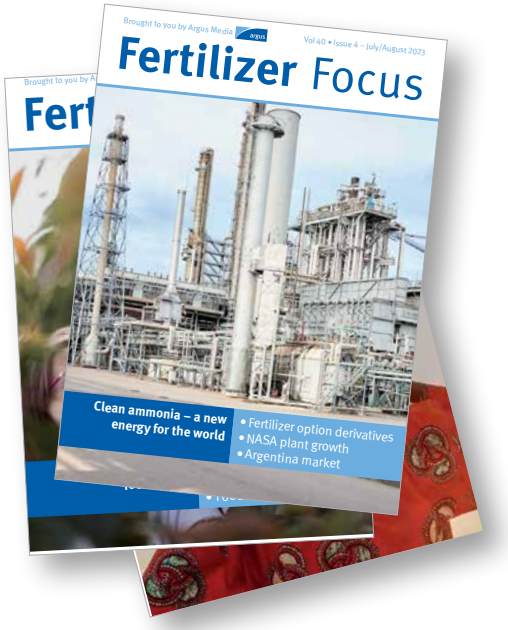
Fertilizer Focus

Media pack 2024

Fertilizer Focus heritage

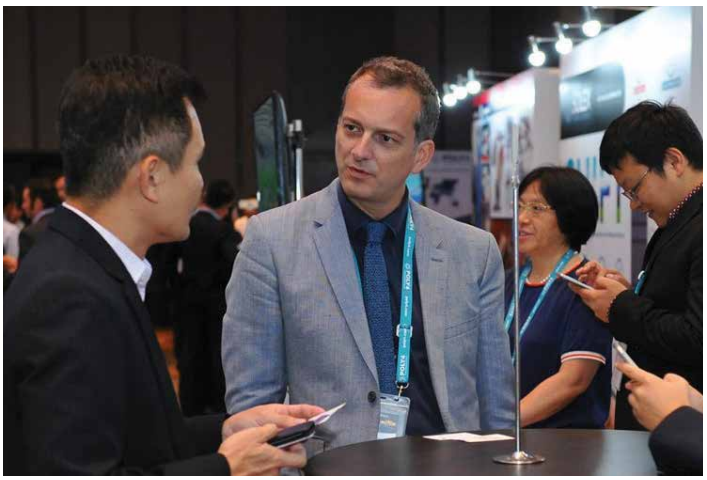
Argus produces the most comprehensive suite of pricing and market intelligence services available to the fertilizer industry

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



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

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



Editorial schedule

January/February issue

Advertising due date - **8 December 2023**

Special Focus - CLEAN AMMONIA

- Key global clean ammonia production hubs
- Market expansion
- Unlocking the hydrogen economy

SUPPLEMENT - LATIN AMERICA

- Infrastructure & logistics in Brazil
- Policies and regulations in Latin America
- The impact of El Nino

March/April issue

Advertising due date - **9 February 2024**

Special Focus - Added Value fertilizers

- Micronutrients as adjusters for plant growth
- Investments in biostimulants
- Adapting strategies to adopt AVFs

SUPPLEMENT - Asia

- Future growth in India
- Phosphate protectionalism policies in Asia
- Laos' emergence as a potash power in southeast Asia.
- What happened to Australia's SOP wave?

May/June issue

Advertising due date - **12 April 2024**

Special Focus - Technological advancements

- Innovations in packing and material handling
- Next generation of plant nutrition
- Digital applications for the fertilizer industry

SUPPLEMENT - AFRICA

- Infrastructure investments
- Copper demand supporting sulphur imports to S Africa
- North Africa: the new price driver for sulphur
- The growth prospects for specialty fertilizers in East Africa

July/August issue

Advertising due date - **7 July 2024**

Special Focus - The fertilizer economy

- Funding new projects
- Hedging tools to de-risk project development
- Fertilizer affordability
- Market opportunities for investors

SUPPLEMENT - Middle-East

- The changing nature of regional nitrogen investment
- Market impact from conflicts
- Rising sulphur production fin the Middle-East

September/October issue

Advertising due date - **9 August 2024**

Special Focus - Fertilizer sustainability

- Decarbonisation progression
- Sustainability investments in Africa
- Revitalizing soil fertility

SUPPLEMENT - Europe

- East Europe capacities
- Importing fertilizers
- European policy update

November/December issue

Advertising due date - **11 October 2024**

Special Focus - FEnhanced efficiency fertilizers

- Advancements for additives and coatings
- NPK processing technology
- New methods for increasing yields

SUPPLEMENT - North America

- Mexico: market overview
- Canada's rail network and the risk of bottlenecks
- Lithium and the increasing in sulphur consumption in North America
- US Inflation Reduction Act impact on nitrogen plant investments

Distribution

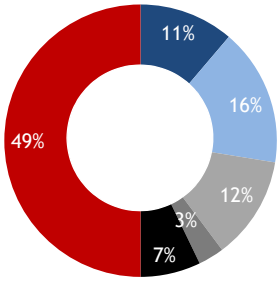
Sector leading digital and hard copy distribution

Published six times a year, the magazine is read by subscribers in over 90 countries. Fertilizer Focus has a unique, best in class distribution, benefiting from Argus' unrivaled presence in the fertilizer sector - **the digital circulation of the magazine in late 2023 was nearly 15,000 - and is growing substantially each month.** Around two thirds of our digital recipients are paying subscribers of Argus fertilizer price reporting and outlook services. This encompasses executives and decision makers in all of the major fertilizer producers, traders, importers and buyers, as well as sector focused financial institutions, shippers, engineering companies, plant contractors, government agencies and trade associations. Our key magazine features are promoted on leading social media platforms (LinkedIn, Twitter, Facebook)

Reader profile

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

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



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

Unique event distribution

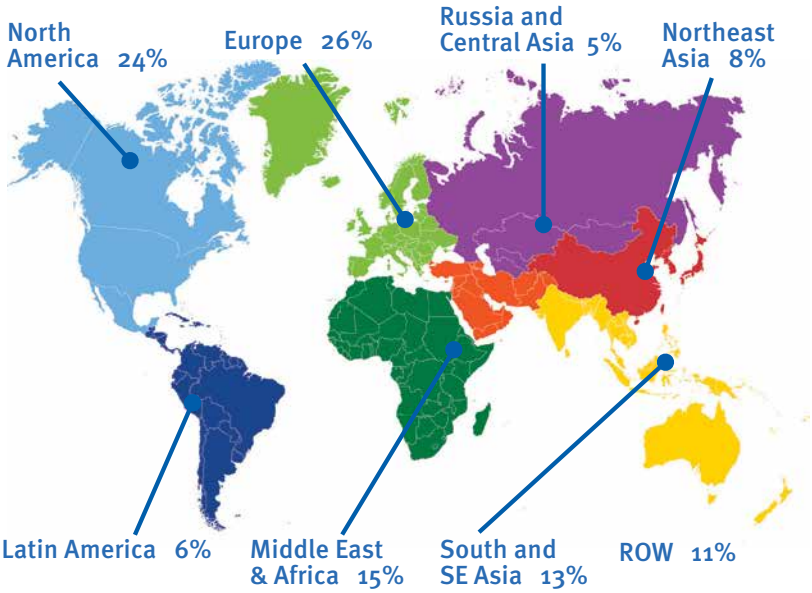
Fertilizer Focus is distributed to every one of the thousands of delegates attending Argus' fertilizer conferences around the world, and available at all of the major global and regional industry events.

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

Global distribution breakdown

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

Regional distribution of Fertilizer Focus recipients



Argus events

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

Global and regional industry events

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

Advertising rates 2024

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

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

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

Advertising specifications

Editorial & advertising schedule 2024	
Edition	**Due date**
January/February	8 December
March/April	9 February
Maj/June	12 April
July/August	7 July
September/October	9 August
November/December	11 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)

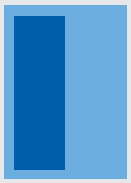
The above will ensure your advertisement appears in the best possible quality, however if you are unable to supply as a PDF we will accept a 300dpi JPEG or TIFF file in CMYK colour format.

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.

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

Fertilizer Focus

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

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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 **Stefan Worsley:**

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SPECIAL FOCUS: TECHNOLOGICAL ADVANCEMENTS

- Innovations in packing and material handling
- Next generation of plant nutrition
- Digital applications for the fertilizer industry

SUPPLEMENT: AFRICA FOCUS

- Infrastructure investments
- Copper demand supporting sulphur imports to S Africa
- North Africa: the new price driver for sulphur
- The growth prospects for specialty fertilizers in East Africa

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Timely, accurate and dependable price assessments, news and analysis for the agriculture markets

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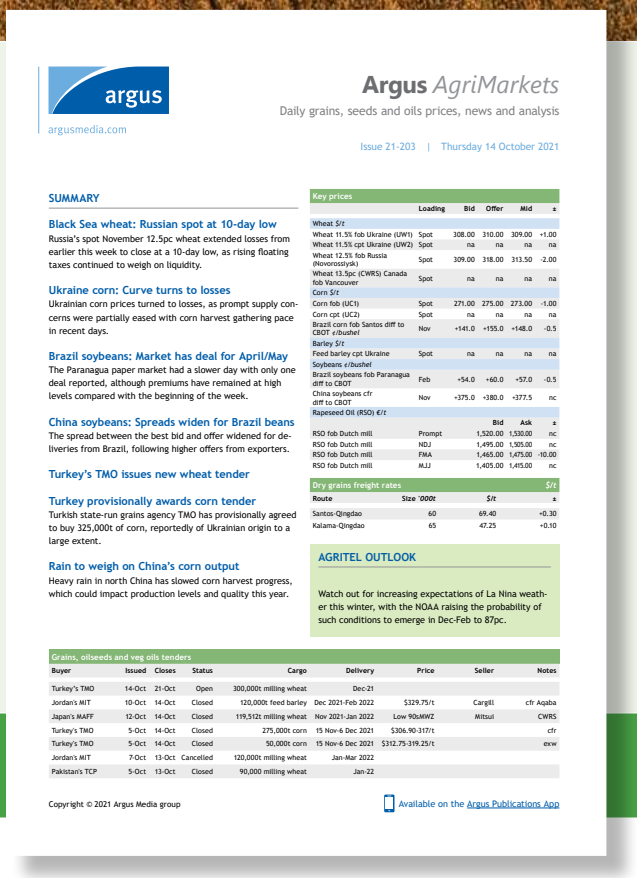
  - Ukraine wheat market
  - Ukraine corn market
  - Ukraine Barley Market
  - Russia wheat market (spot prices only)
- **Brazil soybean and corn - news, insights and prices**
- **China soybeans market**
- **Global news and key market developments**



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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 Paranagua 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	±
Wheat $/t					
Wheat 11.5% fob Ukraine (UW1)	Spot	308.00	310.00	309.00	+1.00
Wheat 11.5% cpt Ukraine (UW2)	Spot	na	na	na	na
Wheat 12.5% fob Russia (Novorossiysk)	Spot	309.00	318.00	313.50	-2.00
Wheat 13.5pc (CWRS) Canada fob Vancouver	Spot	na	na	na	na
Corn $/t					
Corn fob (UC1)	Spot	271.00	275.00	273.00	-1.00
Corn cpt (UC2)	Spot	na	na	na	na
Brazil corn fob Santos diff to CBOT ¢/bushel	Nov	+141.0	+155.0	+148.0	-0.5
Barley $/t					
Feed barley cpt Ukraine	Spot	na	na	na	na
Soybeans ¢/bushel					
Brazil soybeans fob Paranagua diff to CBOT	Feb	+54.0	+60.0	+57.0	-0.5
China soybeans cfr diff to CBOT	Nov	+375.0	+380.0	+377.5	nc
Rapeseed Oil (RSO) €/t					
			Bid	Ask	±
RSO fob Dutch mill	Prompt		1,520.00	1,530.00	nc
RSO fob Dutch mill	NDJ		1,495.00	1,505.00	nc
RSO fob Dutch mill	FMA		1,465.00	1,475.00	-10.00
RSO fob Dutch mill	MJJ		1,405.00	1,415.00	nc

Dry grains freight rates $/t

Route	Size '000t	$/t	±
Santos-Qingdao	60	69.40	+0.30
Kalama-Qingdao	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	Issued	Closes	Status	Cargo	Delivery	Price	Seller	Notes
Turkey's TMO	14-Oct	21-Oct	Open	300,000t milling wheat	Dec-21			
Jordan's MIT	10-Oct	14-Oct	Closed	120,000t feed barley	Dec 2021-Feb 2022	$329.75/t	Cargill	cfr Aqaba
Japan's MAFF	12-Oct	14-Oct	Closed	119,512t milling wheat	Nov 2021-Jan 2022	Low 90s/MWZ	Mitsui	CWRS
Turkey's TMO	5-Oct	14-Oct	Closed	275,000t corn	15 Nov-6 Dec 2021	$306.90-317/t		cfr
Turkey's TMO	5-Oct	14-Oct	Closed	50,000t corn	15 Nov-6 Dec 2021	$312.75-319.25/t		exw
Jordan's MIT	7-Oct	13-Oct	Cancelled	120,000t milling wheat	Jan-Mar 2022			
Pakistan's TCP	5-Oct	13-Oct	Closed	90,000 milling wheat	Jan-22			

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