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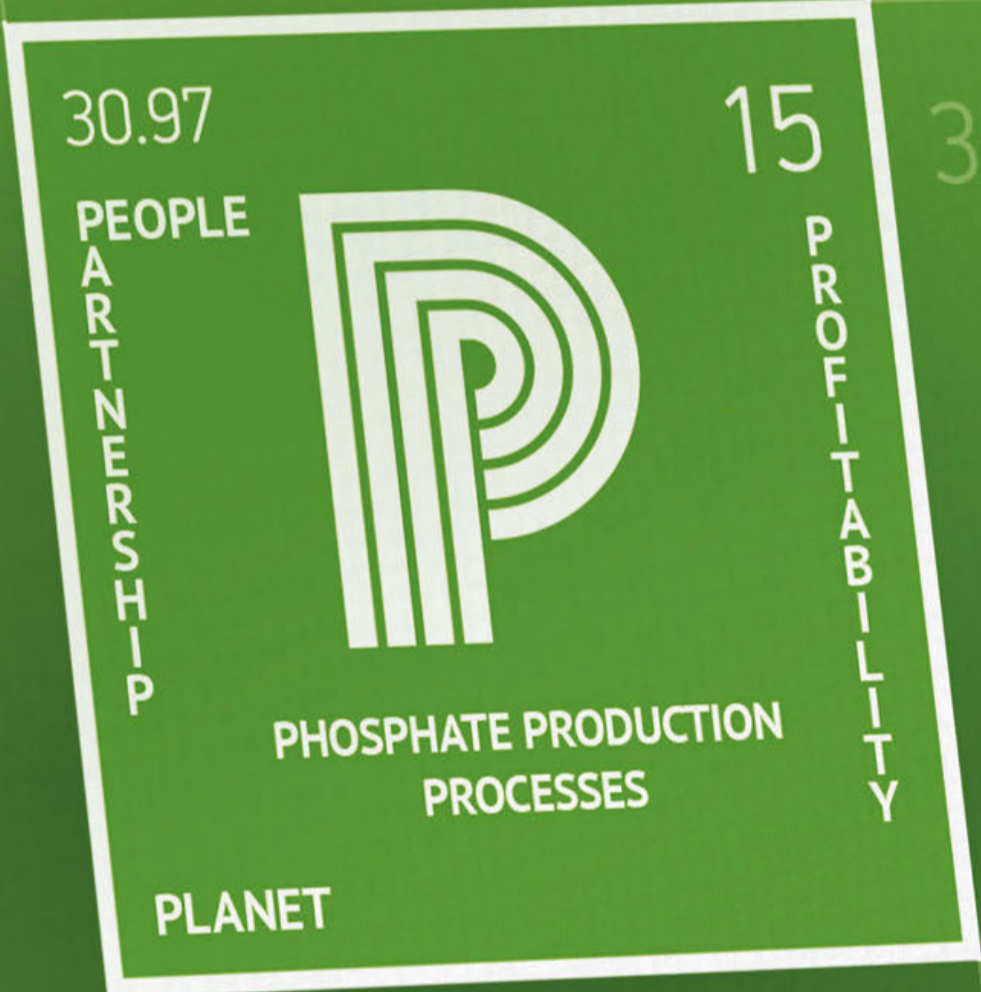


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SINCE 1921.**

1 47
2 48
3 49
4 50
5 51
6 52
7 53
8 54
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12 58
13 59
14 60
15
16
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18
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31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46

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1	47
2	48
3	49
4	50
5	51
6	52
7	53
8	54
9	55
10	56
11	57
12	58
13	59
14	60
15	
16	
17	
18	
19	
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29	
30	
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	
44	
45	
46	



Cover: The Itaipu Dam on the Brazil-Paraguay border. PHOTO: CASALE



13

Will US tariffs shape fertilizer prospects?



31

Latin America's green ammonia projects

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CONTENTS

- 13 The year ahead – fertilizer consumption to set a new record?**
We look ahead at fertilizer industry prospects for the next 12 months, including the key economic and agricultural drivers likely to shape the market during 2025.
- 18 Fertilizer Latino Americano welcomes you to Rio!**
CRU will host the 2025 Fertilizer Latino Americano conference at the Windsor Oceanico Hotel, Rio de Janeiro, 26-29 January 2025.
- 21 Brazil's National Fertilizer Plan – the wider strategy**
Bruno Dias Ferreira, Pedro Veillard Farias, Tiago Nunes de Freitas Dahdah, Bernardo Silva, Guilherme Almeida Machado and Jose Carlos Polidoro explain how Brazil is planning to consolidate its position as a global leader in sustainable agriculture.
- 26 BioConsortia – the uniquely positive biologicals company**
California-based biologicals company BioConsortia is launching the nitrogen-fixing product Always N for 2025 season sales in New Zealand with its partner Mosaic. Fertilizer International spoke with Marcus Meadows-Smith, the company's CEO, ahead of Fertilizer Latino Americano 2025.
- 28 Latin America's value-added fertilizer market and ag innovation**
Value-added fertilizers (VAFs), long operating in the shadows of traditional fertilizers, have emerged as a powerful force in the region's agricultural transformation. Vatren Jurin of DunhamTrimmer explains more.
- 31 Latin American low-carbon ammonia projects**
Latin America has become a desirable destination for green ammonia projects. Ahead of Fertilizer Latino Americano 2025, Fertilizer International discusses regional green ammonia project prospects with leading players ATOME, Casale, Atlas Agro and Stamicarbon.
- 44 Maximising soybean crop yields**
Soybean cultivation in Brazil, the US and other countries requires large applications of potash and phosphate. Growers are, however, increasingly turning to biostimulants and micronutrients such as boron to achieve incremental yield gains.

PHOSPHATES AND POTASH INSIGHT

- 52 P & K management in soybean/corn rotations**
Dr Karl Wyant, Nutrien's Director of Agronomy, outlines how the phosphorus, potassium and sulphur removed during soybean/corn rotations in Brazil and the US are best replenished.
- 55 Van Iperen's Green Switch journey**
Van Iperen International is pursuing an ambitious sustainability strategy to cut its carbon footprint by 50%. In a partnership with Cinis Fertilizer, the company recently introduced GreenSwitch® Potassium, a sustainable potassium sulphate (SOP) fertilizer produced from industrial residues.

REGULARS

- 4 Editorial**
CRU's top fertilizer calls for 2025
- 5 Market Insight**
- 8 Industry News**
- 12 People & Calendar**
- 58 Index to advertisers**

CRU's top fertilizer calls for 2025



1	47
2	48
3	49
4	50
5	51
6	52
7	53
8	54
9	55
10	56
11	57
12	58
13	59
14	60
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	
44	
45	
46	

“There is huge risk almost everywhere we look. With that in mind, our predictions for 2025 focus on what we can say with the highest degree of certainty in a very uncertain world.”

As a tumultuous year draws to a close, it has become traditional for CRU's fertilizer team to make a few predictions for the year ahead.

There is huge risk almost everywhere we look. Events in the Middle East have dominated the headlines over the last 12 months, Russia's war in Ukraine is ongoing, and a new US President is poised to shake up world trade with blanket import tariffs. With that in mind, our predictions for 2025 focus on what we can say with the highest degree of certainty in a very uncertain world.

No additional duties on Russian fertilizer into Europe. Russian imports into Europe have increased this year. But they remain well within historical norms at around a third of all imports into the EU. We do not think restrictions on Russian fertilizer imports into Europe will be imposed in 2025 – although, with Poland taking on the European Council presidency in January, noise on this topic is likely to increase.

The flood of ammonium sulphate (AS) will continue. The consistent growth in caprolactam-based AS capacity in China has seen the country's exports rise ever higher at around 20% year-on-year. In 2025, we expect AS exports from China to exceed 17 million tonnes, equivalent to around 80% of total global AS exports.

The new Trump administration will impose US trade tariffs. We do not forecast what those tariffs will be. But we think there will be an impact on fertilizer supply and demand – both in the US market and globally. Tariffs will take a bite out of US fertilizer demand in the second half of this year, in our view. Fertilizer imports into the US will become more expensive as a result, with tariffs also reducing the competitiveness of US agriculture.

China will lower urea export barriers (eventually). We expect China to step back into the urea export market in the second half of the year, with exports resuming once urea's peak period for spring application has passed. Going forward, we also expect China's diammonium and monoammonium phosphate (DAP/MAP) exports to be structur-

ally lower in 2025 – although restrictions will not be as tight as those imposed on urea.

More European nitrogen consolidation and closures. Europe's nitrogen producers will remain under pressure in 2025. Pricing of natural gas and ammonia in Europe will incentivise ammonia imports over production, particularly in the year's second half. Consequently, some producers will switch off ammonia production in favour of imports.

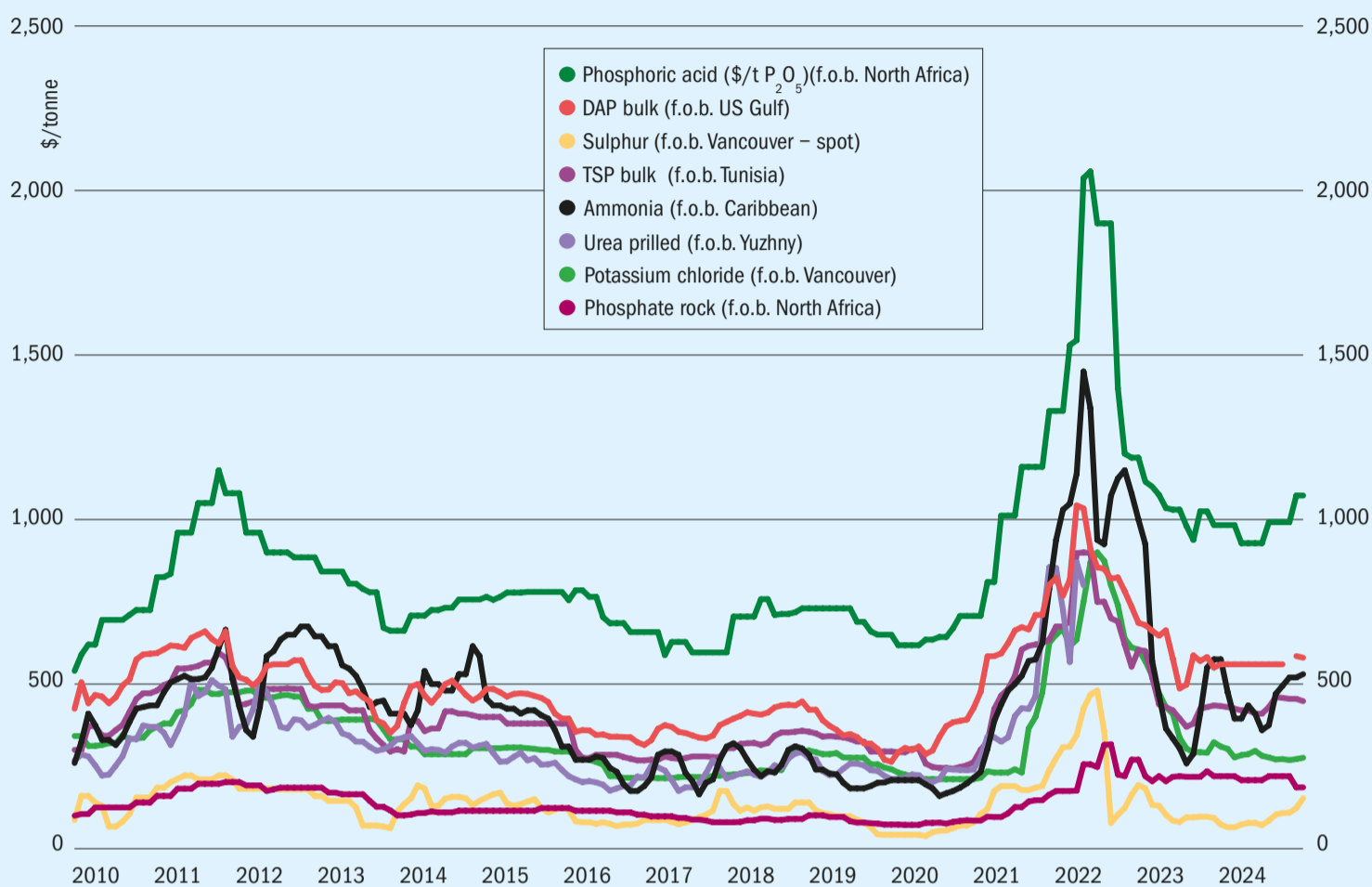
Phosphate pricing to spur investment. Granular phosphate prices are now so high they have intersected with our long-run marginal cost (LRMC) for DAP. This means they are high enough at present to recover the capex on new production plants, a situation CRU expects to continue for the next two years. This should incentivise producers to invest in new greenfield capacity outside Saudi Arabia and Morocco – with some good reasons to invest in the US and Australia, for example.

China to ramp up its international potash investments. China's reliance on muriate of potash (MOP) imports is on the rise. Indeed, CRU now has around nine million tonnes of Chinese-backed potash investments in its 'probable-case' forecast – with a large chunk of that likely to enter our 'base-case' forecast. Chinese-backed investment in Laos, for example, will see the country's MOP capacity rise to more than five million tonnes from next year, making Laos a bigger producer than both Germany and Israel. China is also looking further afield at potash investments in Thailand, Republic of Congo and even in Spain.

Blue ammonia continues advancing. Greenfield blue ammonia projects will come into production over the coming years in the US and Qatar, along with some brownfield retrofit operations using carbon capture and storage (CCS) in the US. The project pipeline supports our call that blue ammonia will be the focus of investments for the next few years. Green ammonia development will most likely focus on China. CRU thinks many green ammonia cost estimates are too low. Some green ammonia projects currently on the drawing board will therefore not progress in our view. ■

Market Insight

Historical price trends \$/tonne



Source: CRU

PRICE TRENDS

Market snapshot, 2nd January 2025

Urea market starts year on positive note.

In India, National Fertilizers Limited's latest import tender secured only 187,000 tonnes of urea, just a fraction of the 1.5 million tonnes NFL was seeking. Market sentiment remains firm despite this, with the lack of sales to India being seen as a bullish sign. Interest from Turkish buyers, for example, with bids at up to \$330/t f.o.b., allowed Baltic Sea suppliers to ignore Indian demand. In a similar move, SIUCI made a successful sale out of Oman at \$375/t f.o.b..

The New Orleans market has been lacklustre over the festive holiday, but has rallied back to \$333/st f.o.b. NOLA since. This price falls way short of what can be attained in the Middle East, in India and elsewhere. Even Brazil has edged ahead of NOLA again.

Brazilian prices, while they have risen to \$370/t cfr, have so far fallen short of the \$375-380/t cfr offered by some. Egypt

has managed to trade with Europe at up to \$403/t f.o.b., although the region has remained relatively quiet.

Ammonia little changed outside Tampa settlement. Ammonia prices were largely unchanged in the first week of the New Year with some participants not yet back at their desks. Many in the market expect higher supply to begin to weigh on prices in the weeks ahead – with the decline in the Tampa settlement, down \$32/t to \$538/t cfr for January pointing the way.

Northwest Europe's spot price remains assessed at \$610-620/t cfr currently. Offers from Algeria, meanwhile, are now at \$550/t f.o.b., down around \$10/t from late last year.

Phosphate prices steady as China exports still restricted. Global spot market activity for DAP/MAP was limited at the start of the year, although tight availability remains a concern while China's export restrictions remain in place. In China itself, export restrictions – along with lacklustre domestic demand – have continued to push domestic DAP/MAP prices downwards.

The latest sales tender from Ethiopia's EABC, which closed 23rd December, has been a recent market talking point. This buyer has made a counter offer to suppliers at \$639/t f.o.b. and requested that all cargoes are shipped in January and February, according to sources.

While India's government has extended the special package subsidy for DAP, this has not changed market fundamentals. Elsewhere, prices for MAP barges at New Orleans declined further in early January while DAP prices inched up – the upshot being that MAP's price premium over DAP has now almost gone.

Potash prices firm in SE Asia, Brazil. The Brazilian and Southeast Asian markets have paved the way for higher potash prices, despite sluggish demand entering the New Year.

Brazil's potash prices increased to \$305-310/t cfr. This increasing price trend may be hindered by high stock turnover and the persistent weakness of the Brazilian Real.

In Southeast Asia, standard MOP prices firmed \$10/t to an average of \$300/t cfr

Market price summary \$/tonne – early January 2025

Nitrogen	Ammonia	Urea	Ammonium Sulphate	Phosphates	DAP	TSP	Phos Acid
f.o.b. Caribbean	500	-	f.o.b. E. Europe 231	f.o.b. US Gulf	580	-	-
f.o.b. New Orleans	-	365	-	-	-	-	-
f.o.b. Yuzhny	Port closed	Port closed	-	f.o.b. N. Africa	600	448	1,073
f.o.b. Middle East	415	349	-	cfr India	634	-	1,060
Potash	KCl Standard	K ₂ SO ₄	Sulphuric Acid		Sulphur		
f.o.b. Vancouver	282	-	cfr US Gulf	143	f.o.b. Vancouver	153	-
cfr India	284	-	-	-	f.o.b. Arab Gulf	165	-
f.o.b. Western Europe	-	601	-	-	cfr China	184	-
f.o.b. Baltic	223	-	-	-	cfr India	183	-

Prices are on a bulk, spot basis, unless otherwise stated. Phosphoric acid is in terms of \$/t P₂O₅ for merchant-grade (54% P₂O₅) product. Sulphur prices are for dry material. n.a. = not available.

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– its highest level since April 2024. The majority of producers were looking for prices above \$300/t cfr as 2025 began. Chinese potash market sentiment remained firm, with port wholesale prices rising in the first week of January.

Sulphur prices decreased in China but flatlined elsewhere. Delivered sulphur prices into China decreased as January began. Elsewhere, other benchmarks remained flat with limited transactions taking place due to new year celebrations.

Demand has remained subdued and most markets are seeing stable prices. Weak demand has kept prices from fluctuating. In India, for example, while demand in Brazil is not expected to return until the middle of January once prices decrease. Spot prices in the Middle East also remained unchanged, despite slight increases in the monthly prices released by Kuwait and Qatar.

China’s price decreased to \$182-185/t cfr following reports that the country’s buyers were reluctant to consider prices above \$185/t cfr. This has come at a time when the price difference between domestic port stocks and international cargoes has widened.

OUTLOOK

Urea less bearish. Shaking off December’s bearishness, the short-term forecast for urea has been revised higher on renewed demand in Europe, ongoing activity in India and production curtailments in Iran.

The backdrop to rising global urea prices remains the total absence of China from the export market. Indeed, CRU does not expect Chinese urea supply to reach international markets before July.

India ended 2024 with 6.5 million tonnes of urea stocks, lower than last year’s closing stock of 7.3 million tonnes. Availability for the next India import tender will depend timing and competition for tonnes from Australia, Thailand and the US, which is expected to be fierce.

Ammonia prices to extend declines. Having reached their 2024 peak in last year’s first quarter, ammonia prices appear to have turned a corner and should (for the most part) extend their declines over the next six months.

Support for prices west of Suez should remain limited during 2025’s first half, with most benchmarks expected to bottom out around June-July, moving in line with seasonal norms.

East of Suez, the Middle East benchmark is also set to undergo declines during January-June, with output having vastly improved since Ma’aden concluded lengthy maintenance works. Although prices have held in the low-\$400s/t f.o.b. for several months, a lack of demand from the Far East and only modest interest from India should see prices decline over the next two quarters.

Phosphates steady. While relatively steady prices are expected throughout the first quarter, some slight declines are likely in the second quarter as supply improves.

In India, stocks remain relatively low with potential for off-season demand to add price support. Still, buyers remain sensitive to prices and are likely to limit purchases, given that import margins remain heavily negative at current prices and under existing subsidy levels.

Fresh export agreements from China are expected to remain minimal during the first quarter, as authorities seek to

push domestic prices down to an acceptable level. The lack of China exports will add further support to bullish global market sentiment. Exports from China should pick up in the second quarter, however, giving buyers another supply option.

Upwards trajectory for potash. The bullish market sentiment of recent weeks is expected to persist in 2025, with spot prices set to rise modestly in the months ahead. Affordability is expected to drive the market, with 2025 consumption projected to slightly outpace last year’s demand. Producers have held their ground on offers heading into the new year, with the opportunity of hiking prices after a year of lows.

Brazil’s spot MOP price – in the \$305-310/t cfr range at the end of 2024 – is forecast to rise gradually over the next six months, culminating in a high of \$315/t cfr in June. In the Southeast Asian potash market, CRU expects the average standard MOP price to rise steadily from \$300/t cfr in January to a high of \$308/t cfr in June.

Sulphur prices set to decline. Despite recent price increases, subdued demand is expected to drive sulphur prices down during the first half of 2025.

In the Middle East, prices are forecast to peak at around \$167/t f.o.b. in January and then decline to an average of \$147/t f.o.b. in February and \$125/t f.o.b. around April. The January price for product into China has been revised upwards to \$183/t cfr, with prices then expected to decline to an average of \$147/t cfr by April before rising again to \$152/t cfr in May.

In Brazil, prices are forecast to remain around their current \$182/t cfr level during January before declining – in line with other benchmarks – to around \$164/t cfr in February and \$141/t cfr by April. ■

1	47
2	48
3	49
4	50
5	51
6	52
7	53
8	54
9	55
10	56
11	57
12	58
13	59
14	60

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BRAZIL

Petrobras resumes Tres Lagoas fertilizer unit construction

Brazil's state-controlled oil company Petrobras plans to resume construction of its UFN-III nitrogen fertilizer unit in Tres Lagoas, Mato Grosso do Sul state.

The company's board of directors approved the restart at the end of October. The unit has been mothballed for more than a decade.

UFN-III was initially scheduled to become operative in 2015. But work was halted in 2014 when the unit was around 80% complete. Attempts by Petrobras to sell the unit in 2022 subsequently fell through.

The company has now earmarked an investment of BRL 3.5 billion (\$614 million) to complete the unit – working to a new start-up date of 2028. The company is also investing \$159 million to restart its Araucária Nitrogenados SA (ANSA) plant in Paraná, as well as resume UFN-III construction.

The ANSA plant has been mothballed since 2020. Petrobras announced the investment to return the nitrogen unit to production in August 2024 with operational resumption now expected in May 2025.

The board-level commitment to complete UFN-III and restart ANSA is part of a five-year strategic plan by Petrobras to



Yara and Petrobras representatives at a technical cooperation signing ceremony in November.

invest in fertilizer assets – part of a wider \$20 billion package for refining, transportation, commercialisation and petrochemicals.

To help deliver on its fertilizer sector ambitions, the company is exploring a new partnership with Yara International, as well as working with Brazil's agriculture research centre Embrapa to develop renewable feedstocks for lower-carbon fertilizers and biofuels.

The potential partnership with Yara is based on two agreements linked to the return of ANSA to production.

In the first agreement, ANSA will produce automotive liquid reducing agent (ARLA 32) for the domestic market, initially using Yara's high-quality automotive grade urea as a raw material. Eventually, ARLA 32 will be produced using urea generated on-site by ANSA itself, once production at the unit restarts.

The second technical cooperation agreement involves joint studies covering fertilizer and industrial products, decarbonisation projects, emissions reduction, and the production of renewable and low-carbon fertilizers. ■

UNITED STATES

EPA backs phosphogypsum road project

The US Environmental Protection Agency (EPA) has approved a pilot road construction project at Mosaic's New Wales production complex in Polk County, Florida.

Mosaic is proposing to build four test road sections, each one incorporating different amounts of phosphogypsum (PG) as an aggregate in the road base. For decades now, the company has generated large quantities of phosphogypsum as a by-product of phosphoric acid production.

It is typical practice in Florida to store this PG in large-scale stacks that need to be carefully maintained and managed. Environmental groups in the state have, however, long opposed using phosphogypsum – which is mildly radioactive – in road projects, arguing that this creates unacceptable risks to the health of road construction workers and water quality.

However, the EPA has concluded that the project will be safe, although this conclusion and the Agency's approval applies to the pilot project only and not to any broader use in Florida road construction. "Results from multiple modeling efforts indicate that risks due to the proposed pilot project are low," the EPA notice said.

Project risks had been properly scoped, in the Agency's view, with potentially affected individuals identified.

"EPA believes that it is most appropriate to consider the potential risk to site workers and the nearest residents to the site when determining whether the pilot project is as protective as leaving the phosphogypsum in the stack. None of the comments raised topics which EPA did not consider in its technical evaluation or lead to a concern for human health or environmental impacts not previously considered," the EPA notice added.

While the EPA was deciding whether to approve Mosaic's project proposal, state legislators and Governor Ron DeSantis

approved a 2023 bill authorising Florida's Department of Transportation to study the use of phosphogypsum in road projects.

"Upon a determination of suitability by the department, phosphogypsum from phosphate production may be used as a construction aggregate material in accordance with the conditions of the United States Environmental Protection Agency approval for this use," the bill said.

SAUDI ARABIA

Mosaic become Ma'aden shareholder

The Mosaic now owns more than 111 million shares in Saudi Arabian mining company Ma'aden valued at approximately \$1.5 billion.

These were received on 24th December on completion of the sale of Mosaic's 25% interest in the Ma'aden Wa'ad Al Shamal Phosphate Company (MWSPC). The MWSPC was previously a joint venture between Mosaic, Ma'aden and Saudi

Basic Industries Corporation (SABIC).

Mosaic expects to record a fourth quarter 2024 pre-tax gain of approximately \$0.5 billion as a result of the transaction.

"We have enjoyed a long and successful partnership with Ma'aden, and we look forward to continuing our work together under this evolved structure," said Bruce Bodine, Mosaic's president and CEO. "Mosaic now has a transparent value for its investment in Ma'aden and greater capital flexibility in the future."

CHINA

New ammonia plant for Caojing port

Shanghai Huayi Holdings Group is building a 300,000 t/a natural gas-based ammonia project at Shanghai's Caojing port, according to reports at the CNFA ammonia conference in November. The new plant is expected to commission in 2025.

This project is likely to affect Chinese ammonia import demand in future, as its output is destined for domestic consumption by Caojing-based chemical giants such as BASF, Secco, Covestro, Invista and others.

Annual ammonia demand at Caojing is about 500,000-700,000 tonnes currently. CRU therefore expects the commissioning of the new plant, if it goes ahead in 2025 as scheduled, to have a negative impact on volumes of ammonia imported into China.

ALGERIA

Phosphate megaproject launched

The Algerian Chinese Fertilizers Company (ACFC) has launched a \$7 billion integrated phosphate project (PPI) in the country's Tebessa province, according to trade publication *Energy, Capital & Power*.

ACFC was formed in 2022 as a joint venture between Algerian firms Manal and Asmidal, a subsidiary of Algerian energy giant Sonatrach, and Chinese firms Wuhuan Engineering and Tian'An Chemical, a nitrogen and phosphate fertilizer producer. It was set up to develop and exploit the Bled El Hadba phosphate deposit at Djebel Onk, with the two Algerian firms owning 56% of ACFC and the two Chinese companies owning the remaining 44%.

The megaproject includes a large-scale phosphate rock mine with a capacity of 6 million t/a – around 2.5 times greater than Algeria's current national output – extracted from 2.2 billion tonnes of ore reserves. The

CANADA

Jansen megaproject ahead of schedule



The Jansen project is located 140 kilometres east of Saskatoon, Saskatchewan, Canada, and is BHP's most advanced under-development project.

BHP is making faster than expected progress on stage one of its Jansen potash mine project (Jansen S1). The under-construction project, located 140 kilometres east of Saskatoon, Saskatchewan, is now 60% complete.

Under stage one plans, the 4.35 million t/a capacity Jansen mine is expected to produce its first potash towards the end of 2026, following a six-year construction phase. The mine will then take a further two years to ramp-up to full capacity (*Fertilizer International* 515, p54).

Karina Gistelink, BHP's asset president potash, said 2024 had been a good year for the project. Jansen S1's two mine shafts have now been finished, for example, and work on surface structures – such as the mill and railway lines – is well advanced.

"Earlier this year, in around August, we crossed the 50 per cent completion mark on Jansen 1, which is the first stage of the construction of the mine," Gistelink told local media outlet *Saskatoon StarPhoenix*.

The switchover from shaft sinking to underground mining at Jansen also began in late December – with Christoff Kühn, Program Director at BHP, describing this as "another major milestone for Team Jansen" and the project.

"The transition from shaft development to underground mining in the production shaft is testament to the dedication and hard work of our incredible team, as well as the unwavering support from our contracting partners, the local community and the larger BHP business," Kühn said on LinkedIn. "Drum miner one will now cut the lateral connection between the two shafts

before opening up more space underground for our operation to commence our ramp-up."

Gistelink also confirmed that work on BHP's potash export terminal at the Port of Vancouver – where BHP will ship much of Jansen's production overseas – is also on schedule. "We're very well on track as well to refurbish an existing coal port into a potash port," she said.

Gistelink said BHP's board of directors gave the go-ahead for Jansen's second stage (Jansen S2), which is five percent complete, largely because of how well Jansen S1 was going. "Our board got really comfortable and got really excited about the prospect of building the largest mine here in Canada in potash," she said.

The \$18 billion project is currently on budget. BHP has been able to fend off inflationary pressures and keep costs down because of its joint venture with the contractor, and by also spending \$4 billion on local procurement to save on transportation and logistics costs. "We have leveraged the BHP global procurement model as well as the very well-established local supply chain," Gistelink said.

85 percent of the potash mined at Jansen will be sold and shipped overseas, while the remaining 15% will primarily go to the United States. "We'll target the key markets, such as Brazil, Southeast Asia, but also India, China and, where possible, also the more mature markets such as Europe," Gistelink said.

BHP is relying on new technology to control Jansen's production costs and guard against increasing competition from Eastern European and Southeast Asian potash suppliers. "We will be the lowest-cost producer here in Canada," said Gistelink. ■

scale of this deposit should guarantee a mine life of around 80 years.

The ACFC is also proposing to construct a state-of-the-art production and processing complex at Qued Kebrik, *Energy, Capital & Power* said, with 21 phosphate processing units also spread across Souk Ahras, Annaba and Skikda.

The project could enter production as early as 2027, according to the current timetable, creating 12,000 construction-phase jobs and 30,000 direct and indirect jobs once operational.

Existing phosphate producer SOMIPHOS is also planning a one million tonne capacity expansion at its Djebel Onk site.

AUSTRIA

LAT Nitrogen pauses fertilizer production at Linz

LAT Nitrogen curtailed fertilizer production at its Linz site on 2nd December. The move was made in response to higher European natural gas prices and weak regional demand for nitrogen fertilizers.

“Due to the current economic situation and the lacklustre and uncertain demand for straight nitrogen products all across Europe, LAT Nitrogen has decided to curtail fertilizer production of CAN, NPK and urea at its Linz site until at least the end of 2024. Contributing to European fertilizer supply security remains our key priority. Therefore, we aim to resume full production as soon as demand and natural gas developments allow,” company sources said.

ANGOLA

KBR secures ammonia plant contract from AMUFERT

KBR has signed an agreement with AMUFERT for the development of a new ammonia plant in Soyo, Angola.

Under the terms of the contract, KBR will provide the technology license, proprietary engineering design, equipment and the catalyst for AMUFERT’s 2,300 tonnes per day ammonia plant.

“We are thrilled to be a part of this project and support AMUFERT’s efforts in accelerating sustainable agriculture in Angola through our leading ammonia technology,” said Jay Ibrahim, KBR President, Sustainable Technology Solutions. “KBR has a proud legacy in Angola, and we look forward to working closely with AMUFERT and our partners to ensure the success of this important project.”

UNITED KINGDOM

ICL acquires GreenBest



UK smart fertilizer producer GreenBest was recently acquired by ICL Growing Solution.

Leading speciality fertilizer producer ICL has acquired GreenBest, a UK-based manufacturer of bespoke fertilizers for the horticulture, sports turf, and landscape sectors.

“With over 25 years of expertise in custom manufacturing of advanced granular and liquid nutrition, GreenBest has built a strong reputation for agility and customer-focused solutions,” said Elad Aharonson, president of ICL Growing Solutions. “Its established presence in the horticulture, landscape and turf sectors, combined with a strong distribution network, enhances our ability to deliver sustainable, tailor-made solutions to customers worldwide.”

Tim Le Mesurier, GreenBest’s founder and managing director, said: “The GreenBest team is thrilled to join the ICL family. It will enable us to combine our strengths, expand our innovation capabilities, and provide even greater value to our customers worldwide.”

The acquisition will benefit both businesses, Aharonson said. GreenBest’s established market channels and production capacity will support future growth, he said, while ICL will offer this Somerset-based business extra investment and supply chain efficiencies.

The GreenBest purchase is ICL’s third acquisition of 2024, signalling the company’s commitment to capturing innovation and strengthening its leadership position in its core markets.

Earlier this year, ICL expanded its biologicals portfolio by purchasing Nitro 1000, a Brazilian biostimulants company, and buying-up CAF, a North American provider of bespoke agricultural formulations. All three acquisitions are part of ICL’s strategy to broaden its fertilizer product offering and position itself for growth in adjacent and new markets.

RUSSIA

New Volgograd urea plant planned

Russian chemicals group Volgograd Polymer plans to construct an ammonia-urea production plant within the Khimprom Special Economic Zone (SEZ) near the city of Volgograd, local media reported on 5th December.

The RUB 207 billion (\$2.08 billion) plant will have the capacity to produce two million t/a of granular urea. Initial development is due to start this year, with the plant expected to be commissioned in 2032.

Volgograd Polymer is part-owned (48.75% share) by Russian billionaire Roman Trotsenko, who also retains a 60% share in Azot Group, one of the country’s largest nitrogen fertilizer producers.

CANADA

Stamicarbon wins low-carbon fertilizer plant contracts

Genesis Fertilizers, a farmer-owned consortium, has awarded Stamicarbon contracts covering technology licensing, the process design package (PDP) and the equipment supply for a urea fertilizer plant.

Genesis plans to construct a 2,500 tonnes per day (t/d) capacity urea melt plant at Belle Plaine, Saskatchewan. This is expected to be Canada’s first low-carbon fertilizer plant, thanks to the incorporation of a carbon capture and sequestration (CCS) unit.

The integrated urea and diesel exhaust fluid (DEF) project is currently scheduled to begin operations in 2029, although it is still awaiting a final investment decision. The urea plant will be based on Stamicarbon’s proprietary Adiabatic Flash urea melt technology – part of the company’s NX STAMI UREA™ portfolio – which offers operational efficiency and reliability while minimising process steam consumption.

The production complex will also include a 1,500 t/d capacity DEF unit. DEF, known as AdBlue® in Europe, is a 32.5% high-purity urea solution that reduces NOx emissions from diesel engines. Stamicarbon’s DEF production design – part of the company’s NX STAMI Specialties portfolio – enables any urea plant to directly produce ISO 22241-compliant DEF from aqueous urea solution. The design combines high product quality with lower production costs by eliminating the need for finishing and blending.

The plant’s licensing contract is subject to Genesis Fertilizers making a final investment decision, Stamicarbon said.

Stamicarbon also announced the successful award of a second Canadian contract at the end of December. This covers the supply of a replacement high-pressure urea stripper for Nutrien’s Fort Saskatchewan Nitrogen Operations (FNO) in Alberta.

“These awards highlight Stamicarbon’s leadership in providing efficient urea technology and tailored, high-performance equipment engineered to meet the evolving needs of fertilizer producers,” said Pejman Djavdan, Stamicarbon’s CEO.

First Phosphate Corp to use Prayon technology

Canadian phosphate project developer First Phosphate Corp has signed a phosphoric acid technology licensing agreement with Prayon.

First Phosphate is the owner and developer of the Bégín-Lamarche property in Saguenay-Lac-St-Jean, Quebec, Canada. This rare anorthosite igneous phosphate rock deposit has the potential to yield high purity phosphate products, enabling the company to target the high-value lithium iron phosphate (LFP) battery market.

Prayon’s license covers the production of 600 tonnes per day (P₂O₅) of merchant-grade phosphoric acid (MGA) – as well as the generation of a high-purity gypsum by-product.

First Phosphate has also selected Ballestra, one of Prayon’s official licensees, to fulfil the project’s engineering services agreement. This covers the front-end engineering design (FEED) and engineering, procurement and construction (EPC) services and their management (EPCM) for the project.

First Phosphate already has a supply agreement in place with Norfalco-Glencore, dating from July 2023, to meet the sulphuric acid requirements of the project’s phosphoric acid plant.

“With these technology, engineering and sulfuric acid supply agreements in place, First Phosphate will have the ability to implement a process to convert approximately 500,000 tonnes per annum of igneous apatite originating from its future mining operations into upwards of 190,000 annual tonnes of value-added phosphoric acid,” said John Passalacqua, First Phosphate’s CEO.

“Through the sale of this license, Prayon gives First Phosphate access to a world-renowned technology and highlights its commitment to transforming a critical, strategic material into high-value-added products, while recycling by-products in a well-established circular economy,” said Prayon’s Benoît Van Massenhove.

KAZAKHSTAN

EuroChem fast-tracks Zhambyl fertilizer complex

EuroChem subsidiary EuroChem Karatau plans to quickly complete a new fertilizer manufacturing complex in Kazakhstan’s Zhambyl region, working to a two-year project timetable. Construction is expected to start in March 2025 and finish in February 2027.

The complex includes an 800,000 t/a capacity sulphuric acid plant, a 260,000 t/a capacity potassium sulphate (SOP) plant, and a 200,000 t/a capacity dicalcium phosphate (DCP) plant. Kazatomprom will offtake about half of EuroChem plant’s sulphuric acid output for use in the solvent extraction of uranium. ■

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People



Elad Aharonson will become ICL's new president and CEO on 13th March.

ICL has announced that **Elad Aharonson** will become its new president and CEO, effective 13th March 2025. The company's board of directors approved the appointment on 23rd December. Elad replaces ICL's outgoing president and CEO **Raviv Zoller** who is leaving the company in a planned departure.

Aharonson has been an integral part of ICL's leadership team for nearly four years, having served as president of the company's Growing Solutions business unit since April 2021. During this time, he expanded ICL's specialty fertilizer portfolio and generated sales in new territories – through organic growth and via acquisitions – helping to position ICL as a global leader in the specialty plant nutrition market.

Prior to joining ICL, Aharonson enjoyed a 16-year stint at Elbit Systems, holding various senior management positions – including as executive vice president and general manager of the ISTAR Division. He also served as executive vice president and general manager of Elbit's UAS Division.

"ICL's Board of Directors has confidence that Elad is the right person to head ICL, as his years of service to ICL have been marked by outstanding leadership and performance," said Yoav Doppelt, executive chairman of ICL's board of directors. "Elad has a profound understanding of ICL's business and values, as well as a clear vision for the company's future. We are certain that his leadership will continue to drive ICL's strategy to significantly increase its specialty product offerings, driven by delivering unique value to its customers, and by translating megatrends into innovative businesses."

"Additionally, on behalf of the Board of Directors and the entire ICL team, I want to personally thank Raviv [Zoller] for his dedicated leadership and successful contributions to ICL." concluded Doppelt.

Mayo Schmidt became the executive chairman of the board of directors of Brazil Potash Corp on 6th January. He replaces **Stan Bharti**, who will step down as a company director and chair the company's advisory board instead. Mr Schmidt is the former chairman and CEO of Nutrien and brings to Brazil Potash extensive executive leadership experience in global agriculture, fertilizer manufacturing, and public company governance.

"Mayo's appointment represents a significant milestone in Brazil Potash's corporate development," said Matt Simpson, CEO of Brazil Potash. "His distinguished record building global agricultural businesses and deep expertise in the fertilizer sector are invaluable. We look forward to benefiting from his vast experience as the

Company progresses in its next phases of growth as we aim to build Brazil's premier domestic potash supplier."

Mr Schmidt's career notably includes executive roles at Nutrien, the world's largest fertilizer company, where he served as a board member, as chairman and as transitional president & CEO. In a career highlight, he helped guide the successful merger of Agrium and PotashCorp to form Nutrien in 2018 by chairing the joint committee in charge of the process.

The supervisory board of thyssenkrupp nucera has extended the contract of current CEO **Dr Werner Ponikwar** for a further five years until July 2030.

"Werner Ponikwar has been driving the development of thyssenkrupp nucera as a strong player in the hydrogen market in recent years. Under his leadership, the company successfully completed the IPO in July 2023, established itself in the dynamic and evolving hydrogen market and brought high-technology products to market. His strategic vision and commitment to innovation have been pivotal for thyssenkrupp nucera's growth journey and we are looking forward to continuing our trusting collaboration," said Dr Volkmar Dinstuhl, chairman of the supervisory board.

The board also appointed **Dr Stefan Hahn** as thyssenkrupp nucera's new CFO, effective from the start of March. He replaces **Dr Arno Pfannschmidt** who is retiring. Dr Hahn joins the company from thyssenkrupp AG, where he held various senior positions in the finance & controlling department. ■

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31 MARCH - 2 APRIL

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PHOTO: SIMON INGLETHORPE

The year ahead – fertilizer consumption to set a new record?

The tariff proposals of the incoming US administration are dominating much of the debate over agricultural and fertilizer markets prospects for 2025. Any escalation in regional conflict over the next 12 months, especially in the Middle East, could also imperil commodity markets.

We look ahead at fertilizer industry prospects for the next 12 months, including the key economic and agricultural drivers likely to shape the market during 2025.

Stable yet underwhelming growth

The IMF expects world economic growth to hold steady at 3.2 percent per annum in 2024 and 2025. The outlook for average annual growth over the next five years (2024-2029) at 3.1 percent remains at its weakest level in decades – with the IMF describing this as “a mediocre performance compared with the pre-pandemic average”.

These slightly underwhelming growth prospects were, however, counter balanced by better news on inflation. Indeed, the IMF suggest that the global economy has been unusually resilient during the recent deflationary environment.

“It looks like the global battle against inflation has largely been won,” said Pierre-Olivier Gourinchas, the IMF’s economic counsellor and director of research. “After peaking at 9.4 percent year-on-year in the third quarter of 2022, we now project headline inflation will fall to 3.5 percent by the end of next year [2025], slightly below the average during the two decades before the pandemic.”

The IMF linked the recent inflationary surge to a combination of post-pandemic supply disruptions, strong demand pressures and the sharp spike in commodity prices following the war in Ukraine. Yet with inflation now close to central bank targets in most countries, as these after-shocks have diminished, the path is now clear for monetary easing across major economies, in the IMF’s view.

Looking ahead, Gourinchas warned that a shift to damaging trade and industrial policies could lead to a significant drop in global output, relative to the IMF’s baseline forecast.

“Despite the good news on inflation, downside risks are increasing and now dominate the outlook. An escalation in regional conflicts, especially in the Middle East, could pose serious risks for commodity markets,” he said.

Ag commodities – tariff war expected

2024 has been a year of further price declines for sugar, major grains and oilseeds, Rabobank reported in its annual outlook, while tropical tree crops such as cocoa, coffee, and palm oil experienced a price upside. Consequently, grain and oilseed farmers look set to enter 2025 with narrowing margins – even negative in some cases – against an uncertain geopolitical backdrop.

In its outlook for the year ahead, Rabobank expects a tariff war to start following the change of US government in January 2025. “Many geographies,

technologies, and industries” would be affected, if this were to occur, both creating and destroying “a lot of value in several countries”, in the bank’s view.

“Potential tariffs on imports from China, Mexico, Canada, and many other countries could result in farmers facing an attack on their margins,” said Rabobank. “The US imported \$195bn worth of agricultural products in 2023, including alcoholic beverages, fruits and vegetables, sugar, cheeses, vegetable oils (including used cooking oil), coffee, and cocoa.”

The US was likely to make China the primary target for tariffs, said Rabobank, with used cooking oil imports potentially among the first to be affected.

“When China retaliates, the humble soybean, as the single largest agricultural purchase that China makes from the US, might once again find itself in the cross-hairs. With soy prices down by 25% over the last year, US farmers might not believe their (bad) luck,” Rabobank said.

Significant shifts in agricultural trade would be one likely consequence, according to Rabobank. A new US-EU trade deal, for example, could see Europe’s soy and soymeal sourcing requirements shift away from South America to the US instead.

Rabobank’s headline ag market calls for 2025 are:

Ukrainian agricultural exports to decline.

While Ukraine will continue to ship its exportable grain surplus – barring an increase in Russian attacks on the country’s ports and grain-laden vessels in the

What drives fertilizer demand?

Fertilizer demand is influenced by the complex interplay of many factors – some of which are harder to predict than others. In the short-term, the main drivers of demand include:

- The macroeconomic environment, interest rates, currency exchange rates and farm economics
- Crop prices and fertilizer-to-crop price ratios
- Crop mix, growing areas and crop yields
- Soil nutrient levels and nutrient replenishment
- Policy, regulation and fertilizer subsidies
- Sustainability, nutrient management and nutrient recycling

Many of these factors vary from country-to-country and region-to-region. Adding to the complexity, these primary drivers are in turn influenced by a host of secondary considerations.

Macroeconomic conditions, by triggering slowdowns or expansions in global, regional and national growth, control overall economic demand and affect the health of agricultural markets. **Farm economics** and attendant issues such as working capital, interest rates, credit availability and barter ratios have a more direct impact on the cost of doing business and the ability of farmers to purchase fertilizers.

Crop prices and fertilizer-to-crop price ratios act as key controls on crop nutrient demand as they play a critical role in determining farm buying power and (alongside exchange rates) fertilizer affordability. Crop prices in turn are driven by the **harvest size** annually, **stock levels** and **demand** for agricultural commodities. Fertilizer industry analysts pay particularly close attention to the prices of cereals, oilseeds, cotton, sugar and palm oil, the main fertilizer-consuming crop types globally.

The **biofuels market** is also an important driver of fertilizer demand due to large-scale cultivation of maize and sugarcane for ethanol and oilseed rape (canola) for biodiesel (*Fertilizer International* 474, p22). Crop failures due to extreme weather events such as the **El Niño** (*Fertilizer International* 475, p38) and **La Niña** can also affect fertilizer demand in the short-term.

In its latest short term outlook, the International Fertilizer Association (IFA) also singles out three further fertilizer market drivers¹:

- Trade disruptions
- Sanctions, tariffs and protectionism
- Decarbonisation investment.

Black Sea corridor – the country still faces major challenges, including labour shortages, adverse weather, and low stock levels, even without additional Russian aggression. Rabobank also flags up a major risk of Ukraine hitting Russian ports, these being responsible for roughly 23% of global wheat exports.

Mild La Niña due. A very short and weak La Niña event is expected in 2025 – and may be having impacts already. The significant delay in the return of rainfall in Brazil and the recent dryness in Argentina and the southern US, for example, are typical La Niña weather effects. There could be knock-on effects if the late soybean harvest in Brazil causes delays to safrinha corn planting.

Tariff introduction likely to hit global trade and growth. The global economy in 2024 has managed to combine falling inflation with moderate economic expansion. The prospect of US tariffs, however, risks splintering global trade and financial flows. The potential effects of tariffs on US dollar availability, meanwhile, places those developing nations with high dollar-debt exposure at particular risk. A strong dollar would, though, mean lower prices for all dollar-denominated commodities. In the US, the combination of trade tariffs and tax cuts is likely to push inflation higher, potentially

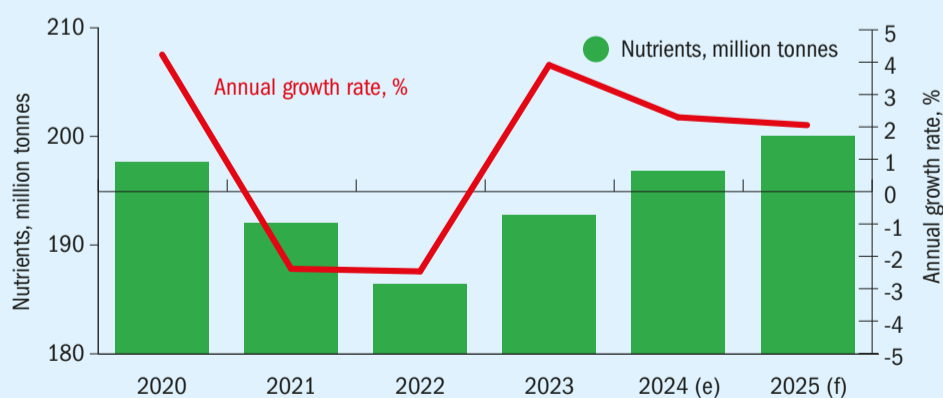
limiting the ability of the Federal Reserve to further reduce interest rates next year.

Mixed climate change impacts on crop yields. Long-term climate change will continue to affect agricultural productivity, with differing impacts across different crops and regions. While warmer temperatures in northern regions are lengthening growing seasons – leading to higher yields – climate trends are having adverse crop production impacts in low latitude regions. Consequently, strong negative effects on corn

yields are projected in future, whereas wheat yields and harvests in high-latitude regions may benefit from higher CO₂ concentrations and expansions to the planting area.

Coffee and cocoa prices set to fall in 2025. Cocoa and robusta coffee prices reached all-time record highs in 2024, while arabica prices peaked at their highest level since 1977. Rabobank expects price declines for these ag commodities in the coming year, as production expands and demand declines to balance the market.

Fig. 1: World fertilizer consumption (nutrient tonnes) and annual growth rate: fertilizer year (FY) 2020-2025



Note: 2024 = estimate
2025 = forecast

Source: IFA (January 2025)

Fertilizer demand – a new high in 2025?

The International Fertilizer Association (IFA) is estimating a modest 2.3 percent rebound in global fertilizer consumption in 2024 to 201 million tonnes of nutrients (N + K₂O + P₂O₅), building on the 4.3 percent recovery in 2023 and following the sharp demand contraction of the two years prior (Figure 1). This was, however, an N and K₂O led recovery with P₂O₅ consumption unchanged year-on-year. In general, farmers benefited from better average potash and nitrogen fertilizer affordability in 2024 – against the backdrop of broadly lower crop prices – but faced more expensive phosphate product purchases, relative to 2023 averages¹.

The mixed picture on affordability in 2024 was accompanied by changes to the global crop area, with fewer hectares of maize and wheat and more hectares of rice, soybeans and oil palm being planted. The US Departments of Agriculture (USD) also reported record US corn yields in 2024¹.

IFA expects the following regional trends to drive up global fertilizer consumption in 2024:

- East Asia drives the recovery through increased K₂O usage by the palm oil producing countries Indonesia and Malaysia – this being linked to higher palm oil prices – as well as higher potash consumption in China
- Higher N use in both East Asia and the Eastern Europe & Central Asia region, driven by India, Russia, China, Indonesia and Ukraine in particular
- P₂O₅ use, meanwhile, declined in Latin America in 2024 due to lower affordability and a decline in Brazilian soybean and corn production, although a rebound in phosphate demand is expected in 2025.

Looking ahead, IFA expects the modest growth rate in global fertilizer demand to continue this year and is forecasting a 2.0 percent year-on-year rise in nutrient use in 2025. An increase by this amount (+4 million tonnes to 205 million tonnes of nutrients) would see global fertilizer consumption rise above pre-pandemic levels to set a new record (Figure 1).

Comparing 2025 to 2020, the previous record year for fertilizer consumption, IFA reports¹:

- Higher demand for N – which has proven itself the most resilient nutrient – with relatively inelastic consumption linked to supportive government policies in many countries
- Slightly higher demand for K₂O driven by better affordability.
- Slightly depressed demand for P₂O₅ due to its lower affordability.

Fertilizer supply – adjusting to disruptions

Previously, following the start of the war in Ukraine in 2022, IFA has relied on a supply metric known as ‘capability’. This estimates actual fertilizer supply by adjusting downwards newly-announced production capacity by factoring in likely disruptions to production output in certain countries. In recent years, supply capability has needed to assess the impact of the following major events on the global fertilizer market (*Fertilizer International* 518, p12):

- The trajectory of Russia’s war in Ukraine
- International sanctions placed on Russia and Belarus

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WHAT ARE FARMERS THINKING?

In its latest *Farmers Insights Survey*, now in its fifth year, McKinsey questioned around 4,400 farmers across nine countries between January-March 2024. Farmers reported five key things:

1. Increased input prices remain a top risk

Despite recent price declines, growers still believe that increases to input costs are the top risk to their profits – with extreme weather now a close second. Indeed, extreme weather and climate are the top risks for Latin American and European growers. Overall, farmers are increasingly concerned about the collective risks to their businesses from extreme weather events, commodity prices and worker shortages.

2. Practices driving input efficiency are up

One highly encouraging survey finding is that practices such as variable rate fertilization and the use of biologicals, controlled-release fertilizers and stabilised fertilizers are on the rise, being driven by a desire to improve yields and reduce production costs. The top three reasons behind the adoption of these sustainable practices were highly commercial too: yield benefits, lower production costs and the generation of additional revenues.

3. More than one-third of farmers use biologicals

McKinsey found that the adoption rate for biologicals among growers globally is above one-third currently and rising. Some 90 percent of farmers expect to maintain or increase their spending on biological products such as biostimu-

lants. What's more, buying behaviour is largely independent of fertilizer price hikes, with almost two-thirds of growers saying will either maintain or increase their expenditure on biologicals, regardless of changes in crop protection and fertilizer prices.

4. Technology adoption rises

Nearly half of growers around the world are using technology in their operations, with adoption on the up. In this year's survey, McKinsey has seen a roughly one-fifth increase in the percentage of growers adopting or willing to adopt technology. This is especially true where farm tech has an operational focus – such as variable rate fertilization.

5. Input distributors are soil health influencers

Farmers globally cited their input providers as key influencers when looking for recommendations on soil health, with these even being ranked as the top advisors in North America and Europe. Growers identify soil health as an increasingly important topic, McKinsey found, with input distributors consistently ranked as the key advisors on this topic.

One key takeaway from the 2024 survey was the way in which farmers are innovating in response to increasing weather and climate risks. McKinsey expects to see greater adoption of new practices and novel products in future, biologicals being one example, with a specific focus on improving soil health. ■

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- The logistical ability of both Russia and Belarus to export fertilizers
- The introduction of protectionist policies curbing exports from key fertilizer exporting countries such as China.

Although IFA's has partly returned to using a traditional capacity metric in its latest short-term forecast, China's imposition of export limits on urea and finished phosphates has continued to be a disruptive theme in 2024. Houthi rebel attacks, first reported on last year (*Fertilizer International* 518, p12), have also raised fertilizer shipping costs and increased transit times by diverting shipments away from the Suez canal to the longer Cape of Good Hope route¹.

IFA is currently forecasting the following fertilizer supply changes for the two years 2024-2025¹:

- A four percent increase in nitrogen capacity (ammonia) from 192 mil-

lion tonnes to 201 million tonnes N – driven by new capacity in China and low-cost projects in the US, Russia, Mexico and Iran.

- An increase in phosphate capacity of just one percent from 64.3 million tonnes to 65.1 million tonnes P_2O_5 – with only a few small-scale phosphoric acid plants commissioning in India, China, Brazil and Morocco over this two-year period.
- A four percent increase in potash capacity from 64.0 million tonnes to 66.6 million tonnes K_2O – based on the expansion of existing production capacity in Canada and Russia and the ramp-up of new projects in Laos.

In terms of individual commodities, IFA makes the following global production and trade estimates for 2024 versus 2023:

- **Urea:** Increased production (+2.1%) to 200 million tonnes and a fall in trade

(-0.5%) to 55 million tonnes.

- **Monoammonium phosphate and diammonium phosphate (DAP/MAP):** Increased production (+3.6%) to 67 million tonnes and a fall in trade (-2.6%) to 28 million tonnes.
- **Muriate of potash (MOP):** Higher production (+5.1%) to 73 million tonnes and an increase in trade (+5.6%) to 58 million tonnes.

Summing up

The key takeaways in IFA's short-term outlook are as follows¹:

- **Major trends:** the global economy has remained resilient despite mounting risks to growth; the cost of borrowing is high, but so is market confidence; agricultural and fertilizer markets remain politically exposed; progress on decarbonisation is uncertain and complex.

Fig. 2: CRU's top fertilizer calls for 2025



Source: CRU

CRU in its top fertilizer calls for 2025 (page 4, Figure 2 opposite) predicted:

- No additional duties on Russian exports into Europe
- Chinese ammonium sulphate to continue to flood the market
- Trump tariffs to take a delayed bite out of US fertilizer demand
- China to eventually lower urea export barriers in the year's second half
- High phosphate pricing to spur investment
- More consolidation of nitrogen production in Europe with further plant closures
- China to ramp up its international potash investments in Laos and elsewhere
- Blue ammonia to continue advancing while progress on green ammonia falters (outside China).

● **Fertilizer demand:** agricultural consumption is recovering, but has diverged for individual nutrients; K demand is leading the way, N demand is resilient, while P demand lags behind; Asian markets are driving the demand recovery with this underpinned by government support.

● **Supply and trade:** fertilizer capacity improvements are relatively solid amid lower incentives to invest; China has changed its market role by prioritising domestic demand over fertilizer exports; the global fertilizer market continues to adjust to disruptions to both shipping and trading partnerships.

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Fertilizer Latino Americano welcomes you to Rio!

CRU will host the 2025 Fertilizer Latino Americano conference at the Windsor Oceanico Hotel, Rio de Janeiro, 26-29 January 2025. Join key market players at Latin America's biggest fertilizer networking event.

Fertilizer Latino Americano (FLA) returns to the vibrant city of Rio de Janeiro in 2025. The event is the longest established and most influential fertilizer industry meeting in Latin America – and is celebrating its 36th anniversary this year.

The conference is a CRU and Argus collaboration and attracted over 1,000 delegates representing 500+ organisations when it was last held in Rio in 2023. The event offers excellent networking opportunities and is aimed at senior executives from across the international fertilizer supply chain, with leading producers, traders, distributors and consumers all represented.

As its name suggests, FLA has a particular focus on Latin America, while at the same time having a global reach with attendance from more than 60 countries. The event promotes commerce, investment, partnerships and innovation across the Latin American market. A large-scale exhibition and numerous networking events also provide extensive business opportunities throughout the conference.

By allowing fertilizer companies to meet, negotiate and do business at the very start of the year, Fertilizer Latino Americano's timing in January has always been an advantage. The return to Brazil in 2025 is also generating extra industry interest – as it offers attendees access to key players operating in one of the world's largest fertilizer markets.

Dominic Halahan, CRU's portfolio director, anticipates a record attendance for the 36th edition of the region's most influential and prestigious fertilizer gathering:



More than 1,000 delegates attended Fertilizer Latino Americano the last time it was hosted by CRU in Rio in 2023, making it the most successful year in the event's history – which stretches back more than three decades.

“While the last two years have seen fertilizer markets change and adapt to new trade flows and adapt to unforeseen circumstances, Brazil and Latin America have continued to play a central role in the ferti-

lizer industry. Don't miss out on this major networking opportunity at an event designed for the industry – joining the biggest fertilizer buyers, traders and manufacturers involved in the Latin American market.”



SPEAKER: TERJE BAKKEN
Head of Ammonia and Fertilizers, ATOME

“Today, the Mercosur region imports 90-95% of its nitrogen fertilizers, and ATOME saw an opportunity to build a world-class facility where nutrients are needed most: in the market. Our flagship Villeta project leverages excess renewable power and a strategic location in one of the most important food-producing regions in the world.”

Key themes

The event's three-day agenda offers comprehensive market coverage. This year, there will be a particular focus on:

- Latin America's speciality fertilizer market
- Brazil's importance to global food security
- Developments in the biostimulants market
- The role of start-ups in fertilizer industry innovation
- Global freight market outlook
- Brazilian agricultural market outlook
- Long- and short-term fertilizer markets drivers
- The impact of geopolitics on fertilizer markets
- Innovative nitrogen stabilisers in Latin-America.

A series of panel discussions will also address key current issues, including:

- Global fertilizer markets
- Green ammonia projects and new production technologies
- Market outlooks for biostimulants, organo-mineral fertilizers and Latin American agricultural production
- Regenerative agriculture and climate change
- Nutrient balances and soil fertility status by country
- The legislative panorama in Latin America
- The region's use of innovative nitrogen stabilisers.

CRU's expert analysts will also be present to offer their insights into price expectations and global supply and demand trends across all the key markets.

This year, CRU is proud to have support from leading fertilizer and agricultural organisations in Latin America including Abag, Abimilho, Abisoló, Abitrigo, AMA Brasil, Anacofer, ANDA, Fertilizar, IBRAM, Siacsp and many others.

The conference is also backed by the following top tier sponsors: Ma'aden as diamond sponsor; Petrobras as sapphire sponsor; Koch Agronomic Services and OCP Nutricrops as platinum sponsors. ■



CONFIRMED TOP-TIER SPEAKERS

- **Albeta Klein**, CEO, International Fertilizer Association
- **Motti Levin**, CEO, Haifa Group
- **Chrystel Monthean**, Executive Vice President Americas, Yara International
- **Jason Newton**, Chief Economist and Head of Market Research, Nutrien
- **Mark Ringkob**, Vice President, Commercial, The Mosaic Company
- **Mario Suffriti**, Commercial Director, Profertil
- **Leonardus Vergutz**, Chief Scientific Officer, OCP Nutricrops
- **Matías Ruffo**, Director Agronomy, Latin America & Southern Africa, Koch Agronomic Services
- **Luís Prochnow**, Director General, NPCT
- **Mauricio Medici**, Licensing Manager/Area Sales Manager, Stamicarbon
- **Bruno Fonseca**, Senior Economic Analyst, Rabobank
- **Sarah Reiter**, Executive Vice President, Business Development, BioConsortia
- **Cleber Vieira**, Partner, Agroconsult
- **Humphrey Knight**, Principal Analyst, Phosphates and Potash Fertilizers, CRU
- **Vatre Jurin**, Chief Technology Officer, Dunham Trimmer
- **Terje Bakken**, Head of Ammonia and Fertilizers, ATOME.

SPEAKER: VATREN JURIN

Chief Technology Officer, Dunham Trimmer

"The Latin American agricultural sector has been quietly pioneering the adoption of value-added fertilizers (VAFs) – also known as specialty fertilizers – particularly in its vast row crop operations and high-value specialty crop segments. This market, hidden in plain sight for years, has now reached a critical inflection point, with global valuations touching \$19.3 billion in 2022 and projected to surge beyond \$30 billion by 2030."

TAKE A DEEPER DIVE WITH FERTILIZER INTERNATIONAL

Fertilizer International magazine, as the official magazine of Fertilizer Latino Americano 2025, has curated a selection of articles from participating companies on key conference themes to accompany this year's event. Take a deeper dive into FLA here:

MONDAY 27 JANUARY, 11:50-12:40.

Panel discussion – *The outlook for green ammonia projects and new production technologies*. Interviews with Olivier Mussat, CEO, ATOME, Petter Ostbo, CEO, Atlas Agro, and Mauricio Medici, Stamicarbon's Licensing Manager for the Americas. Starts on page 31.

MONDAY 27 JANUARY, 14:30-14:45.

Latin American speciality fertilizer market. Article on 'Latin America's value-added fertilizer market' by Vatre Jurin, Chief Technology Officer, DunhamTrimmer. Starts on page 28.

MONDAY 27 JANUARY, 14:45-15:00.

Developments in the biostimulants market. Interview with Marcus Meadows-Smith, CEO, BioConsortia. Starts on page 26.

WEDNESDAY 29 JANUARY, 11:20-12:20.

Panel discussion – *Appraising the market outlook for biostimulants*. Article by ICL's Karla Martins, Technical Development Consultant, and ICL Brazil colleagues on 'Biostimulants in soybean: a Brazilian success story'. Starts on page 44.

WEDNESDAY 29 JANUARY, 12:20-13:20.

Panel discussion – *Understanding the legislative panorama in Latin America*. Article by Jose Carlos Polidoro, Advisor, Ministry of Agriculture and Livestock of Brazil, and governmental colleagues on 'Brazil's National Fertilizer Plan – the wider strategy'. Starts on page 21.



Exhibition guide

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Brazil's National Fertilizer Plan – the wider strategy

With a strategic vision, effective partnerships, and targeted investments, Brazil has the potential to turn its current challenges into competitive advantages. **Bruno Dias Ferreira, Pedro Veillard Farias, Tiago Nunes de Freitas Dahdah, Bernardo Silva, Guilherme Almeida Machado** and **José Carlos Polidoro** explain how the country is planning to consolidate its position as a sustainable leader in global agricultural.

Brazil's fertilizer supply – why is strategy necessary?

Brazil is at a pivotal moment, poised to solidify its position as a global leader in agricultural innovation and the production of food, fibre and bioenergy. As one of the world's largest agricultural powerhouses, the country has consistently demonstrated its ability to meet the growing demands for food and agricultural commodities.

The launch of the *National Program for the Conversion of Degraded Pastures*, aimed at doubling productive capacity without increasing deforested areas, is a cornerstone of Brazil's strategy to maintain sustainable growth in agriculture. This initiative is projected to significantly elevate the demand for fertilizers, soil amendments, and other essential inputs necessary to sustain plant nutrition and maximize crop yields¹.

The importance of fertilizers in Brazilian agriculture cannot be overstated. In 2023, approximately 86% of the fertilizers consumed in Brazil – equivalent to 39 million tonnes – were imported. This is currently Brazil's largest import segment by value, costing the equivalent of 25 billion US dollars in 2022 and 15 billion dollars in 2023.

Total fertilizer consumption reached 45 million tonnes in 2023, an increase of four million tonnes on the previous year. This surge in consumption highlights the growing reliance on fertilizers to boost agricultural productivity, a trend that has been



The \$1 billion Serra do Salitre phosphate project entered production in March 2024. It will displace imports and provide Brazil with much needed in-market fertilizer supplies.

critical for the development of the country's agribusiness sector.

This upward trend in fertilizer consumption was anticipated in the *National Fertilizer Plan (PNF)*, a policy document specifically developed to address Brazil's dependency on imported fertilizers. Indeed, the plan projects that national fertilizer consumption will surpass 70 million tonnes by 2050².

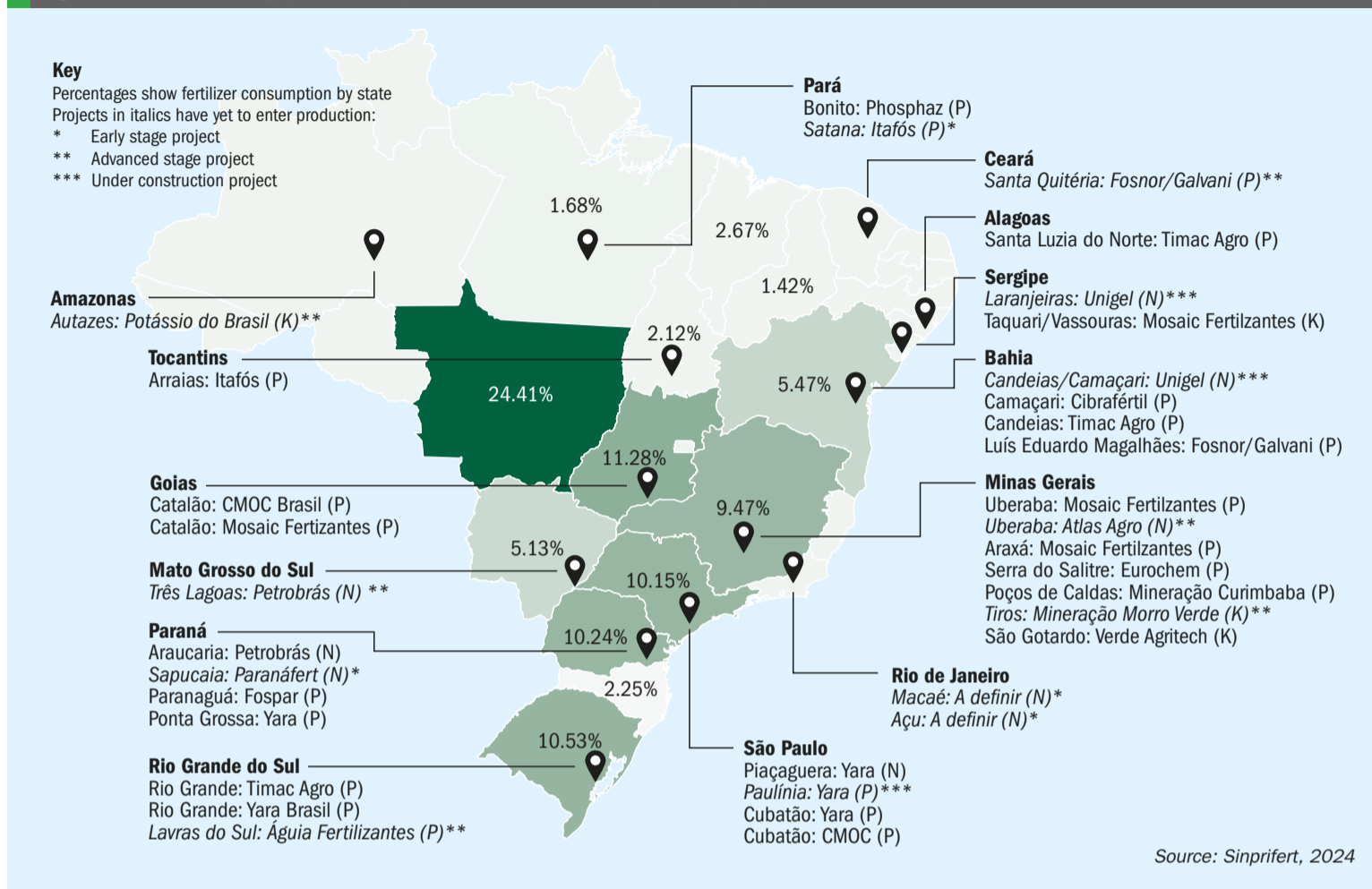
This projection is underpinned by the country's adoption of high-efficiency agricultural technologies and a commitment to enhancing productivity per hectare. Recent findings from the National Supply Company (CONAB) reinforce PNF projections, with

the 2024/2025 grain harvest expected to see an 8.3% increase in output, equivalent to an additional 24.62 million tonnes above the 2023/24 harvest³.

Brazil's growing prominence in global agricultural trade amplifies the strategic role of fertilizers. According to the United States Department of Agriculture (USDA), Brazil is expected to account for 71% of global soybean exports and 32% of global corn exports by 2033⁴.

These figures underscore the critical need for a reliable and sustainable supply of fertilizers to maintain and enhance Brazil's agricultural output. As the global population continues to rise, the demand

Fig. 1: Brazil's existing production plants and under-development projects



for food is expected to surge, positioning Brazil as an essential food market player and guarantor of global food security.

However, the country's heavy reliance on imported fertilizers exposes Brazil to significant risks and challenges. In particular, any disruptions to international supply chains, whether due to geopolitical conflicts, trade barriers, or logistical issues, could have severe repercussions on both the domestic availability and cost of fertilizers.

Given Brazil's importance to world agriculture, such disruptions would not only threaten domestic agricultural production but also impact global food supply chains. This dependency highlights the urgent need for strategic policies and investments aimed at increasing domestic fertilizer production, diversifying sources of fertilizer raw materials, and enhancing logistical infrastructure.

The implications of these challenges go beyond economic considerations as well. The fertilizer sector is closely tied to national security, as the stability of food production is a critical factor in maintaining social and economic cohesion and resilience.

The Brazilian government has recognised this, embedding fertilizer supply strategies within broader frameworks for

sustainable agriculture, industrial development, and international trade. The combination of these efforts aims to reduce vulnerability, strengthen Brazil's position in global markets, and support its leadership in sustainable agricultural practices.

As Brazil embarks on this transformative journey, the fertilizer sector stands at the forefront of the country's strategy to balance productivity, sustainability, and security. Through a combination of innovative policies, strategic investments, and public-private collaborations, the country has the opportunity to address current challenges and establish a robust and sustainable agricultural supply chain that meets both domestic and global needs.

The National Fertilizer Plan (PNF)

Recognising the strategic role of the fertilizer sector, Brazil has developed a series of public policies and initiatives to reduce dependence on imports and strengthen domestic production. The cornerstone of this effort is *The National Fertilizer Plan (PNF)*⁵.

This landmark plan contains five strategic guidelines, 27 goals, and 168 actions

distributed across short-, medium-, and long-term time horizons. These measures address critical themes, such as increasing the supply of organic and organomineral nutrients, repurposing solid waste, as well as encouraging the use of 'reminerals' and agrominerals.

The Project Portfolio – a key part National Fertilizer Plan – lists more than 50 wide-ranging strategic ventures. These cover diverse areas such as research and development and mineral resources exploration. Projects are targeting the following key needs:

- **Development of organomineral fertilizers:** These integrate organic matter with minerals to enhance nutrient release efficiency.
- **Utilisation of urban and industrial waste:** Projects that transform waste into raw materials for fertilizer production – with these contributing to the sector's sustainability by adopting circular economy practices.
- **Agromineral exploration:** Geological studies and mining projects in regions such as the Triângulo Mineiro and Mato Grosso to expand the supply and availability of domestic crop inputs.

THE NOVA INDÚSTRIA BRASIL (NIB) – REINDUSTRIALISING BRAZIL

With a focus on innovation, the energy transition, and sustainability the **Nova Indústria Brasil (NIB)** – a comprehensive strategy to reindustrialise the country launched in 2024 – complements the efforts of the National Fertilizer Plan and the CEFENP. The NIB is designed to integrate and strengthen the national industry by setting out incentives and goals on decarbonisation and the bioeconomy, as well as promoting the growth of strategic production chains⁶. It is projected to receive investment of BRL 300 billion by 2026.

Three of the NIB’s six key missions will have a direct impact on the fertilizer sector and Brazilian agriculture, underscoring the country’s commitment to food security, sustainability, and the energy transition:

1. **Sustainable and Digital Agro-industrial Chains for Food, Nutritional, and Energy Security:** This mission prioritises the modernisation of agro-industrial chains – to boost productivity and guarantee food security. It promotes the domestic production of strategic fertilizer inputs, precision agriculture and sustainable farming practices. The expansion

of crop production capacity and efficient and environmentally-friendly crop management practices are also a key focus, particularly for family farming, with the adoption of bio-based fertilizers and remineralizers being encouraged.

2. **Bioeconomy, Decarbonization, and Energy Transition to Secure Resources for Future Generations:** This mission aims to reduce carbon emissions by 30% and capture Brazil’s biodiversity for use in industrial production. In the fertilizer sector, this includes the development of green hydrogen for ammonia synthesis and the expansion of bio-based fertilizers.

3. **Digital Transformation of Industry to Enhance Productivity:** The goal of this mission – the digital transformation of 90% of Brazilian industrial enterprises – provides the fertilizer sector with the opportunity to adopt more efficient, automated processes. These include digital platforms for monitoring crop inputs and ‘Agriculture 4.0’ technologies that integrate smart sensors with real-time data. Collectively, the greater use of these digital technologies can significantly improve crop productivity and efficient fertilizer use. ■

These projects, as well as boosting innovation, are designed to encourage investment and capture technological expertise from the private sector via public-private partnerships.

Center of Excellence in Fertilizers and Plant Nutrition (CEFENP)

Overall, the PNF aims to improve and expand the business environment for domestic fertilizer production through foreign direct investment, lines of finance for fertilizer plant construction, the creation of a level playing field on taxation, and other structural measures. Probably its most ambitious initiative, however, is the creation of the Center of Excellence in Fertilizers and Plant Nutrition (CEFENP).

The CEFENP has been set up to coordinate efforts on fertilizer research, development, and innovation (R&D&I), as well as promote cutting-edge technologies, by connecting universities, research institutions, and industry. Its strategic priorities include developing bio-based fertilizers, controlled-release fertilizers, and remineralizers, as well as the commercial deployment of low-carbon technologies, including industrial ammonia synthesis from green hydrogen.

The CEFENP – although physically headquartered in the Rio de Janeiro State Technology Park – is decentralised and will operate as a ‘virtual centre’ with regional hubs strategically distributed across major agricultural production areas. The hubs will

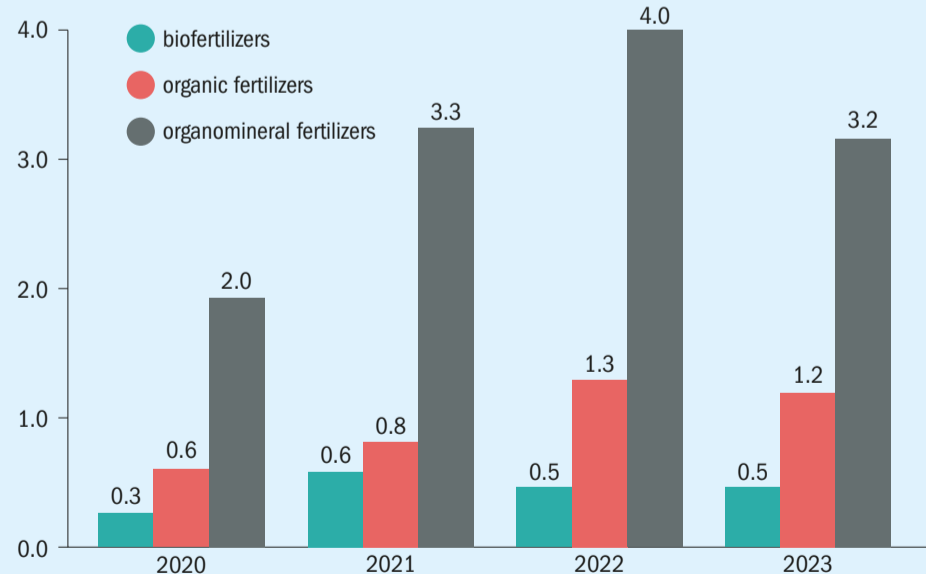
promote technology transfer and play a crucial role in bringing together the private sector, universities and research institutes – as well as coming up with tailor-made solutions that match the specific needs of each agricultural region.

Regional hubs will support the development of innovative fertilizers, while also initiating studies on nutrient use efficiency and the mitigation of the environmental impacts of fertilizer use. Each hub will specialise in sustainable management practices that address local circumstances, such as the specific tropical soil and crop types found locally.

Importantly, the CEFENP will function as an integrated digital platform, providing fertilizer producers, researchers, and investors with access to a comprehensive repository of data, analytical results, and research findings, as well as sharing best practices and the latest advances in technology. The overall aim is to boost the development of the fertilizer sector by strengthening communication and taking maximum advantage of the synergies that exist between different players.

As well as the CEFENP, other complementary initiatives are also being implemented to enhance the competitiveness

Fig. 2: Historical revenue trends of emerging fertilizer categories, BRL billion



Source: Abisolo, 2024

and sustainability of Brazil's fertilizer sector. These include the Fertilizer Industry Development Program (PROFERT) and the Rota Rondon.

Fertilizer Industry Development Program (PROFERT)

PROFERT, established by government Bill 3507/2021, is a strategic initiative to reduce Brazil's reliance on imported fertilizers by encouraging domestic production⁷. Key actions include:

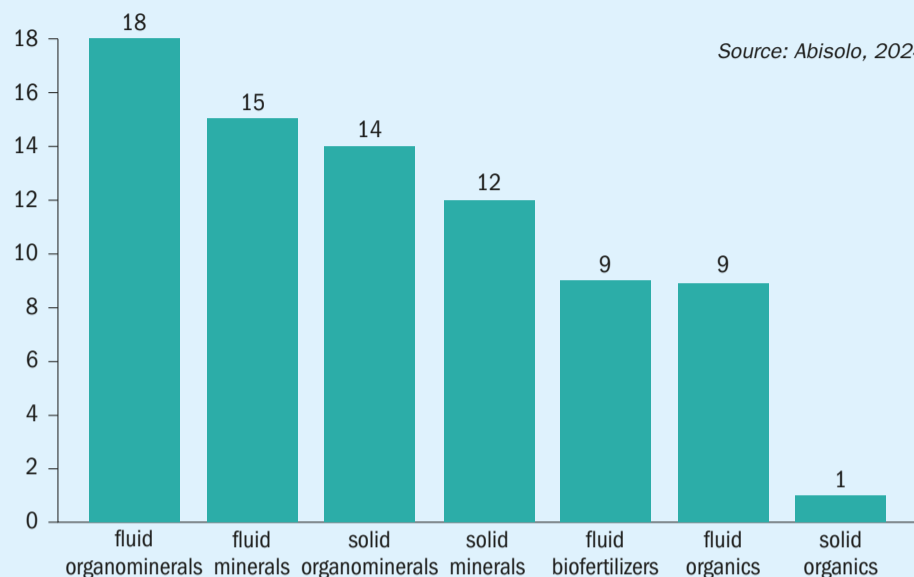
- **Tax exemptions and reductions** that incentivise fertilizer plant construction and modernisation, particularly in regions with strategic potential.
- **Dedicated financial support** for low-carbon technology projects and bio-based fertilizer production.
- **Support for research and innovation partnerships** between industry, universities and research centres, if these meet the aims and objectives of the CEFENP, especially the development of technologies that improve agronomic efficiency and reduce environmental impacts.

The Rota Rondon – a logistics strategy for Brazil

The Rota Rondon is designed to connect Brazil to the Pacific Ocean through an integrated network of transport corridors, including roadways, railways, and waterways. These routes are expected to transform Brazil's trade dynamics by improving access to Asian, African, and other Pacific-facing markets – while simultaneously providing capacity to import the essential raw material inputs needed for domestic fertilizer production. Key elements of the Rota Rondon include:

- **Development of multimodal corridors** that integrate road, rail, and water transport for the swift and efficient movement of fertilizers from production centres to key agricultural hubs.
- **Improving logistics infrastructure to lower transportation costs**, making fertilizers more affordable for agricultural producers and consequently boosting the competitiveness of national crop production.
- **Sustainable logistics practices** with low environmental impacts that meet the transport sector's decarbonisation goals, including the use of cleaner fuels and energy-efficient rail transport.

Fig. 3: Projected percentage growth of emerging fertilizer chains in 2024



Concluding remarks

In summary, the integration of PROFERT, the Project Portfolio, and the Rota Rondon – alongside initiatives such as the CEFENP and the NIB – provides a comprehensive strategy to transform Brazil's fertilizer sector. Together, these policy measures have the potential to enhance agricultural productivity, reduce dependence on fertilizer imports, and position Brazil as a leading global supplier of sustainable agricultural inputs.

The fertilizer sector has a central role to play in consolidating Brazil's position as a leading player in global agriculture and food security. The country – faced with the continuous growth in food demand and the challenge of reducing its dependency on imported inputs – has adopted a strategic and integrated approach to transform its fertilizer supply chain.

ICMS Agreement 100/1997

This long-standing agreement offers significant support to Brazil's farming sector by providing a partial exemption and reduction in ICMS (Tax on Circulation of Goods and Services) taxation on fertilizers, pesticides and other inputs. The agreement, by reducing the tax burden on critical products, helps strengthen the domestic agricultural sector and promotes fertilizer use across the country by making these more affordable to farmers⁸.

Initiatives such as the National Fertilizer Plan (PNF), Nova Indústria Brasil (NIB), and the Center of Excellence in Fertilizers and Plant Nutrition (CEFENP) demonstrate the government's commitment to fostering innovation, enhancing domestic production capacity, and promoting sustainable practices. These strategies are further supported by PROFERT, the PNF Project Portfolio, and the Rota Rondon – programmes which are addressing the sector's challenges with a closely aligned set of public policies, economic incentives, and logistical solutions.

By improving access to high-quality inputs and lowering their costs, particularly for small- and medium-sized farmers, the ICMS Agreement helps to sustain agricultural productivity and food security while maintaining competitiveness in global markets. This tax instrument – as an alternative approach to strengthening the fertilizer supply chain – complements strategies designed to boost Brazil's domestic fertilizer production, improve logistics, and encourage the use of innovative and sustainable fertilizers, as already outlined in this article.

While Brazil has made significant progress toward creating a more autonomous and sustainable fertilizer sector, the success of these initiatives will depend on their effective implementation, the ability to overcome structural challenges, and strong collaboration between government, the private sector, academia, and civil society. Critical issues, including financing, technological capacity building, and environmental impact mitigation, must also remain priorities to ensure progress is balanced and inclusive.

Additionally, by integrating global

Additionally, by integrating global trends – such as decarbonisation, the use of bio-based inputs, and agricultural digitalisation – Brazil can position itself as a model leader in sustainable farming practices. Maintaining the success of the country’s agricultural sector also depends on continuing efforts to diversify sources of ag inputs, reduce logistical costs, and enhance international competitiveness.

Transforming the fertilizer sector is not merely a matter of economic competitiveness either. It is also a question of national sovereignty and global leadership. Indeed, strengthening the fertilizer supply chain is essential for the resilience of Brazilian agribusiness, helping to meet the increasing demands of global markets, while also contributing to the food security of a growing global population.

In our view, with a strategic vision, effective partnerships, and targeted investments, Brazil has the potential to turn its current challenges into competitive advantages – and solidify its position as a sustainable leader in the global agricultural landscape. ■

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BioConsortia – the uniquely positive biologicals company

California-based biologicals company BioConsortia is launching the nitrogen-fixing product Always N for 2025 season sales in New Zealand with its partner Mosaic. The product, which is based on robust, spore-forming, gram-positive microbes (*Paenibacillus*) fixes atmospheric nitrogen throughout the growing season by colonising the roots of corn, wheat and potatoes, as well as fruits and vegetables. Always N delivers consistent yield gains and is backed by data from more than 300 trials in Brazil, New Zealand, the US and Europe. *Fertilizer International* spoke with **Marcus Meadows-Smith**, the company's CEO, ahead of the Fertilizer Latino Americano 2025 conference.

Introduction

Could you briefly introduce the company and its innovative nitrogen-fixing and biostimulant product portfolio to our readers – and explain the company's plans for disrupting the fertilizer market?

"We are an R&D company. We don't have a sales and marketing team, and our business model is to sell to the major fertilizer, crop protection, seeds and seed treatment companies.

"Seed and crop protection companies all have their own in-house biological R&D teams. We therefore have to come out with products that are superior, higher consistency – and have developed into the world leaders at gene editing gram-positive microbes.

"Gram-positive microbes probably mean nothing to most of your readers. These are hardy, robust organisms. We've carved out our niche as being the best R&D company with this type of microbe.

"They form a spore, go dormant, become inert and can survive practically anywhere. But once they're in the root zone, plants produce an exudate that triggers the microbe to come out of its spore form and start growing to colonise the plant.

"We focus all our research on products that are going to be easy to use. They can be placed 'in the can' together with a fun-



Greenhouse testing by BioConsortia of nitrogen-fixing products in various soils.

gicide and an insecticide seed treatment and fit into standard agronomic practice – with two years of shelf life and an additional two-year life on seed.

"We've even got that shelf life with spores on fertilizer granules in very harsh environments. Yet the bacteria inside remain alive and viable and ready to germinate when conditions change and it gets the signal from plant roots.

"We're a company of over 50 scientists now, based in California, having invested over a 100 million dollars researching and developing products. That's including those you're interested in – nitrogen-fixing products for non-leguminous crops and biostimulants."

Nitrogen-fixing with Always N

What are key advantages of a gram-positive microbial product like Always N and how does it function – are these game changing in your view?

"In the US, a number of nitrogen-fixing microbial products have already been launched. But they are the gram-negative from just-in-time manufacturing with a short shelf life that are then put in furrow, which is highly cost-prohibitive, or applied as an over-treatment.

"The problem with over-treatments is you often reduce the viability of the seed and germination because of getting the seed wet twice – once for the initial fungicide

and insecticide treatment and then on-farm. Over treatment can also disrupt the seed company's fungicide and insecticide treatment package that was there already.

"Whereas Always N can go on with that initial seed treatment and – being gram-positive – is very stable and easy for the grower to use. What's spot-on therefore, and benefits the seed company in terms of sales, is that it's delivered to the grower as part of their single integrated treatment package.

"We embarked on an R&D collaboration with The Mosaic Company, who funded the research phase for Always N, after some initial work and discoveries ourselves. This was originally to develop a fertilizer product for things like pasture grass – effectively a fertilizer granule with bacterial spores on the surface that can be broadcast.

"For seed-sown annual crops, Always N is definitely most effective applied as a seed treatment. But there are some crops, like pasture grass, tree crops, where a fertilizer granule may prove to be the better delivery mechanism.

"For agricultural inputs, it's about robustness and ease of use in standard agronomic conditions, as no one wants to keep products in cold storage. People want two years of shelf life, not six months, otherwise you don't have enough time in the distribution channel for delivery through retail and then onto the farm."

Biostimulant product offering

What biostimulants are BioConsortia developing and bringing to market?

"Some very remarkable yield increases are possible by the addition of Zaffre, our biostimulant product, compared with the leading biologicals on the market today.

"Biostimulants don't fix atmospheric nitrogen. They actually talk to the plants, producing volatile organic compounds (VOCs) like indole acetic acid (IAA) that tells the plant to grow bigger.

"IAA acts as a sort of instruction to the plant – grow your root system bigger, put on more biomass. The other thing biostimulants do is increase the ability of the plant to absorb soil nutrients.

"They don't create nutrients, the way nitrogen fixers do. Instead, they solubilise P and K and allow its absorption into the root system for plant growth.

"Obviously if you've got soils that bind nutrients, having a microbial biostimulant like Zaffre there helps release these

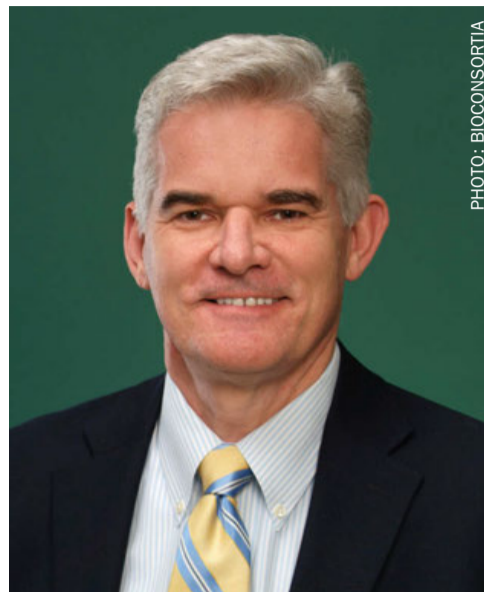


PHOTO: BIOCONSORTIA

Marcus Meadows-Smith, BioConsortia's CEO.

in soluble form for the plant to take up, that's where it's getting stimulation. While nitrogen fixation works in a wide range of soils, biostimulants are more soil-specific, performing better in certain soil types where that binding occurs more aggressively.

"As I mentioned, we're an R&D company and don't push products through clever marketing. Instead, they have to be better than what's on the market today – through their ease of use, higher yields and better consistency – and that's what you see in our data."

Partnering with Mosaic since 2020

How important is BioConsortia's partnership with The Mosaic Company – a very high-profile fertilizer industry player – both in the US and now in Brazil?

"To be honest, nitrogen fixation might have been left on the shelf if Mosaic hadn't come along and helped us fast-track – it was the relationship that drove the acceleration of our nitrogen-fixing products. They're obviously now running field trials in multiple crops, in multiple countries within the Americas.

"What has evolved is that originally we thought Always N was going to be a just a fertiliser product and therefore go through Mosaic's sales force. Whereas we're now working together on additional routes to market.

"We're selling the product direct to seed and seed treatment companies, which tend to be the crop protection rather than the fertiliser players. Then obviously Mosaic goes direct to some markets itself.

"Mosaic is really a great partner for the Americas where their footprint is incredibly strong. In other parts of the world, we're looking for other partners – fertilizer, crop protection and seeds companies – and for Europe, for Asia-Pacific, for Africa, starting to talk to other fertilizer companies.

"Mosaic are very happy with the way it's going. More recently, they've expanded to China, India, Vietnam and Thailand and have BioConsortia's distribution rights there – because they're developing what's actually a very interesting business model, talking to millions of growers through smartphones."

Brazil market expansion one year on

It's just over one year now since BioConsortia announced its entry into the Brazilian market. Why target Brazil and what's been BioConsortia's experience of the country's massive domestic ag market one year on?

"Always N, our first product in Brazil, took us six years to get registered. Today Brazil has fast-tracked biologicals – because they've seen the benefit for growers – and registration now takes just one year.

"That's opened up the market for biologicals to come in faster. Brazil also requires efficacy data, as you don't get a registration in Brazil if you can't demonstrate that your product works in government-approved field trials, and that's the process we're going through now.

"The other thing we've found is that Brazilian soils are more responsive to microbial biologicals. It's quite possible that soils in Brazilian fields are not as rich and deep as US soils, and therefore their added contribution is that much higher.

"In Brazil, we're just starting to get results this year [2024] from the field trials we're running and are very excited by the opportunity there. On corn, we've seen an 11% yield increase with our lead product at multiple locations, which is really a dramatic response to a microbial product. We're now going into the registration phase – so will be launching products in about a year.

"We've a targeted approach to commercialisation and product launches, going after the big row crops to start with. That means rice in certain parts of the world, whereas in Europe it's wheat, and corn in the US and Brazil." ■

Latin America's value-added fertilizer market and ag innovation

PHOTO: TESSENDERLO

In the ever-evolving landscape of agricultural inputs, a quiet revolution has been taking place across Latin America. Value-added fertilizers (VAFs), long operating in the shadows of traditional fertilizers, have emerged as a powerful force in the region's agricultural transformation. **Vatren Jurin** of DunhamTrimmer explains more.

Plantation crops such as coffee are part of the success story for value-added fertilizers in Latin America.

A transformed market

The Latin American agricultural sector has been quietly pioneering the adoption of value-added fertilizers (VAFs) – also known as specialty fertilizers – particularly in its vast row crop operations and high-value specialty crop segments. This market, hidden in plain sight for years, has now reached a critical inflection point, with global valuations touching \$19.3 billion in 2022 and projected to surge beyond \$30 billion by 2030, with a robust and compelling 6.8% per annum growth trajectory.

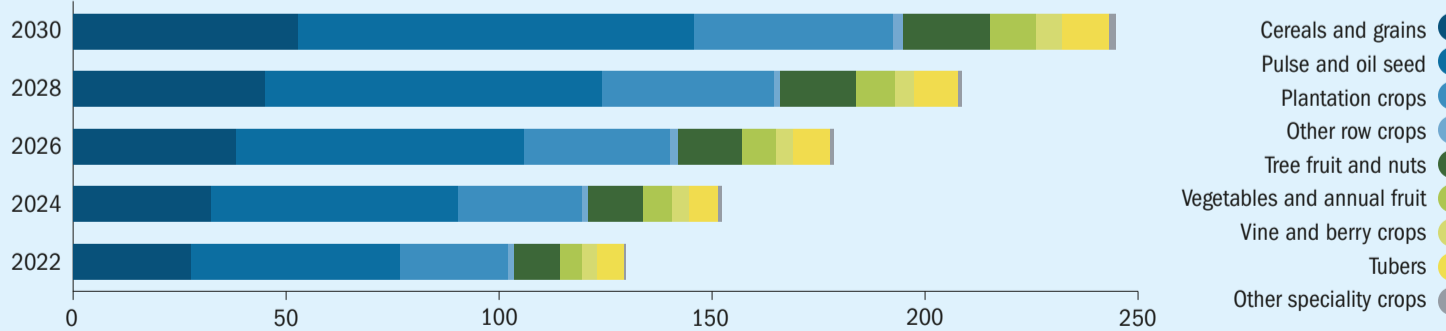
What makes this transformation particularly noteworthy is its natural evolution – a response to the region's unique agricultural challenges and opportunities rather than a top-down industry initiative.

Table 1: Area of agricultural land in Latin America treated with value-added (VAFs)

Crop Group	2022	2024	2026	2028	2030
Cereals and grains	28.17	33.07	38.83	45.58	53.52
Pulse and oil seed	49.13	57.70	67.70	79.43	93.19
Plantation crops	25.16	29.38	34.30	40.05	46.76
Other row crops	0.97	1.14	1.33	1.57	1.84
Tree fruit and nuts	11.19	13.05	15.22	17.75	20.70
Vegetables and annual fruit	5.88	6.87	8.02	9.37	10.94
Vine and berry crops	3.03	3.54	4.14	4.84	5.66
Tubers	6.17	7.21	8.42	9.83	11.48
Other speciality crops	0.57	0.66	0.78	0.91	1.07
Total	130.27	152.62	178.74	209.32	245.15

Source: DunhamTrimmer

Fig. 1: Area of agricultural land in Latin America treated with value-added (VAFs)



Source: DunhamTrimmer

To understand the scale of this transformation, it's important to grasp the concept of 'treated hectares' – as this key metric measures the cumulative area treated with VAFs throughout a growing season, not just the physical land area. For instance, if a single hectare receives three applications of a VAF during one season, this counts as three treated hectares, therefore reflecting the intensity of fertilizer usage rather than just geographical coverage. This distinction becomes crucial when analysing the true scope and impact of VAF adoption across different crop categories.

Latin America's VAF treated hectares have grown to an impressive 130 million hectares, with row crops representing the lion's share of treated areas (Table 1, Figure 1). It's the region's approach to VAF application that sets it apart from its global counterparts, particularly when it comes to the treatment of row crops. Unlike the northern hemisphere, LATAM farmers employ more frequent in-season management practices, enabling multiple foliar applications throughout the growing season, thereby multiplying the treated hectare count for each physical hectare under cultivation.

The VAF innovation story: beyond traditional nutrition

What sets VAFs apart from conventional fertilizers is their sophisticated three-pillar approach: being comprised of foundational nutrients, performance enhancing components, and functional physiological elements (Table 2, Figure 2). This isn't merely a marketing distinction; instead, it represents a fundamental shift in how growers approach crop nutrition and performance. It's also worth noting that the evolution of VAFs has been driven by advances in the biostimulant sector, leading to products that deliver more than the sum of their parts.

The flexibility in VAF formulations has proven particularly valuable in the Latin American context. Manufacturers can, in fact, drastically adjust VAF compositions, ranging from 25-95% for foundational components, 0.5-30% for performance enhancers, and 3-25% for functional biostimulant components (Table 2). This adaptability allows for the precise tailoring of VAFs for specific crops and growing conditions, a crucial factor given the region's diverse agricultural landscape. In turn, it is this ability to fine-tune formulations that has

enabled VAF manufacturers to address specific local challenges while maintaining competitive pricing and performance.

The Latin American advantage: a closer look at row crops

The region's unique position in VAF adoption is particularly evident in its soybean sector. Row crops account for 83 million treated hectares, with soybean cultivation leading the way. Soybean management practices, which include multiple crop protection applications throughout the growing season, have created an ideal environment for VAF integration. This high adoption rate in row crops sets Latin America apart from other global markets, where VAF use has traditionally been more concentrated in specialty fruit and vegetable crops.

The success in row crops can be attributed to Latin America's distinctive agricultural practices, particularly in countries like Brazil and Argentina. These nations have developed sophisticated crop management systems that allow for multiple in-season applications, maximizing the

benefits of VAF technology. Overall, the region's approach to row crop management has effectively demonstrated that VAFs can be successfully integrated into large-scale commodity crop production, challenging the conventional wisdom that specialty fertilizers are primarily for high-value specialty crops.

Plantation crops: a strategic growth sector

Plantation crops have emerged as another significant VAF success story in the region. Coffee, pineapple, tropical fruit trees, and banana plantations, crucial to Latin America's export market, have become major consumers of VAFs. Countries like Brazil, Colombia, Ecuador and various Central American nations have seen extensive adoption across their plantation sectors, driven by the crops' high economic value and extended growing seasons. The long-term nature of these crops has encouraged growers to invest in advanced nutrition strategies, making them ideal candidates for VAF applications.

Table 2: Value-added fertilizers are sophisticated products that combine three components in different percentages

+/- 5% Formulation parameters	Foundational	Enhancing components	
	Fertilizer source	Performance (Chemical)	Functional (Biostimulant)
	25 to 95 %	0.5 to 30 %	3 to 25%

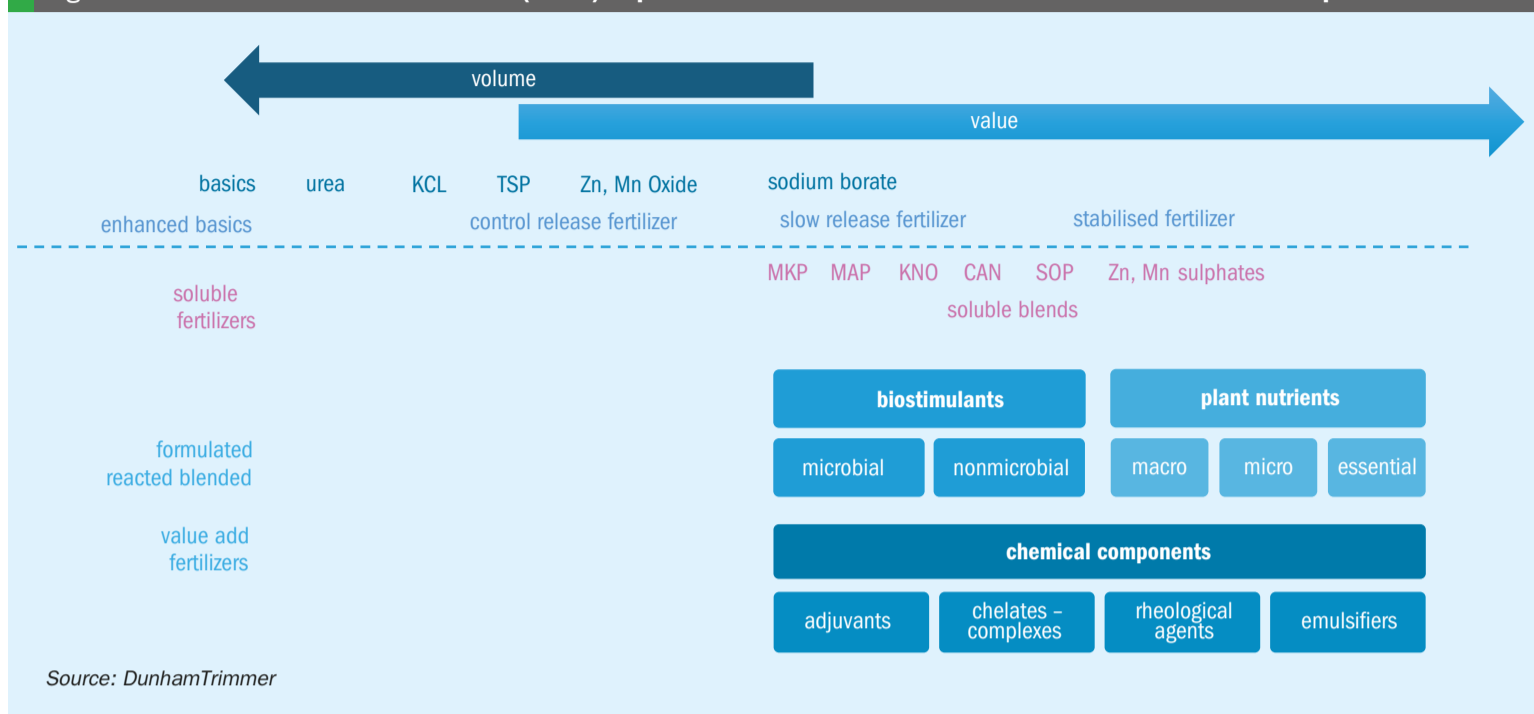
Source: DunhamTrimmer

Fig. 2: For value-added fertilizers, different permutations of enhancing components (functional, performance) are possible

type	performance	functional	delivery	economics
dry	complex	efficient	broadcast	higher margins competitive difference
liquid	chelate			
soluble	slow release	consistent	precise	agronomic stress mitigation nutrient use efficiency nutrient acquisition nutrient utilization
insoluble	control release			
organic	inhibitor	compatible		
mineral				

Source: DunhamTrimmer

Fig. 3: The rise of value-added fertilizers (VAFs) is part of a fundamental shift from volume to value in the crop nutrient market



Source: DunhamTrimmer

The specialty crop revolution: intensive management drives innovation

Perhaps the most dynamic segment of Latin America’s VAF market lies in its specialty crop sector. Specialty crops, while comprising a smaller portion of treated hectares, represent a more intensive and sophisticated segment of VAF application and technology. The treated hectare figures in this sector tell a compelling story (Table 1, Figure 1):

- 11 million treated hectares of tree fruit and nuts
- 6 million treated hectares of vegetables and annual fruits
- 3 million treated hectares of vine and berry crops
- 6 million treated hectares of tubers.

These figures are particularly revealing, as they reflect multiple applications throughout the growing season, resulting in treated hectare counts that far exceed the actual planted area.

Chile and Peru stand out as leaders in this segment, particularly in their fruit export sectors. High-value crops such as table grapes, berries, stone fruits and citrus receive multiple VAF applications, often through both foliar and irrigation systems. The intensive management of these crops, driven by export market demands, has created a sophisticated VAF usage pattern that can see up to six foliar applications per

season during favourable market conditions. This high-intensity application model has become a proving ground for new VAF technologies and application strategies.

Environmental sustainability and market growth

The rise of VAFs in Latin America isn't just about productivity – it's increasingly aligned with environmental sustainability goals. These products enhance nutrient uptake efficiency, reducing leaching and runoff, while their biostimulant components improve plants' resilience to environmental stresses like drought and soil salinity – crucial advantages in an era of climate change. The environmental benefits of VAFs have become increasingly important as the region faces growing pressure to adopt more sustainable agricultural practices. They also represent a long-term shift from volume to value in the fertilizer market (Figure 3).

The combination of enhanced efficiency and environmental benefits has positioned VAFs as a key component of Latin America's agricultural future. As the global VAF market is projected to undergo continued strong growth through to 2030, Latin America's position as a key adopter and innovator in this space becomes increasingly significant. Indeed, the region's unique combination of large-scale row crop operations, extensive plantation crops, and high-value specialty crop production continues to provide an ideal testing ground for VAF technology and application strategies.

Looking ahead: future growth and innovation

The evolution of the VAF market in Latin America, from a hidden segment to a mainstream force in agricultural inputs, reflects broader changes in world agriculture. As the global ag industry grapples with the challenges of sustainability, climate resilience, and productivity, the region's experience with VAFs offers valuable lessons for other markets. The successful integration of VAFs across diverse crop types and production systems demonstrates the versatility and potential of these products.

The success of VAFs in Latin America also demonstrates that innovation in agricultural inputs doesn't always announce itself with fanfare. Sometimes, the most significant transformations happen quietly, hidden in plain sight, until their impact becomes impossible to ignore.

As we look toward the future of global agriculture, Latin America's VAF market stands as a testament to the power of gradual, market-driven innovation in shaping sustainable agricultural practices. The region's journey with VAFs provides a roadmap for other markets also seeking to balance productivity, sustainability, and profitability in modern agriculture. ■

About the author

Vatren Jurin is Chief Technology Officer at DunhamTrimmer.

Latin American low-carbon ammonia projects

Latin America has become a desirable destination for green ammonia projects. This is linked to the region's abundance of relatively inexpensive renewable energy, and large-scale fertilizer demand from a growing, high-value and import-dependent agricultural market. Ahead of *Fertilizer Latino Americano 2025*, *Fertilizer International* discusses regional green ammonia project prospects with leading players ATOME, Casale, Atlas Agro and Stamicarbon.

ATOME

Bringing the hydrogen revolution to the fertilizer sector

Exclusive interview with Olivier Mussat, ATOME's CEO



Introduction

ATOME is the UK-headquartered developer of three world-scale green fertilizer projects in Latin America: the flagship 145 megawatt (MW) Villeta and 300MW Yguazu projects, both in Paraguay, and its latest project in Costa Rica, expected to be similar in size to Villeta.

The flagship Villeta project will be located 35 kilometres from the capital city of Asunción, the country's main import/export centre located on the River Paraguay. The project will produce up to 264,000 t/a of 'green' calcium ammonium nitrate (CAN) fertilizer – using surplus hydroelectricity gen-

erated by the Itaipu dam on the Brazilian-Paraguayan border (see photo) – potentially displacing up to 500,000 t/a of CO₂ emissions versus conventional fertilizer production and application.

Villeta will be sited within an existing industrial complex that is already home to fertilizer producers and consumers. ATOME is due to make the final investment decision (FID) soon, with Villeta scheduled to enter production in 2027. Recent landmark project developments include:

- A 145MW power purchase agreement (PPA) with ANDE, the national power

company of Paraguay, the largest single PPA ANDE has signed with an industrial user at the lowest industrial tariff

- The granting of a Free-Trade Zone to ATOME in November 2023, meaning the project will benefit from exemptions on municipal, VAT and corporate income taxes
- The completion of the project's Environmental and Social Impact Assessment (ESIA) in February 2024
- The completion of the project's front-end engineering and design (FEED) during the first half of 2024

- The signing of a heads of terms for the long-term sale of all of the project’s renewable fertiliser output to Yara International in July 2024
- Announcement of Casale as the project’s engineering, procurement and construction (EPC) contractor in November 2024.

ATOME’s three-year journey

Olivier, it’s only three years since ATOME was first listed on the London Stock Exchange’s AIM market. In fact, the company remains the only pure play green fertilizer producer on the London market. **Could you give our readers a quick pen portrait of the company and outline the remarkable progress it’s made during the last 36 months?**

“The genesis of ATOME is really about the hydrogen revolution. It comes down to our very fundamental view that a lot of hydrogen today is used to make ammonia – and that 80% of all ammonia makes fertilizer.

“So we saw that the hydrogen revolution – from a business and investment point of view – will initially be the fertilizer revolution. Then the next hard realisation is that the fertilizer sector emits more annual emissions than shipping and aviation combined, and yet feeds half of the world, right?

“ATOME’s ethos is how to develop green fertilizer projects, which have a market impact, a climate impact, with the least requirement for, or exposure to, subsidies. Number one for us was how can we be commercially viable without subsidies – which take forever – and also be seen as a partner in the countries where we operate.

“Our ethos is also to actually kill two birds with one stone, taking action on climate change and on food security – that’s at the heart of a big opportunity today. It’s an opportunity to move away from having big, centralised fertilizer supply centres, in Egypt, in Saudi, in Russia, in the US, and give countries with access to renewable power the opportunity to suddenly have decentralised low-carbon, domestic fertilizer production instead.

“That’s a great opportunity for a number of reasons, one obviously being security of supply. With the Ukraine war, has come the reality that we are highly dependent on

other countries, especially in Latin America, which imports the majority of its nitrogen fertilizers, and in 2022 saw prices absolutely shoot through the roof.

“We clearly saw there was an opportunity to accelerate the change from old ‘grey’ fertilizer production systems to the new ‘green’ low-carbon systems and also do that in an economical way, because everybody says that if it’s ‘green’ it has to be more expensive. Well, guess what, if you have the right type of renewable power in the middle of the right agricultural demand markets, you can actually produce green fertilizers very competitively.

“That’s one of the reasons we chose calcium ammonium nitrate (CAN-27) for our first project, Villeta in Paraguay. Most of the world’s CAN-27 is produced and used in Europe but by the time it gets into the hands of farmers in Brazil, Argentina and Paraguay – adding logistics, demurrage, taxation, you name it – it’s actually quite pricey. So, producing CAN-27 domestically, without all of the logistical costs, can actually be competitive.

“There’s also a need to understand how to develop infrastructure projects, which are inherently complicated and take a long time, in a certain way. You’re going from electrons to molecules, from long-term power purchase agreements (PPAs) to short-term commodity events, in the middle of a green fertilizer market that’s still in its infancy.

“One of ATOME’s strengths, let’s call it our secret sauce, is a team capable of combining the right type of project development with what’s very much a risk-based approach across the entire value chain. The risk of this market has a supply side, a policy side and a technology side.

“How do you make sure you don’t take technology risks? Obviously, it’s about right sizing, finding the right technology partner and finding the right type of power – because these are chemical facilities that need to run 24/7. ATOME’s projects are in certain countries in the world where you have a lot of hydroelectric power. That baseload supply gives us a very real competitive advantage.

“Why did we list on the London Stock Exchange (LSE)? Well, number one for us is the expertise of the company.

“It’s a small team with a lot of individual expertise. Terje Bakken spent 20 plus years with companies like Yara and EuroChem as a senior VP. Our chairman and major investor Peter Levine has successfully floated and exited a number of energy and infrastructure companies on the LSE. And I was Chief Investment Officer at the International Finance Corporation, part of the World Bank Group, with a seven billion dollar portfolio of infrastructure and energy projects.

“It’s all about putting the right complementary team together, with technical capacity, financing capacity, and fertilizer industry expertise, and also understanding the proposition going into Paraguay and Costa Rica first. Being listed on the London Stock Exchange provides full transparency and clarity, so it’s much easier to cut through at the government level and for them to understand very quickly who we are.

“This helps with creating and establishing industry-leading partnerships. Energy engineering company Baker Hughes became an investor because they saw we are a small, agile team punching above our weight who can get things moving very quickly. This is something we recognise with our engineering and construction partner Casale – a company with a long history yet is family-owned and also agile.

“With such a big market, you can start small, inch by inch by inch, because 260,000 tonnes of fertilizer production capacity per project is barely 1% of Latin American regional nitrate demand. So it’s all about making a dent, but starting slowly, rather than the worldview of some fertilizer producers – which is go big or go home.

“That’s one of the reasons that we’ve really found a kindred spirit in Casale – they’re very focused on reducing emissions, increasing efficiency at the lower end of the production capacity scale.”

Why Latin America?

I’m sure delegates at the forthcoming Fertilizer Latino Americano conference in Rio in January will be interested to learn why ATOME chose to locate its project slate within the region – and Paraguay and Costa Rica in particular?

“Paraguay was by far and long the first country in the list as, in a good year, they only use about three of the seven gigawatts net of hydroelectric power available from

“It comes down to our fundamental view that most hydrogen today is used to make ammonia – and that 80% of all ammonia makes fertilizer. The hydrogen revolution – from a business and investment point of view – is initially a fertilizer revolution.”

the Itaipu dam and export the rest to Brazil and Argentina. So there's a motivation for Paraguay to use more of these electrons to create more value domestically.

"With hydroelectric power, ATOME can produce fertilizer at a stable, long-term cost. And from a government point of view, Paraguay can create more green jobs, more value-added from this incredible domestic hydroelectric resource and support its agri sector.

"Paraguay is a country which has been extremely stable over the past 40 years, is fully dollarized, now investment grade, and whose biggest export is electricity and second biggest export is agri-products. And, guess what, within a 2,000 kilometre radius, ATOME can sell multiples of the fertilizer volume it produces in Paraguay into Argentina and Brazil, part of free trade bloc Mercosur.

"Yara, our offtake partner at Villeta, has just signed a green fertilizer supply agreement with coffee producers in Brazil and already has an agreement with a large potato grower in Argentina. So this is a regional agricultural market which wants stability, security of supply and is looking for green credentials as well.

"Costa Rica is for us a country which, again like Paraguay, has a very good investment reputation in general combined with very high premium crops, like pineapples, bananas and so on. So the costs of fertilizers for growers in this region, on a relative basis, is a lower than if we went straight for other lower value broad acre crops.

"The ability to add value from zero-carbon fertilizers is higher in Costa Rica and the right type of power supply, a mix of hydro and wind, is also there. I think it also comes down to the fact that we are trying to right size our projects as well and have positive development impacts in the country."

Flagship Villeta project

Is ATOME pleased with general progress at its flagship Villeta project over the last 12 months or so. Do the company's plans to develop a world-scale green fertiliser project remain on track?

"Are we pleased? Yes, with what the project has evolved into from the first discussion three years ago – it originally started as a 60 megawatt project not a 145 megawatt one – to where we are today. We've basically modernised, found ways to save costs, because at the end of the day green fertilizer is great in principle, but it's a cost story.

"You're not going to be able to sell expensive fertilizer anywhere. You have to be the lowest cost product available in the market where you are to ensure you always sell all of your products.

"Could project progress have taken less time? Yes, but that was to always make sure we de-risked everything as much as possible. As a result of that, we've had a lot of interest in debt finance and subscriptions from all the major development finance institutions – IFC, IDB, CAF, DFC, you name it – because we are bang in the middle of addressing both climate change and food security. So, from that point of view, we're also very pleased with their support.

"We are with the right partners on the equity side of the project. But I think we shouldn't shy away from saying, guess what, it's bloody hard.

"Technology wise, there's nothing new as we are using alkaline electrolyzers, an existing 100 year old technology, at an industrial scale because that's what you need to be commercially competitive. But we are still asking investors to do something they have never done before by combining green electrons to make green fertilizers.

"You can finance power plants a dime a dozen and finance chemical plants a dime a dozen. But in combining the two together in one project as ATOME is doing you have a very different investment profile, falling between industrial investors and infrastructure investors, which has certainly been an interesting challenge for us.

"On the engineering side, are we pleased where we landed with Casale as EPC contractor? Yes, we are. We've been able to benefit from their experience on low-carbon ammonia projects elsewhere and bring that experience into the Villeta project and some of the relationships.

"As mentioned, it's all about managing every single risk along the way. So we've made a lot of noise around our achievements with the operating license, permitting and the Environmental and Social Impact Assessment (ESIA).

"Yes, it's a relatively low impact project from an environmental point of view,

but we've seen so many projects delayed because people leave the ESIA until the last minute. So the ESIA was one of these things we tackled head on, early on, basically as soon as we bought the land, and did it to IFC performance standards."

Yara's backing

Yara is committed to growing the market for green fertilizers, particularly through strategic partnerships. In that context, how important – for both companies – is the offtake agreement with Yara for all of Villeta's output?

"We chose CAN-27 and not another type of fertilizer as it's a big Latin American market and it's also a premium fertilizer with valuable agronomic qualities. That's important because you start with a premium market, you prove your concept with a premium market with higher margins which provide more space to be competitive.

"We are not going to be fertilizer distributors – this is not the ethos of ATOME. Instead, we will be producing the molecules and will then partner with the best offtakers.

"It really is a partnership with Yara. We have a very strong strategic alignment on what we want to do together and on growing the market together. Because when it comes to CAN, Yara is the best fertilizer producer around, bar none, and are also the most mature producer on the green fertilizer market side of things.

"Each company is good at what we do. Yara invests a lot to make sure that they get the best premium for fertilizer and bring it to the right market. And ATOME is investing a lot to make sure that we have a green fertilizer product to deliver.

"Sustainability goes hand in hand with profitability, at the end of the day, and we have an ambition to be highly environmental, but we are not a charity. This is, again, where we push back hard on anybody saying that they need subsidies to succeed – if you need long-term subsidies, you're a charity, not a business. We have the same view with Yara, it's a partnership that needs to make long-term economic sense."

“We are pleased with Casale as EPC contractor for the Villeta project. We've been able to benefit from their experience on green ammonia projects elsewhere and bring that experience into Villeta.”



ATOME and Casale at the latter company's HQ, Lugano, Switzerland.

Casale secured as EPC contractor

What does having the backing of a hugely experienced and highly regarded technology licensor such as Casale mean for the project's future?

"We try to have the best partners along the way. AECOM who act as Owner's Engineer in the early phases of Villeta had a lot of engineering expertise across the power side, electrolysers and compressors, and also on the ammonia side, because it's such a big group. They were tasked with shortlisting potential FEED and EPC contractors for our plant.

"We landed on Casale and Urbas Energy for front-end engineering design as people who could move into engineering, procurement and construction. The Urbas team has expertise in Latin American projects and has done the engineering for hydrogen projects in Spain.

"Casale has delivered over 300 ammonia plants globally and the whole dialogue was much easier with a smaller, more integrated company. It was smart of Casale doing the FEED stage as a JV with Urbas, with expertise on the hydrogen side.

"After that, what we saw clearly as we scaled up the project was that Casale was uniquely placed – on the ammonia side, on the nitric acid side, on the granulation

side – with all of these various technology add-ons that are unique to them and offering an integrated solution to ATOME.

"As project developers, we need to know the maximum engineering and construction cost to help resolve the financing,

“We push back hard on anybody saying that they need subsidies to succeed – if you need long-term subsidies, you're a charity, not a business.”

the price we have to sell our product, and to make the project bankable. We've all seen cost inflation going through the roof and projects being cancelled in the US and elsewhere – so keeping a tight cost control has been key to ensure we get the project to construction.”

Financing and go ahead

What are the next steps enabling Villeta to move to a final investment decision (FID) – and is this still on track?

"On the debt side, we are widely oversubscribed, which is going to help us optimise terms. And on the equity side, we are basically in the final negotiation rounds. All of the costings have been done, all of the permitting is in place – and we know the project makes sense economically. But until we have final clarity on equity finance, we will not announce the details.

"That said, we do expect to start early works on the ground in Paraguay, clearing the land and starting the basic civil engineering in due course. We have aggressive timelines and will just continue with these.”

Progressing the Yguazu and Costa Rica projects

ATOME has even more ambitious plans with the larger-scale 300MW Yguazu project in Paraguay and a project venture in Costa Rica. How are both projects progressing and what are the likely time-scales for these to enter production?

"The Villeta project's development phase has taken about three years and we expect the development of our next two projects to take between 18 months and two years. The whole idea of everything we're doing – by creating the relationships, the templates and the engineering – is we can use all of the lessons learned to accelerate project deployment so we can do it faster and cheaper.

"As soon as the FID and full financing of Villeta are announced, we will start the hard miles on the Yguazu project. We finished the electromechanical study, which tells us which location has the least negative effect on the grid and makes the most sense from an infrastructure point of view, and, all in, I think Yguazu will be trailing about 18 months behind Villeta.

"When it comes to Costa Rica, it's going to be roughly the same size as Villeta, so what we're trying to do from an engineering point of view is have it as a 'copy-paste' of Villeta. We also have a decent idea of the location and are working in a formal partnership with ICE, the power producer.

"There is a strong dynamic in Costa Rica but it is a slightly different discussion in Costa Rica because unlike Paraguay you do not have five gigawatts of excess capacity in a smaller country. There's close alignment with ATOME because we fit exactly with where Costa Rica wants to invest – which is in green agriculture and taking care of its farmers.

"Overall, we can apply a lot of things from Villeta in Costa Rica. So, while I would expect that the Yguazu project will be 18 months before reaching FID, I would say add another sixth months on for our project in Costa Rica.” ■

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CASALE

Casale – leading the green fertilizer revolution

Francesco Baratto, the Head of Casale's Syngas Department

Introduction

The Villeta Green Fertilizer Project (GFP) in Paraguay represents a step change in fertilizer industry sustainability – by capturing renewable energy and transforming this into zero-carbon fertilizers using innovative technologies.

The project, located 35 kilometres from Asunción along the Paraguay River, will establish a world-scale green fertilizer production plant using Paraguay's abundant hydropower. The project is designed to meet both domestic and international fertilizer demand while significantly reducing GHG emissions, offering an exemplary model for sustainable industrial development.

Paraguay – a land of opportunities

Paraguay is uniquely positioned to lead the green energy revolution. With nearly 99% of its electricity derived from renewable sources, primarily from the Itaipu Dam, Paraguay boasts one of the world's greenest energy profiles. The country uses only 30% of its 50% share of Itaipu's electricity, leaving a significant surplus available for industrial development.

The demand for fertilizers in Paraguay is driven by the need to maintain and increase agricultural productivity. Ultimately, agricultural sector growth is also determined by fertilizer availability, given the strong link between fertilizer use and crop yields.

Villeta Green Fertilizer Project – the fundamentals

Spanning a 75-acre site in a designated free-trade zone, the Villeta project will produce green fertilizers using 100% renewable baseload electricity. Its location is ideal logistically, offering proximity to the river and the capital city with easy access to import and export routes. These excellent logistics – by enabling the efficient transportation of raw materials and finished products – are a major contributor to the project's economic viability.



The ATOME/Casale project team at the Villeta Green Fertilizer (GFP) project site in Paraguay.

Key project partnerships

The Villeta project brings together a consortium of top level international and domestic partners:

- **ATOME** is a leading UK-based green fertilizer project developer listed on the London Stock Exchange. It is spearheading the project alongside a global pipeline of other green energy ventures with a total capacity of more than 600MW.
- **Casale** is implementing the project's cutting-edge green fertilizer production solutions. The century-old engineering firm is renowned for its expertise in ammonia and fertilizer production technologies. The collaboration between Casale and ATOME began in 2022 with the award of the basic engineering design contract for the Villeta project's green ammonia synthesis loop. Subsequently, the scope of Casale's project work has expanded beyond engineering design to encompass the licensing of all core technologies — for ammonia synthesis, nitric acid, ammonium nitrate solution (ANS), nitrate granulation — and, most recently, providing all the necessary engineering, procurement and construction (EPC) services required to bring the entire project to completion
- Paraguay's national electricity authority **ANDE**, as renewable energy provider, is the project's backbone.

- **Inter-American Development Bank (IDB)** acts as the project's international financial advisor, providing financial stability and credibility while ensuring project objectives align with sustainable development goals.

Collectively, these partner companies, by bringing a wealth of expertise and innovation to the project, should ensure its success and sustainability.

Technology and processes

The Villeta project stands out for incorporating advanced technologies designed to ensure high efficiency, sustainability and scalability. The project's main technological pillars are:

- Alkaline electrolysis (AEL) technology to generate green hydrogen
- A cryogenic air separation unit (ASU) to supply nitrogen – the other critical input for green ammonia synthesis

Watch this space!

Casale's full technical article on the Villeta Green Fertilizer Project and its ground-breaking use of low-carbon technologies will be published in the forthcoming March/April 2024 issue of *Fertilizer International* magazine.

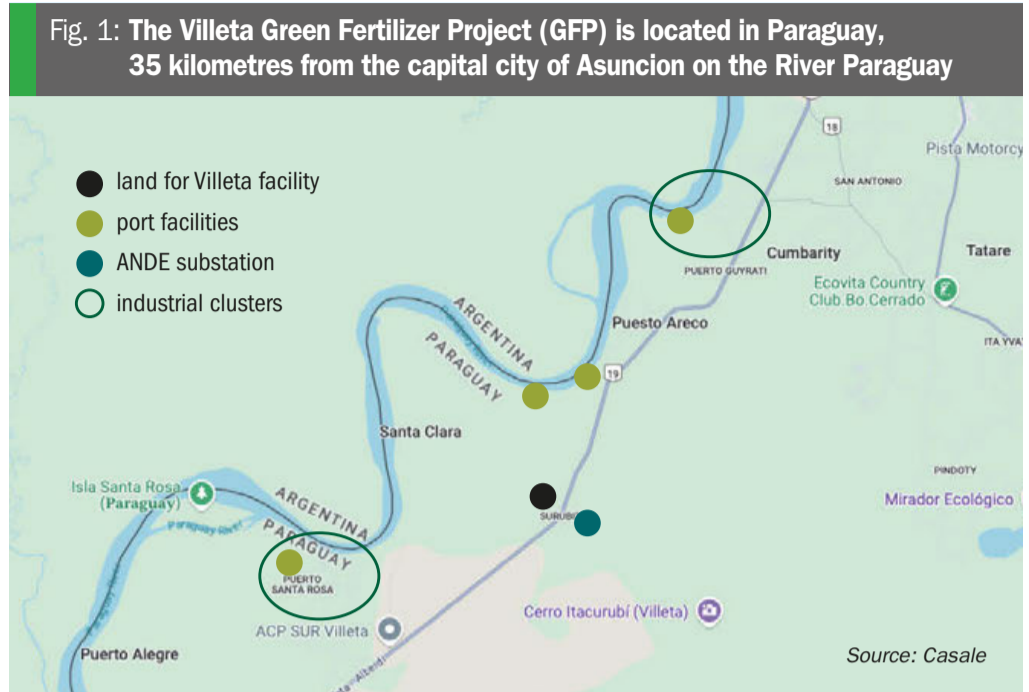
- SMART-N technology for small-scale green ammonia synthesis
- The dual-pressure DualPURE process for nitric acid production
- Finally, the conversion of nitric acid into ammonia nitrate solution and granular calcium ammonium nitrate (CAN), respectively, via NitroPIPE and NitroC-ULTIVA process technologies.

Combined, these Casale technologies meet the Villeta project’s ambitious output targets by collectively enabling the production of 768 tonnes per day of calcium ammonium nitrate (CAN).

Conclusions

The Villeta Green Fertilizer Project, by capturing Paraguay’s abundant hydropower and implementing cutting-edge technologies, provides a model for green industrialisation. Indeed, it sets a benchmark for the future of fertilizer production by aligning the twin goals of economic growth and ecological responsibility.

The project also exemplifies how



renewable energy and industrial innovation can come together to address the dual challenges of environmental sustainability and agricultural productivity. This landmark venture notably combines innovation, entrepreneurialism and leadership with solid engineering and the very high-

est standards in project execution.

As this project illustrates, Casale remains firmly engaged in promoting sustainable development throughout the global chemical industry and is committed to transforming the production of essential chemicals.

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ATLAS AGRO

Brazil – the best place to build a green fertilizer plant?

Exclusive interview with Petter Ostbo, Atlas Agro's CEO



Introduction

Atlas Agro is developing two flagship projects: the Pacific Green Fertilizer (PGF) plant, located in the Horn Rapids industrial park in Richland, Washington, in the United States, and the Uberaba Green Fertilizer (UGF) plant in Minas Gerais, Brazil.

Brazil, as a global agricultural powerhouse, offers Atlas Agro great fundamentals as a fertilizer project location. The country is also heavily import-reliant for its nitrogen fertilizer supply. Atlas Agro's ambition, therefore, is to establish domestic 'green' nitrogen fertilizer production to substitute for imported 'grey' fertilizers.

The 530,000 tonne capacity UGF project has progressed during 2024, with notable highlights including:

- The award of dual feasibility engineering contracts in February
- Project selection for the Brazil Climate & Ecological Transformation Investment Platform (BIP) platform
- An agreement with Casa dos Ventos to supply 300MW of renewable energy for the production of green ammonium nitrate.

Next steps for the UGF project include the front-end engineering design (FEED) followed by construction. The project is currently scheduled to enter commercial production in 2028.

Flagship projects

What's the history of the company, Petter, and what's so innovative about its project portfolio?

"Already, when I was Head of Production of Yara, we found out there was no technical reason you couldn't build zero-carbon fertilizer plants, as the production technology was proven and available and the environmental benefits were clear – so all that was then left was to find the right business model.

"When I left EuroChem some years later, the industry itself still had no real plans to move away from fossil fuels. It was dabbling, as it is now, in carbon capture and storage, but not really considering green fertilizer plants, and had not yet seen the full potential of the green production model.

"I then thought: hey, this presents an opportunity, why not try to pioneer green fertilizers – it has to be done now. That was the reason for starting Atlas Agro and, at that time, the optimal place to construct a green fertilizer plant was in Brazil.

"Fundamentally, If you do not rely on government support or carbon taxes, Brazil is the most attractive place to build, as it imports 95% of its nitrogen fertilizer, represents a large and growing ag market, grows high-value crops and has abundant renewable energy. Brazil is also large – so building in-market green fertilizer plants has strong transportation costs advantages.

"That's why I reached out to Knut Karlsen, my co-founder, who was then living in Brazil. And we started the business development on the Uberaba Green Fertilizer (UGF) project three years ago.

"Following the launch of the Inflation Reduction Act the US sailed up as an attractive place to construct, which is why we're developing the Pacific Green Fertilizer (PGF) plant in Richland. Lately, we see Europe becoming an attractive region too, following the introduction of the RED III and CBAM legislation.

"That's our early portfolio – and our focus is on getting the first plants built in each region.

"When it comes to expectations, the US Pacific Green Fertilizer plant is close to getting its final permits and confirmation of the grid connection it needs. So our hope is to start construction in 2025.

"In Brazil, we're a little bit behind, but plan to start the front-end engineering design (FEED) on the Uberaba Green Fertilizer (UGF) plant soon – which will be based on the design of the Richland plant. Hopefully we'll have started by the time of the FLA conference and, if not, it's imminent. The UGF FEED should be efficient, which means, realistically, I hope we can make the final investment decision (FID) in Uberaba in early 2026."

Uberaba Green Fertilizer (UGF) project update

Delegates at Fertilizer Latino American in January will be very interested to learn more about Atlas Agro's Uberaba Green Fertilizer (UGF) project in Minas Gerais,



described by the company as a first-of-its-kind venture in the southern hemisphere.

Why did Atlas Agro decide to locate in Brazil, what advantages does the country confer, and how is the \$1.15 billion UGF project progressing?

“Brazil requires a lot of fertilizer, but most of it is imported. Local supply increases food security, brings jobs and economic activity and replaces hard currency imports. Brazil also has a lot of high-value crops like sugarcane, citrus, coffee that benefits from using nitrates instead of urea.

“Richland is an agricultural centre for high value crops in the US that also imports most of its fertilizers. It’s a fruit and vegetable market – much of the potatoes and apples grown in the US are grown there. So the Richland and Uberaba projects are both in good places.

“Fortunately, a site was available in Uberaba in an industrial zone that was previously slated for an ammonia plant, reducing siting and permitting risk.

“We’ve concluded a dual feasibility engineering study on Uberaba and expect to start front-end engineering design (FEED) soon as a next step. And we’ve signed a cooperation agreement with Casa dos Ventos, a good renewable energy partner.”

Pacific Green Fertilizer (PGF) plant update

Atlas Agro’s flagship Pacific Green Fertilizer (PGF) project made major strides in 2024. The company recently completed the project’s front-end engineering design (FEED), for example, became part of Pacific Northwest Hydrogen Hub, and also signed a binding strategic offtake and partnership agreement with International Raw Materials Ltd (IRM). **What’s the current state of play with the PGF project, Petter?**

“Our hope is to start construction in 2025. The front-end engineering and design (FEED) was completed this year and we are working on the optimal execution strategy.

“Our strategy for the project and the amount of equity we need partly depends on the US Inflation Reduction Act’s (IRA) green hydrogen tax credit (45V). The final guidance will be out by the time of the conference, but now at the end of 2024 we are eagerly anticipating the details.

“Then there will be a new US administration, which may or may not influence the IRA. We’re using the time now – in antici-

pation of 45V – for continuous improvement of the project and to get the final environmental permits and the details about the grid connection clarified.”

COP29 announcements

Atlas Agro recently secured a \$80 million grant from the USDA’s Fertilizer Production Expansion Program (FPEF). The announcement was made by Tom Vilsack, US Department of Agriculture Secretary, at the COP29 summit in Baku, Azerbaijan, at the end of November. The grant will support the development of the PGF plant in Richland, Washington. Additionally, Atlas Agro also revealed it had been selected for the final cohort of the global Agriculture Innovation Mission for Climate (AIM for Climate) initiative designed to accelerate climate-smart agriculture solutions. **Atlas Agro clearly had a busy and productive time at COP29 – how important are the announcements made during the summit to the company and its project ambitions?**

“We were honoured to be invited to COP29. The World Intellectual Property Organization, WIPO, had invited us to speak, for example, as they’d selected our technology as part of a their annual book on the most promising climate technologies.

“The second invitation was from the consortium behind the industrial transition accelerator (ITA) – a programme to find energy transition projects and help them become reality. Our Uberaba project was one of three selected from Brazil.

“The Pacific Green Fertilizer plant received \$80 million from the USDA to expand the fertilizer production, as the Pacific Northwest imports most of its nitrogen, partly from the US and Canada but also from Russia.”

Imaginative new policies necessary

Petter, you’ve spoken recently about the limitations of current market interventions. Subsidies like the US Inflation Reduction Act require taxpayers to foot the bill, for example, while taxes like EU’s Carbon Border Adjustment Mechanism (CBAM) and Emissions Trading System (ETS) require the customer to pay. **You’ve suggested instead that a more efficient and effective solution would be for the industry itself foot the bill – in the form of a ‘minimum price guarantee fund’. How would this fund work in practice and what are its key advantages, in your view?**

“Our projects are profitable and are getting built. But it’s too little and too slow. Because if we want to decarbonise nitrogen and remove the 2% of global emissions they make up, we need about 800 green fertilizer plants of our size globally. With each one taking about five years and one and a half billion dollars to build – the challenge is very large.

“The main impediment to faster growth is the need for project finance and the risk perception of the banks.

“If the newly built green nitrogen plants pay into some kind of insurance fund, the fund can cover bank repayments in case world market prices for fertilizers fall below what is needed to pay back. This would give banks confidence to support the energy transition.

“The beauty of such a mechanism is that, unlike a grant or a loan, there is not an official selecting winners and losers – as participating plants would already have been built, leaving the private sector to take care of selecting the most viable projects. There is also no risk of wasting grants or loans on projects that are never completed.

“The scheme can cover a large number of plants. An initial \$2-5 billion fund would cover the 30 plants Brazil needs to become self-supplied by fertilizer. If you look at the tax revenues that would accrue to Brazil from the plants built those would be factors higher.”

Reaching a final investment decision (FID)

There’s an exciting 12 months ahead for Atlas Agro, given the company’s ambition is for its two flagship projects – one in the US and one in Brazil – to reach a final investment decision (FID). What’s the pathway and key steps to achieving that goal?

“Green doesn’t mean more expensive, it means different. We don’t need a green premium to compete on average. We don’t have variable input costs like fossil gas, we have fixed power costs – so we can offer fixed price fertilizer on long-term contracts, ceiling prices and other mechanisms to food companies, for example.

“We very much want to be the partner of choice to the Brazilian authorities and agricultural community – to work towards self-sufficiency for nitrogen fertilizers in Brazil. Our Uberaba plant has come far and we hope it is the first of many in the country.” ■

STAMICARBON

Insights on the future of nitrogen technology

Exclusive interview with Mauricio Medici, Stamicarbon's Licensing Manager for the Americas and Sub-Saharan Africa



Introduction

Stamicarbon is the nitrogen technology licensor of NEXTCHEM (MAIRE group). Ahead of Fertilizer Latino Americano 2025 in Rio In January, Mauricio Medici, the company's regional licensing manager, sat down with *Fertilizer International* to discuss the opportunities and challenges faced by regional fertilizer producers – and how cutting-edge technologies for green ammonia and emissions reduction can help Latin American countries meet their agricultural and environmental goals.

Opportunities in a dynamic regional market

Mauricio, as a company, Stamicarbon is committed to sustainable and efficient fertilizer industry growth. **What are the main challenges and opportunities for innovative production technologies in the Latin American market?**

"Latin America is a dynamic and growing market for nitrogen fertilizers. That's being driven by the region's strong focus on agriculture and the growing emphasis on improving crop yields. The region does face its own challenges, however, such as infrastructure constraints and the diverse regulatory and political landscape.

"It's a market therefore that requires adaptable nitrogen production technolo-

gies capable of catering to these differing dynamics. For example, Stamicarbon's proprietary urea and nitric acid technologies, as well as being highly advanced and designed for maximum efficiency, can be specifically tailored for different scales and infrastructure set ups.

"This adaptability is definitely a real strength – as it offers significant opportunities for Latin American companies to make the shift to more sustainable, viable and efficient fertilizer production even when limited infrastructure is available."

Supporting Latin America's energy transition

How will Latin America contribute to the global shift to sustainable fertilizer production in future – and what role will Stamicarbon play in supporting this transition?

"Latin America, in my view, with its abundant renewable energy sources, like hydropower, wind, and solar, is well positioned to set up low-carbon nitrogen plants and provide local markets with much needed reduced carbon footprint fertilizers. Stamicarbon is supporting this transition by providing small- to medium-scale ammonia technology – at capacities between 50 and 500 tonnes per day – that is scalable and can utilise these renewable resources to synthesise green ammonia.

"Our partnerships with regional EPC companies – together with our continuing commitment to innovation – are making the production of ammonia with a reduced carbon footprint both economically feasible and environmentally sustainable. This will definitely enable Latin American producers to contribute significantly to global efforts on decarbonisation in my view

"I feel very positive about the region's future potential. Especially as our ability to offer full life cycle solutions – from feasibility studies and technology implementation all the way through to technical support and services – means we are ready to help Latin American producers navigate and lead in the transition toward a more sustainable nitrogen fertilizer industry."

Overcoming practical hurdles to adoption

What practical challenges to the adoption of green ammonia in Latin America, have you encountered – and how is Stamicarbon working to overcome these hurdles?

"A good question! The capital cost associated with green ammonia installations, where electrolyzers take a major portion, is one of the primary challenges, along with the need for stable renewable energy sources, plus the necessary infrastructure to allow hydrogen production at reasonable scales.



Mauricio Medici, Stamicarbon's Licensing Manager for the Americas and Sub-Saharan Africa.

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“Responding to that, Stamicarbon has focused on developing modular and scalable green ammonia technologies that can, firstly, lower entry costs and, secondly, be compatible with smaller, decentralised renewable energy sources. These flexible solutions provide Latin American producers with the opportunity to start small initially, and then scale up as renewable infrastructure and/or demand improves, making low-carbon ammonia a viable option, even for emerging markets in the region.”

Emissions reduction – another priority

Are you seeing demand from the region’s producers for technologies that help reduce emissions, particularly in countries with stringent environmental regulations?

“Yes, absolutely, as Stamicarbon offers a range of effective technologies, each one designed to offer its own tailored approach to emissions reduction. Our NX Stami Urea™ portfolio, for example, features a range of advanced designs. These minimise ammonia emissions during urea production, while also reducing steam consumption, which is typically generated by natural gas-fed boilers. The end result is a cleaner, more sustainable fertilizer manufacturing process.

“What’s more, we also offer NX Stami Nitrates™, a tertiary abatement system, part of the NX Stami Nitrates™ portfolio, specifically designed to help producers reduce nitrogen oxides (NOx) and nitrous oxide (N₂O) emissions, the two primary greenhouse gases associated with nitric acid production. These type of systems are highly effective in controlling emissions, and are helping producers in Latin America – and worldwide – meet even the most stringent environmental standards and reduce their carbon footprints.

“In November 2024, and this is a great case study example in the region, we signed a contract to provide a license and process design package (PDP) for a tertiary abatement system at Soluciones Químicas’ nitric acid plant in Minatitlán, Veracruz, Mexico. By efficiently removing nitrous oxide (N₂O) from the nitric acid plant’s tail gas stream, this project managed to

successfully bring the plant’s environmental performance in line with current emission regulations in the country.

New process and digital technologies

Are there any advances in urea production technology that can help Latin American producers operate more efficiently and sustainably?

“In urea production, Stamicarbon’s is pursuing improvements in energy efficiency and resource consumption – mainly by targeting process optimisation and heat integration. Our Ultra-Low Energy (ULE) design for large-scale urea production, for example, delivers significant reductions in steam consumption, these translating into lower operational costs and a reduced environmental impact.

“Latin American producers, by adopting advanced urea production technologies – to increase their yield and efficiency and reduce emissions etcetera – can realistically position the region as a leading and self-sufficient centre for fertilizer production in my view.

“The integration of digital technologies can also play a crucial role in enabling plant operators to achieve their environmental goals – by tracking emissions, ensuring compliance with environmental regulations and helping plants minimise their carbon footprint. Stamicarbon’s Digital Process Monitor tool is a case in point, as it combines real-time process monitoring with predictive analytics and an advanced mathematical model, so enhancing productivity while also reducing energy consumption.

“For us, equipping personnel with the necessary skills to run their plants at maximum capacity, safely and with minimal emissions is always a priority. That’s why we developed our Technology Training Simulator.

“This highly advanced training tool realistically simulates operating scenarios and process upset conditions – and is suitable for operators, engineers, and management. It’s customisable too and can precisely replicate all

the elements of a customer’s urea, ammonia, or nitric acid plant, including its process equipment, control systems, and interlocking mechanisms, while also maintaining a realistic look and feel.

“We’re convinced that The Digital Process Monitor and Technology Training Simulator – both part of our NX STAMI Digital™ portfolio – really do offer fertilizer producers in Latin America an opportunity to optimise their operations and improve efficiency.”

Vision for the future

What are Stamicarbon’s long-term goals in Latin America, particularly for low-carbon technologies?

“Well, in the long-term, our aims in Latin America are to promote sustainable growth in the nitrogen fertilizer industry, and support regional players in transitioning to technologies with a reduced carbon footprint. We do recognise the global challenges faced by green hydrogen and ammonia projects and, as a result, the slow market development for green ammonia itself.

“That’s why Stamicarbon also offers low-carbon ammonia technologies, combining its small- to mid-size ammonia loop (50-500 t/d) with NEXTCHEM’s NX-CPO™ process for ‘blue’ hydrogen production from natural gas – the aim being to bridge the gap between ‘grey’ and ‘green’ ammonia production in the coming years while still significantly reducing carbon footprints.

“Overall, our ambition is to remain a trusted partner for Latin American producers by providing innovative and efficient solutions for urea, nitric acid, and green ammonia production. As a company, we are focused on sustainability, and that includes continuously refining our production technologies to further reduce emissions, lower energy consumption, and encourage the shift to renewables.

“I guess our ultimate vision, and I know this will be widely shared, is to create a thriving Latin American fertilizer industry that contributes positively to the global nitrogen market and environmental goals. Stamicarbon will be part of that future, in my view, by empowering producers with the right tools and knowledge to achieve their sustainability targets.” ■

Acknowledgement

Additional reporting by Nikolay Ketov, Stamicarbon’s public relations officer.

“Latin America, in my view, with its abundant renewable energy sources, like hydropower, wind, and solar, is well positioned to set up low-carbon nitrogen plants and provide local markets with much needed reduced carbon footprint fertilizers.”

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2	48
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Maximising soybean crop yields

Nearly 400 million tonnes of soybean are harvested globally every year and processed to yield oil and meal, a major source of animal protein. Its cultivation in Brazil, the US and other countries requires large applications of potash and phosphate. Growers are, however, increasingly turning to biostimulants and micronutrients such as boron to achieve incremental yield gains.

Soybean crop, Brazil.

Advances in plant genetics and agronomy have allowed farmers in Brazil and the US to achieve record soybean yields in recent years. Record-breaking soybean harvests are being accompanied by the ever high uptake and removal of secondary nutrients and micronutrients such as sulphur, magnesium, boron and zinc. This is making the need for season-long macronutrient and micronutrient availability greater today than ever before. Fortunately, fertilizer producers have responded to this

challenge by developing innovative, new fertilizer products and designing sophisticated, tailored fertilizer programmes for soybean.

Soybeans are known for their efficient use of residual soil nutrients, although modern, high-yielding varieties require more careful nutrient management and higher nutrient inputs.

Proper and well planned crop nutrition is known to be one of most effective ways of influencing both soybean yield and quality. Fertilizer management, and

the alleviation of soil acidity, for example, generally have commercially valuable and positive effects on the oil and protein levels of soybeans. Maintaining soil fertility also protects soybean plants from environmental stresses such as weather, disease and nematodes.

In soybean production, soil pH has been singled out for its influence on soil fertility and plant growth. Soybeans thrive at soil pH between 6.0 and 6.8, and both nutrient uptake and yield are maximised at this pH range.

ICL

Biostimulants in soybean: a Brazilian success story

Karla Martins, Deyvid Bueno, Guilherme Souza and Patrick Haim

Introduction

Soybean [*Glycine max* (L.) Merrill] is Brazil's most economically important crop – and is well known for its sophisticated and sustainable cultivation practices.

The continuing success of soybean growing in Brazil is attributable to investments in new technologies, the use of efficient management practices, and the adoption of innovative products that enhance plant performance. The use of biostimulants, in particular, is one innovation that has expanded rapidly and contributed significantly to improvements in the country's soybean productivity.

Biostimulants

Plant biostimulants are synthetic or natural compounds that are applied to soil, foliage, or seeds. They improve soybean yield and quality by stimulating plant metabolism, enhancing nutrient absorption, and increasing resilience to biotic and abiotic stresses.

The main categories of plant biostimulants include microorganisms, humic and fulvic acids, amino acids, plant extracts, and algae extracts. ICL, a leading biostimulant producer, offers all of these product types. The company has been a biostimulant market pioneer.

Sustainability

Sustainability is a key pillar of soybean production systems – benefitting both growers and the planet, respectively, by making soybean products more competitive and reducing the environmental impacts of farming.

One clear example of sustainable cultivation is the widespread use of inoculants for biological nitrogen fixation (BNF) in Brazilian soybean growing. This agricultural practice is adopted on 44 million hectares of soybeans and – by fixing atmospheric N instead of applying synthetic nitrogen fertilizers – avoids 240 million tonnes in CO₂ equivalent emissions¹.

Soil management

In Brazil, soybeans are typically cultivated on nutrient-depleted soils which require careful management to maintain their fertility and ensure high crop productivity. The successful cultivation of a fast-growing crop like soybean relies on several essential factors – these including nutrient-rich soils, the absence of compaction, a high organic matter content, and an active soil microbiota.

ICL biostimulants for soybean management

Phusion is a phosphate fertilizer that incorporates micronutrients and humic substances. It is recommended at planting to nourish crops and aid root development. Phusion also increases phosphorus availability by containing a polymer that helps prevent the adsorption of this major nutrient by soil particles.

Bioz Diamond contains bioactive compounds and organic acids that stimulate soil microbiota diversity. It promotes vigorous root system growth by balancing

nutrient mineralisation and root interaction. This improves nutrient uptake efficiency and helps plants become more resilient to environmental stresses. Overall, the product is designed to enhance soil health and reduce environmental and crop management-related damage to soils.

ICL offers a range of products to enhance **biological nitrogen fixation (BNF)** and ensure robust growth in soybean – starting with seed treatment all the way through to the grain filling stage.

Inoculants based on *Bradyrhizobium* (**Actibio Brady**) and *Azospirillum* (**Actibio Azos**), for example, enhance BNF and root growth. Studies show annual inoculation with *Bradyrhizobium* increases productivity by about 8%, while adding *Azospirillum* can boost this gain to 19%². A third inoculant product, **Actibio Phos** (*Pseudomonas* bacteria), produces metabolites that aid P and K mineralisation and root system development.

The biostimulant **Bioz Topaz**, meanwhile, is recommended as the best option for maintaining seed vigour and ensuring proper rooting. It is composed of an algae

extract, alongside micronutrients such as Ni, Co, and Mo, and supports nitrogen-fixing bacteria activity as well as providing balanced crop nutrition.

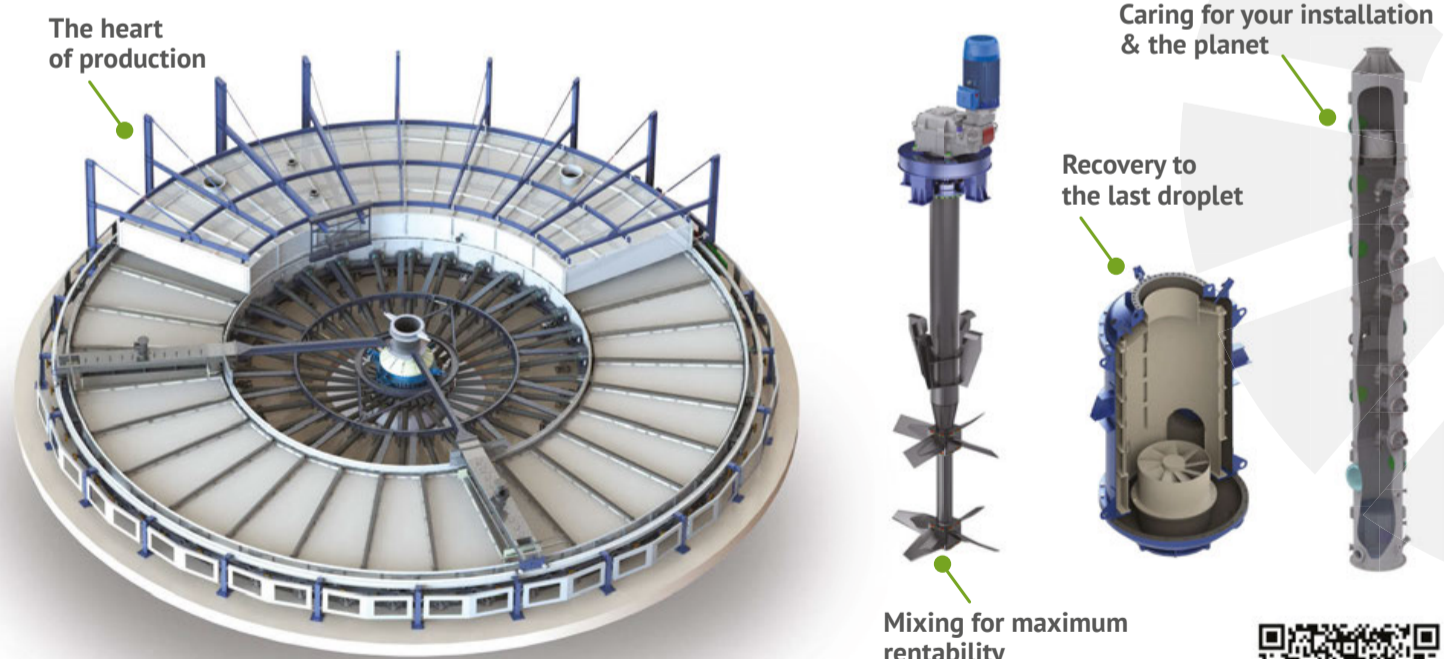
Valuably, Bioz Topaz is compatible with other biological products used in seed treatment, including inoculants, insecticides, and fungicides. In soybean cultivation, Bioz Topaz has been shown to increase the number of nodules per plant by 66% and soybean yields (productivity) by 11% in research carried out by ICL's Innovation Center and ESAPLq/USP (Figure 1).

The BNF process is not limited to seed inoculation or the initial stages of soybean growth. In fact, peak demand for nitrogen actually occurs at the R1 growth stage of the soybean plant, making it essential to keep root nodules active throughout the entire plant growth cycle. To achieve this, however, optimising both photosynthesis and plant metabolism is necessary.

Using **Bioz Nephrite** in nutrient management, for example, increases the photosynthetic activity of plants and promotes the accumulation of carbon in the aerial parts.

Profile[®]
BY PRAYON

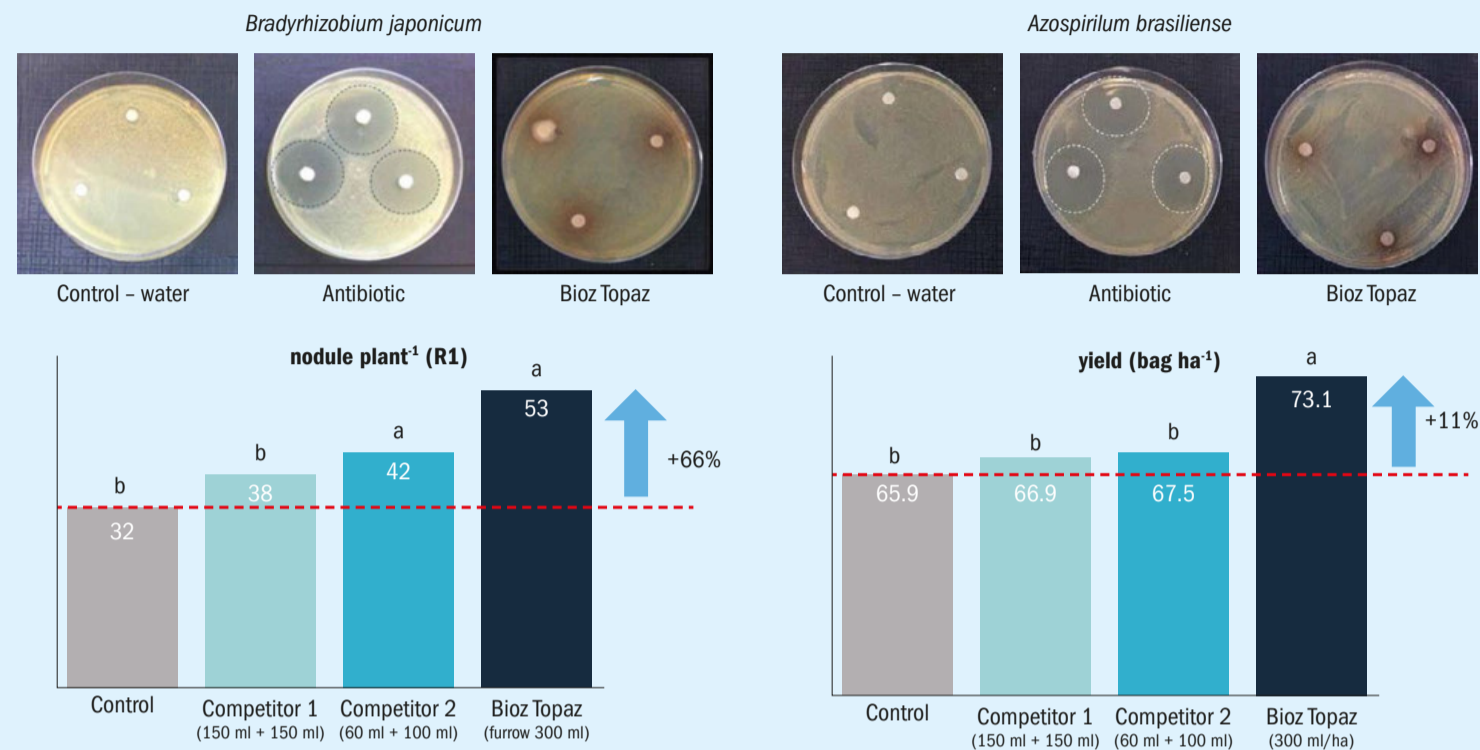
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Fig. 1: The compatibility of Bioz Topaz with *Bradyrhizobium japonicum* (a) and *Azospirillum brasilense* (b) versus two competitor products and a control: number of nodules per soybean plant (left) and soybean crop yield (right).



This is then transported to the roots, intensifying nodule activity and ensuring nitrogen fixation.

A ¹⁵N isotope study has shown that a combined application of **Bioz Topaz + Bioz Nephrite** increased BNF by 33% – by improving the volume, weight, and number of nodules – as well as enhancing soybean productivity (Figure 2).

Strategies for climate stress mitigation

Brazil faces climatic challenges such as extreme weather events with high temperatures and water deficits. Amino acids play a crucial role in mitigating these stresses through their role in vital plant processes. Foliar application of the following two amino acid products can enhance plant resistance to stress by improving the absorption of nutrients and other agricultural chemicals:

- **Bioz Moonstone** is a foliar fertilizer with a unique amino acid complex that mitigates abiotic stresses and promotes rapid plant recovery.
- **Bioz Kellus** contains nutrients such as K, Cu, Mn, and Zn that are complexed with amino acids. This ensures stable solutions, rapid nutrient absorption, and increased antioxidant enzyme activity (Figure 3).

Improving plant structure and flower retention

During vegetative growth, many growers seek to control soybean plant height to optimise the number and arrangement of lateral branches and nodes. The biostimulant **Bioz Sapphire**, by stimulating cell division, improves plant structure, promotes better branching and, valuably, in doing so increases light interception.

During the soybean's reproductive stage, it is common for some flowers to be lost due to abscission. This can be a major issue with some 20-80% of flowers susceptible to the abscission process, depending on the environmental conditions and plant genetic characteristics.

To protect against this, the application of **Bioz Onyx** has proven to be effective at increasing flower set and pod retention. This product contains organic and biostimulant components and promotes the synthesis of essential flowering and fruiting hormones such as gibberellins and cytokinins.

During the 2021/22 and 2022/23 growing seasons, ICL commissioned soybean trials with Bioz Onyx across different producing regions (n=13) in collaboration with universities and external consultancies. Results demonstrated an 8% average increase in soybean produc-

tivity, equivalent to an average yield gain of 288 kg per hectare, confirming the significant economic benefits of Bioz Onyx for growers.

Grain filling and nutritional quality

Inorganic biostimulants such as **Nutriduo** are also available for soybean cultivation in addition to traditional organic-based biostimulants. This product is applied during the grain filling stage and contributes to the biofortification of the crop by enriching the grain with selenium (Se). It also contains amino acids.

The nutritionally balanced composition of Nutriduo (N, P, K, Mg, B, and Zn) is designed to mobilise sugars from the leaves to the grain. The presence of Se is an additional benefit as it improves plants resilience, especially under saline, heat, and water stress conditions.

The future of biostimulants

ICL believes biostimulants have a promising future ahead, thanks to emerging research innovations and a growing range of practical applications. This product group complements and enhances the action of fertilizers and other agrochemical inputs, improving sustainability as well as the quality and yield of agricultural produce.

Looking ahead, the integration of genetic engineering, precision agriculture, big data, artificial intelligence, and regenerative agriculture will have a positive impact on farm productivity and profitability.

The use of biostimulants in crops such as soybean is a great success story for Brazilian agriculture. Yet challenges do remain – particularly when it comes to product regulation. In our view, robust regulation of the biostimulants market, with greater standardisation and the implementation of clear protocols, is essential and necessary to increase producer confidence and expand the use of these innovative and valuable products. ■

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- Guilherme Souza – Technical Development Manager, ICL Brazil
- Patrick Haim – Lead Agronomist, ICL

Fig. 2: Soybean crop performance of Bioz Topaz + Bioz Nephrite (both individual and combined treatments) versus the control: percentage biological nitrogen fixation (top) and nodule weight from five soybean plants (bottom)

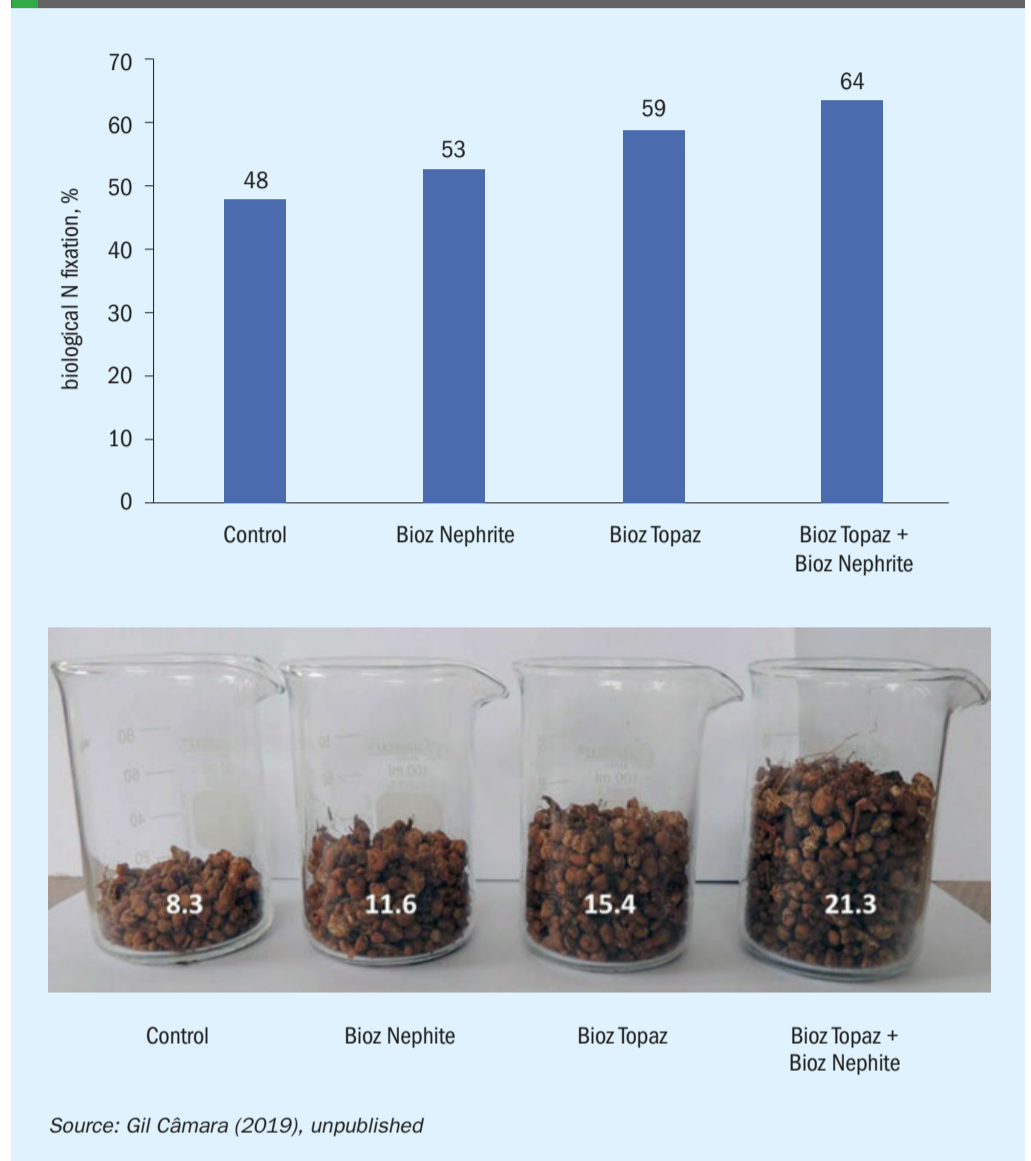
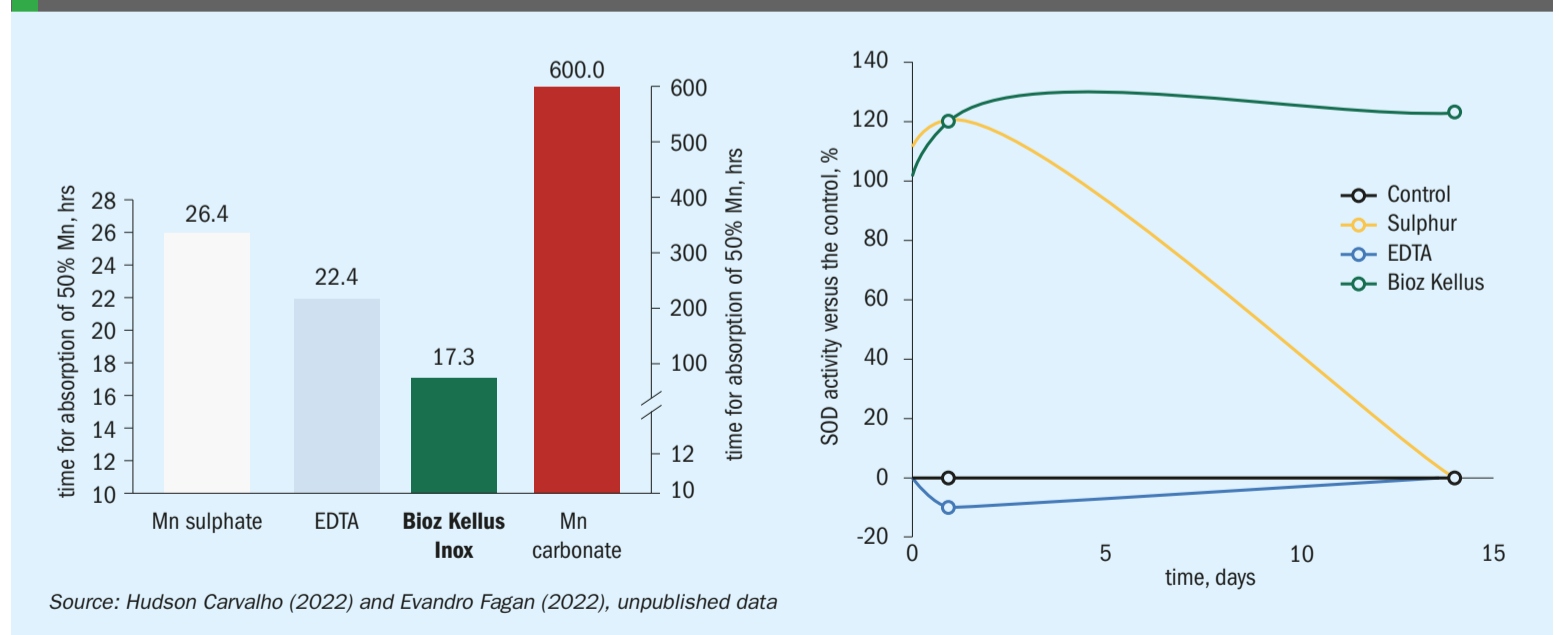


Fig. 3: Effectiveness of Bioz Kellus as measured by: absorption time for 50% of applied manganese versus three other types of soybean plant manganese (Mn) treatments (left) and superoxide dismutase (SOD) activity (right).



U.S. BORAX

Boron in soybean nutrition

Fabiano Silvestrin and Eduardo Saldanha

Boron uptake by soybean

Agronomists have investigated the patterns of nutrient uptake, partitioning, and remobilisation in soybean cultivation for many years. Recent studies have shown that the potential for nutrient uptake by soybean crops has increased significantly as productivity (yield) levels have risen. This has resulted in higher overall demand for nutrients – including for boron.

Crop research carried out by the Brazilian Agricultural Research Corporation (EMBRAPA), for example, shows that new soybean varieties (SYN 1039 and DM 6563) accumulate and export more boron compared to the variety (BRS 184) traditionally grown (Table 1). These data reinforce the fact that precise knowledge about nutrient uptake and demand, and how this varies for different soybean varieties planted in different regions, is essential when it comes to better crop nutrient management

Similarly, results obtained for total boron uptake by soybean plants and boron removal by soybean seeds from a U.S. study (Table 2) do differ from those observed in Brazil. Indeed, such variations in boron uptake are to be expected, as these reflect differences in the growing environment, climate conditions, soil type, and soybean cultivation techniques.

An important parameter provided by the U.S. study is the maximum boron accumulation rate, essentially a measure of peak boron demand. U.S. researchers found that the maximum soybean demand for boron occurs during the R4 reproductive period, with a peak accumulation value of 5.18 g/ha being observed (Table 2).

These results demonstrate the importance of using fertilizer sources – such as Granubor® (sodium tetraborate pentahydrate) – that release all their boron over the growing season and therefore guarantee gradual and consistent boron supply, this being particularly important during those soybean growth stages with the greatest boron demand.

The 2016 EMBRAPA study also determined boron accumulation curves for three soybean varieties. Results show that soybean demand for boron starts in the vegeta-



Table 1: Boron uptake and removal for three different Brazilian soybean varieties

Variety	Crop productivity (kg/ha)	Total B uptake (g/ha)	B removal with soybean seed (g/ha)	Harvest index ⁴ (%)
BRS 184 ¹	3,230	183	80	43
SYN 1059 ²	4,000	375	125	33
DM 6563 ³	3,000	225	73	32

Notes:

1. Conventional, 2. RR, 3. RR2 Pro

4. Harvest index (HI) is the ratio of grain nutrient removal to total nutrient accumulation, and is therefore a relative indicator of nutrient partitioning to soybean seeds

Source: Oliveira Jr et al. (2016)

Table 2: Boron uptake and removal during U.S. soybean cultivation¹

Total B uptake (g/ha)	B removal with soybean seed (g/ha)	Harvest index (HI)	Maximum accumulation rate (g/ha/d)	Maximum accumulation growth stage
325	111	34	5.18	R4

Notes:

1. Average soybean yield = 3.84 t/ha, as measured at physiological maturity (R8 growth stage).

Source: after Bender et al. (2015)

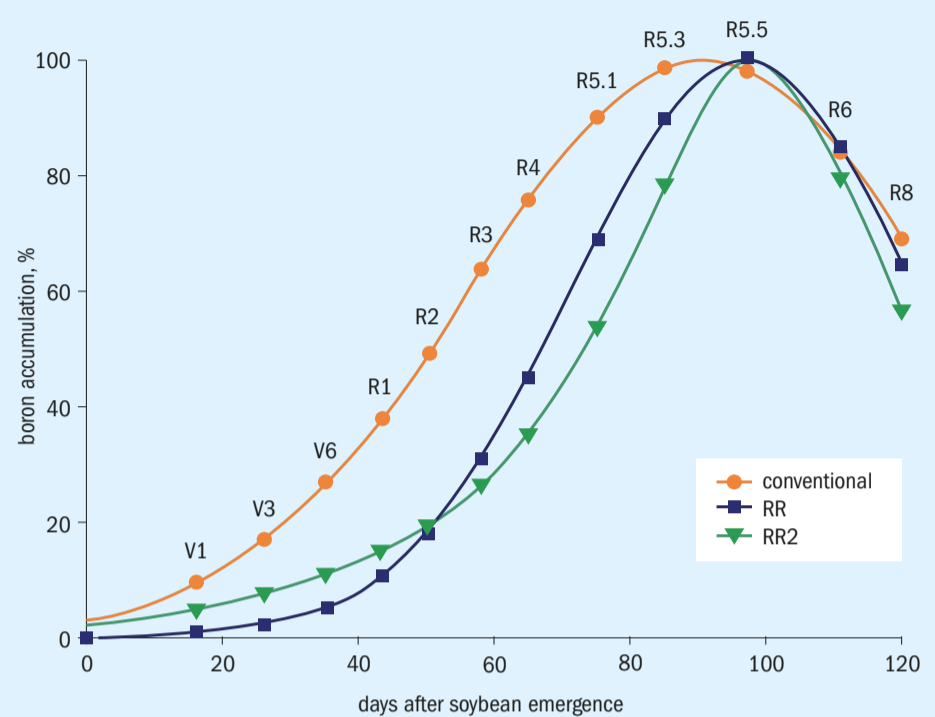
tive phases (V1-V6) and then progressively increases during the crop's reproductive period – particularly between periods R2 and R5 – reaching maximum accumulation between the R4 and R5 phases (Figure 1).

Soybean cultivation research studies commissioned by U.S. Borax, and carried out with different agronomic research institutions in Brazil, show that using Granubor® as a source of boron delivers an average incremental yield improvement of 277 kg/ha. Results were obtained using reliable experimental designs and determined from rigorous statistical analysis, such as ANOVA and mean tests. This provides a high level of confidence in the crop recommendations for Granubor® and the resulting yield improvements.

Granubor®: a high agronomic efficiency fertilizer

To evaluate boron release from different fertilizer sources, U.S. Borax carried out percolation experiments using columns filled with soil under controlled laboratory conditions (see main photo). Water was applied daily to the individual columns, each of

Fig. 1: Boron accumulation curves during the growth stages (V1-R8) of three different soybean varieties cultivated in Brazil



Notes:
 Conventional: soybean variety BRS 184, yield = 3.25 t/ha
 RR: soybean variety SYN 1059, yield = 4.00 t/ha
 RR2: soybean variety DM 6563 (Intacta RR2 PROTM), yield = 3.00 t/ha
 Source: after Oliverira Jr et al. (2016)

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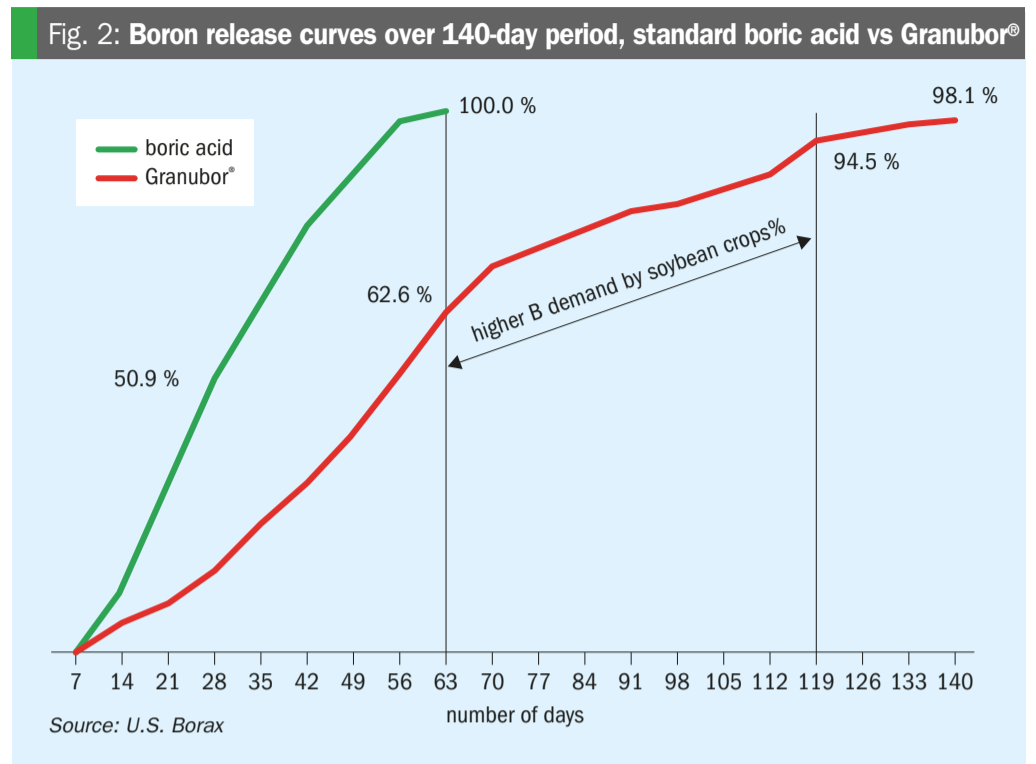
which contained a boron dose from different fertilizer sources. The boron sources tested were standard boric acid (17.5% B), Granubor® (15% B), and five types of ulexite from different regions. The results obtained for ulexite have been described previously (*Fertilizer International* 521, p26).

The volume of drained (percolated) water was collected each day and analysed for soluble boron content. Experimental conditions were as follows:

- 300 g of topsoil (clayey soil) around 10 inches deep (classified as well drained) was placed in 12" x 2" PVC pipes
- Soil content: < 0.1 ppm of B
- 250 g of soil placed in a tube followed by 1 g of boron equivalent fertilizer, covered by 50 g of soil
- Watered 100 ml/day
- Boron concentration in percolated solution was measured by inductively coupled plasma (ICP) analysis.

Results (Figure 2) show that 100% of the boron present in the boric acid percolated after 63 days (9 weeks), while 98.1% of the boron in Granubor® percolated after 140 days (20 weeks). These results confirm that boric acid percolates faster than Granubor® due to its more rapid solubilisation. Therefore, in practice and from a field application perspective, standard boric acid may not fully meet the boron demands of soybean throughout the growing season.

Whereas for Granubor®, in contrast, the pattern of boron release strongly matches the period of greatest boron demand from soybean plants (Figure 2). It can supply



boron to the soybean crop when it's most needed, if applied at the correct time.

Soybean is a global crop and its nutrient needs in different regions will vary according to soil type, climate conditions and soybean variety etc. Nonetheless, U.S. and Brazilian soybean growers have observed significant corrections in boron deficiency symptoms on farms using Granubor®.

In our view, Granubor® provides the best solution for soybean growers requiring a soil-applied boron fertilizer, based on the rigorous analysis of extensive field data collected from numerous research studies (Figure 3).

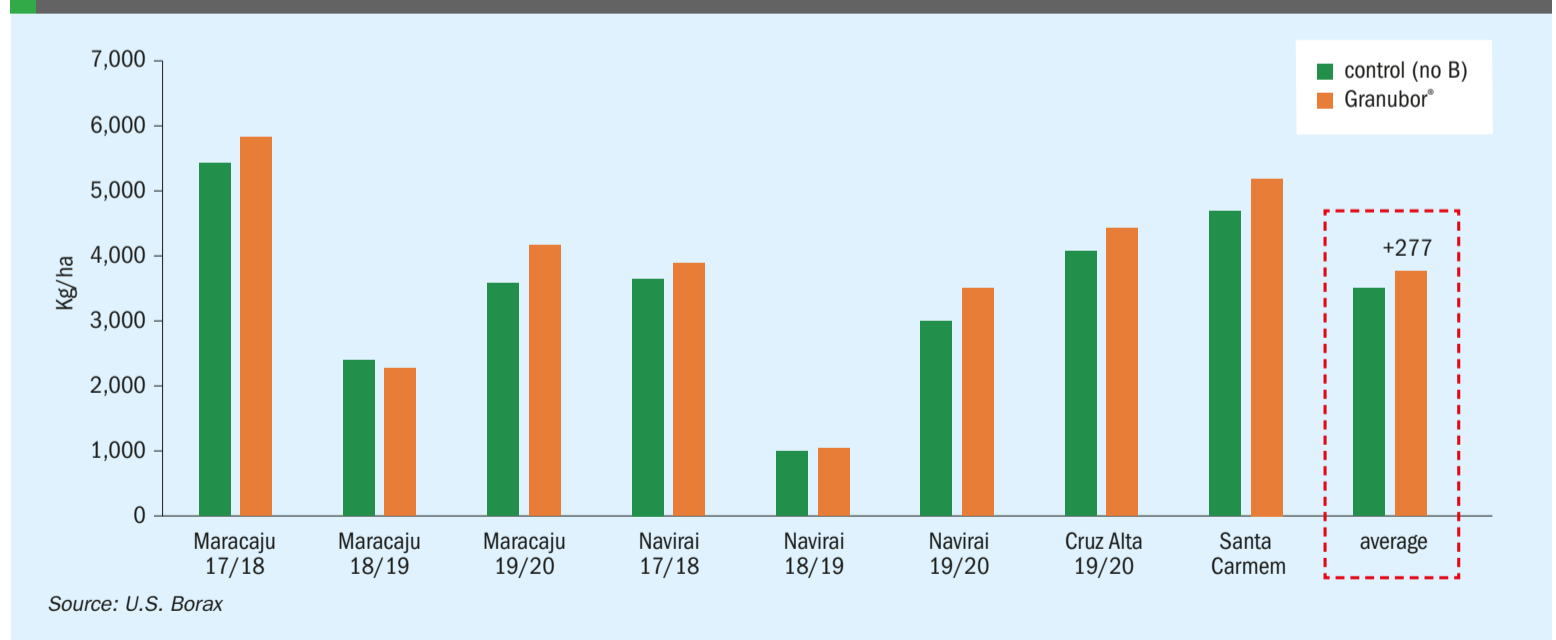
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Fig. 3: Boron yield response of Brazilian soybean crops to the use of soil-applied Granubor® – results for different locations, soil types and growing seasons.



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January-February 2025

phosphates & potash

INSIGHT

52 P & K management in soybean/
corn rotations

55 Van Iperen's Green Switch journey



1	47
2	48
3	49
4	50
5	51
6	52
7	53
8	54
9	55
10	56
11	57
12	58
13	59
14	60

P & K management in soybean/corn rotations

Major global crops corn and soybean are often grown in rotation. **Dr Karl Wyant**, Nutrien’s Director of Agronomy, outlines how the phosphorus, potassium and sulphur removed during soybean/corn rotations in Brazil and the United States are best replenished. The importance of these three nutrients for nitrogen fixation in soybean is also described.

Introduction

Corn (maize) and soybean (soya) are major crops grown throughout the world, often in rotation with one another. For the 2023/24 growing season, global corn production totalled 1.2 billion tonnes, while the soybean harvest came in at 395 million tonnes, according to the USDA.

High yielding crops grown at this scale across millions of hectares require careful fertilizer planning. This is necessary to maximise agricultural productivity while at the same time reducing environmental impacts from the loss of excess nutrients.

In this article, we highlight the removal of phosphorus (P), potassium (K) and sulphur (S) as crop nutrients during soybean/corn rotations in Brazil and the United States. The important influence of P, K and S supply on nitrogen (N) fixation in soybean is also outlined.

Major producing countries

Brazil and the United States collectively account for approximately 68% of global soybean production and 52% of global corn production (Figures 1 & 2). The climate in Brazil allows growers to plant soybeans in the spring and then follow this with corn planting in the same 12-month period. In contrast, much of the climate across the US corn and soybean belts only permits one crop to be planted per year, resulting in a two-year rotation cycle (Figure 3). In both countries, nutrient



PHOTO: UNITED SOYBEAN BOARD

Fig. 1: Top five soybean producing countries by tonnage (left) and growing area (right), 2023/24 growing season

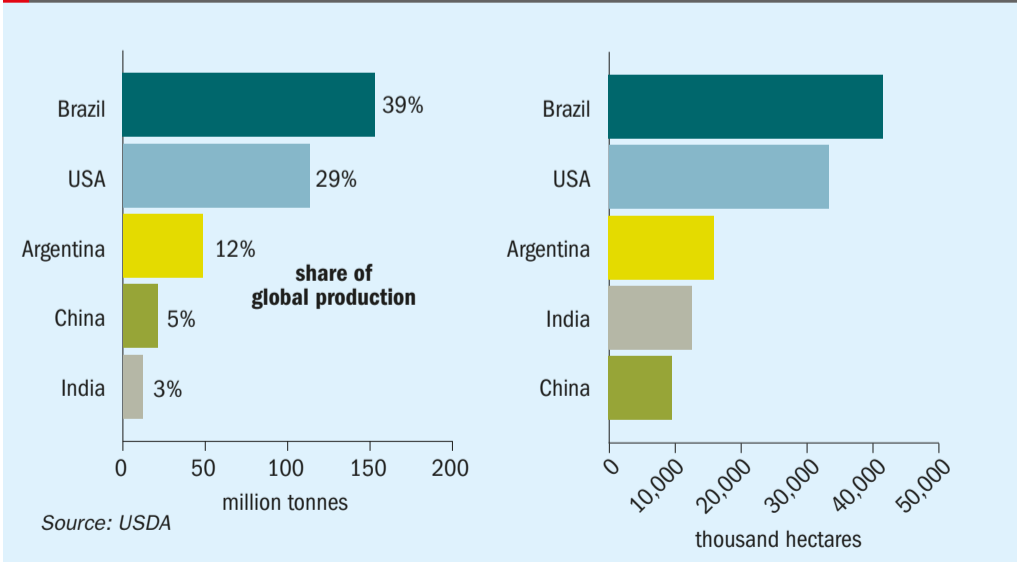
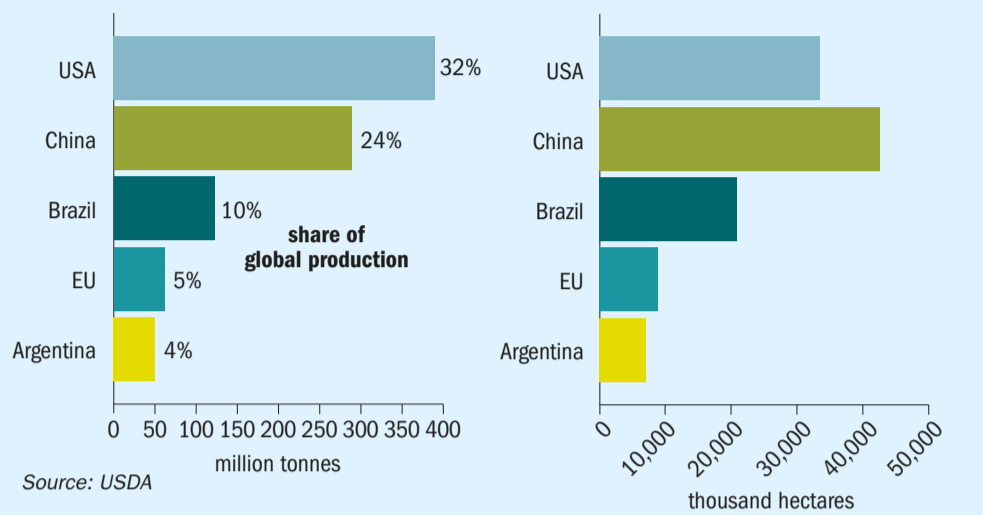


Fig. 2: Top five corn producing countries by tonnage (left) and growing area (right), 2023/24 growing season



management plans need to be adjusted for the local climate to maximise crop yield and quality.

Nutrient removal and fertilizer planning

Estimating how much phosphorus, potassium, and sulphur are leaving the field in the form of a harvested product (e.g., grain) is a crucial tool for nutrient management planning. To maintain long term soil fertility, nutrients exported from the field will ultimately need to be replaced and, consequently, estimates of nutrient removal are used as the basis for fertilizer application rates.

In general, large nutrient removals from the field – as a result of a high yielding crop harvest, for example – will need to be followed by the application of fertilizers or manures at high rates to maintain the productive capacity of farmland (Figure 4).

Assessing the combined quantities of nutrients removed by corn and soybean harvests provides a better holistic understanding of phosphorus, potassium, and sulphur removal from the field across the rotation (Figure 5). The disparities in nutrient removal seen during crop rotations in Brazil and the United States reflect two main factors:

- Differences in the average yields in each country
- Differences in the timeframe for nutrient removal.

Fig. 3: Soybean/corn crop rotation calendar for Brazil and the United States – showing approximate planting, mid-season, and harvest dates. Due to differences in prevailing domestic climate conditions, Brazilian farmers notably practice a double-cropping system in a single year versus the multi-year rotation system practiced by US growers.

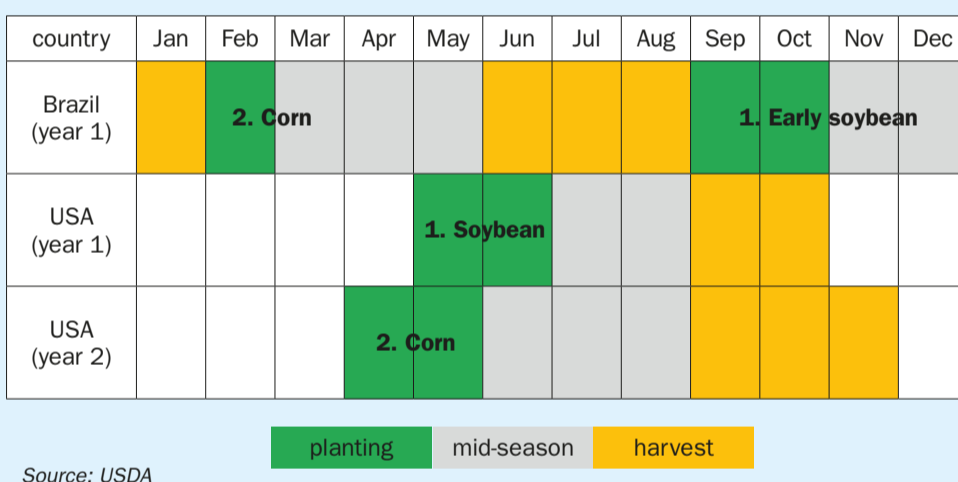


Fig. 4: Typical nutrient removal per tonne of corn and soybean grain yield for phosphorus, potassium and sulphur (left) and typical corn and soybean grain yields for Brazil and the United States (right)

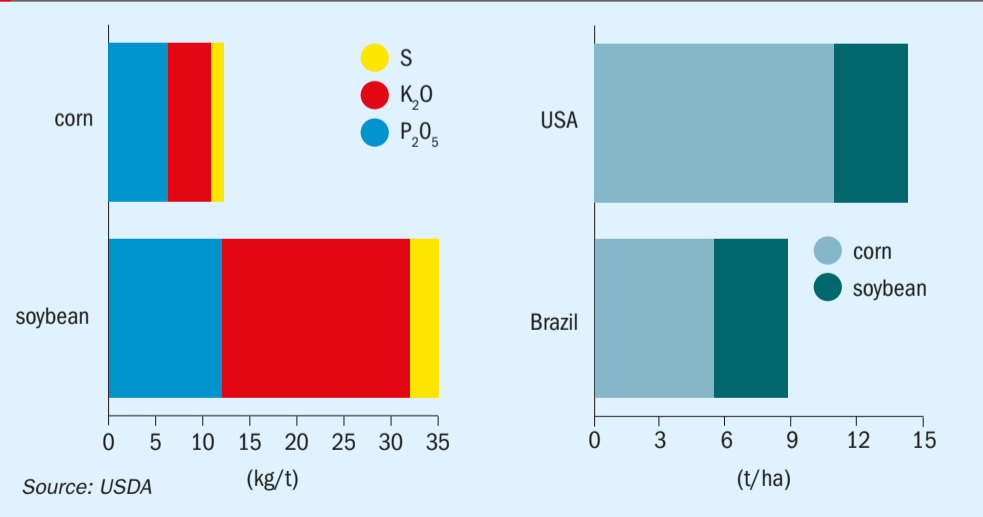
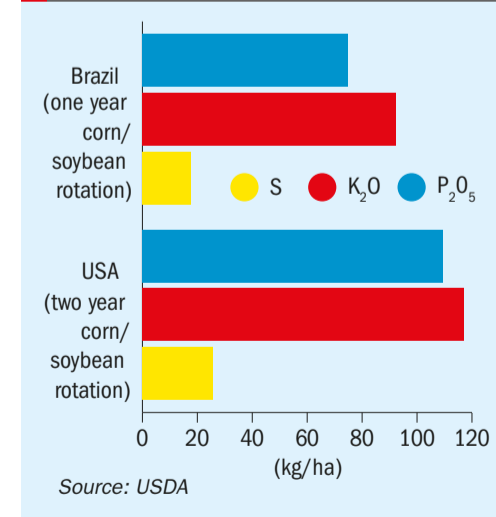


Fig. 5: Cumulative nutrient removal. Cumulative nutrient (P, K and S) removal for soybean/corn rotations in Brazil (top) and the United States (bottom) needed to achieve typical yields.



The lengthy growing period in Brazil's tropical climate, for example, allows the soybean and corn rotation to take place during one single year. Whereas the rotation in the more northerly United States, in contrast, typically takes place over the course of two years due to a shorter growing season. These contrasting approaches to soybean and corn growing practice are important, given that a successful nutrient management plan is based on replenishing soils with the right quantities of P, K and S at the right time.

P, K and S for soybean nodulation

One key aspect of soybean/corn rotations is the ability of soybeans to 'fix' atmospheric nitrogen into the plant-available form needed for crop growth. Essentially, the grower requires soybean plants to be self-sufficient and produce their own 'free' nitrogen fertilizer to drive high yields. Furthermore, soybeans can also enrich the soil and leave nitrogen behind, thereby influencing nitrogen availability and N fertilizer application rates for the corn crop in the next rotation.

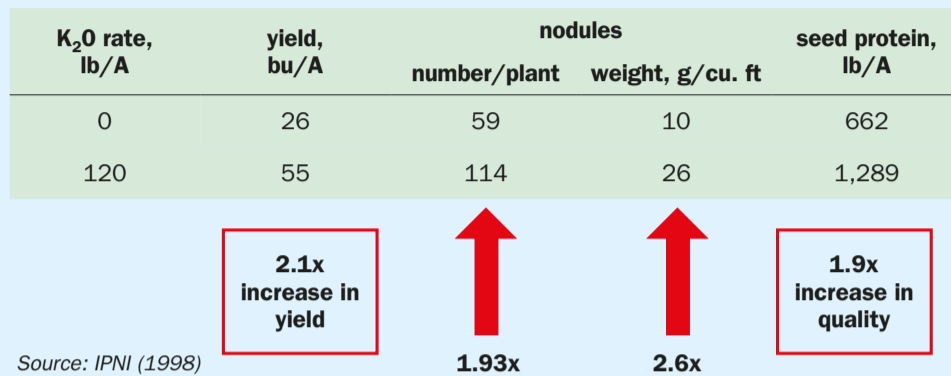
Valuably, phosphorus, potassium and sulphur, by positively influencing the ability of the soybean crop to 'fix' nitrogen, can boost the generation of this shared nitrogen source for soybeans and corn. The role of P, K and S in maximising the 'free' N contribution to the nutrient management plan is reviewed briefly below.

Biological nitrogen fixation functions thanks to a symbiotic relationship between soybeans (and other legumes) and soil dwelling bacteria. In this mutually beneficial relationship, plant roots infected/inoculated by a specific bacterium convert atmospheric nitrogen (N₂) into a more biologically useful ammonium (NH₄) form able to fuel plant growth and yield¹. In return for providing this service, bacteria are rewarded by the plant with sugars derived from photosynthesis to fuel their biological activity. In general, the N fixation capacity of legumes has been shown to correlate highly with crop yields².

Under low phosphate supply conditions, P deficiency is known to limit both plant root growth and the creation of the energy storing compound adenosine triphosphate (ATP), the biological 'currency' used by plants to build sugars. It is important here to remember a critical dictum about the relationship between plants and nitrogen-fixing Rhizobiaceae bacteria:

No sugar = no carbohydrates to pay for N fixation

Fig. 6: Supplying additional potassium supports an increase in larger soybean plant root nodules. In this example, the resulting increase in N fixation capacity leads to an approximate doubling in both soybean yield and quality, versus the control.



Research shows that increasing P supply to soybean plants increases both root and nodule weight³. This, in turn, boosts the above-ground biomass and crop yield, as measured by shoot dry weight.

Plants typically require more potassium than any other nutrient – with the possible exception of nitrogen – due to its vital role in crop growth and development. In general, K has the ability to increase rates of N fixation and overall soybean crop yields via the following mechanisms⁴:

- It contributes to good root growth and has been shown to improve the number and size of nodules on roots
- It is a cofactor for the functioning of the enzyme that transport carbohydrates across cell membranes and into the phloem.

Similar to phosphorus, the same dictum – No sugar = no carbohydrates to pay for N fixation – applies to potassium, with research again showing that increasing the K supply to soybean crops increase both nodule number and nodule weight¹. This, subsequently, results in higher above ground yield and seed protein quality (Figure 6).

The role of sulphur nutrition in promoting N fixation in soybeans has been the subject of a recent review⁴. This concluded that sulphur deficiency leads to fewer root nodules and limits symbiotic nitrogen fixation in soybeans. In one study, sulphur deprived crops – even when inoculated with Rhizobium bacteria – failed to produce root nodules, significantly reducing nitrogen accumulation and soybean shoot biomass⁴. Additionally, a separate study has demonstrated that sulphur nutrient applications significantly increase both the quantity and mass of soybean root nodules⁵.

Conclusions

Estimating the quantities of phosphate, potassium, and sulphur that exit the field as harvested products (e.g., grain) can be useful for planning fertilizer applications in soybean and corn rotations. As previously stated, high yielding soybean and corn remove elevated quantities of P, K and S – and, consequently, growers need an effective fertilizer plan to replace these lost nutrients. Furthermore, these three nutrients can be leveraged to boost nitrogen fixation in soybeans and, in doing so, contribute to the 'free' nitrogen that supports high-yielding soybean and corn crops across the rotation.

As a final comment, a good set of soil sample test results is useful for determining potential P, K and S deficiencies. Such data, alongside estimated nutrient removal rates, can help refine the nutrient management plan to deliver quality crops at high yields, while simultaneously helping prevent nutrient losses to the environment. ■

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Van Iperen's Green Switch journey

Van Iperen International is pursuing an ambitious sustainability strategy to cut its carbon footprint by 50% and switch production to innovative low-carbon crop nutrient products. In a partnership with Cinis Fertilizer, the company recently introduced GreenSwitch® Potassium, a sustainable potassium sulphate (SOP) fertilizer produced from industrial residues using a fossil fuel-free production process.

The crop nutrients and biostimulants company Van Iperen International is placing itself at the vanguard of the sustainability transition in agriculture, with a bold strategy to reduce the impacts of conventional mineral fertilizer production. The Netherlands-based company is planning to “change the rules of the game in plant nutrition” by making the circular economy and resource efficiency cornerstones of its operations – and providing growers with innovative products that make conventional agriculture more sustainable.

The future path set out by Van Iperen's sustainability strategy is embodied by its evocative and inspirational name – the Green Switch Journey. It's a strategy that is already delivering results.

Sustainable SOP with a low carbon footprint

Van Iperen has already made its first deliveries of GreenSwitch® Potassium to customers, the outcome of a successful ongoing partnership with Cinis Fertilizer (*Fertilizer International* 523, p38). This pure and fully water-soluble potassium sulphate (SOP) product – which is associated with significantly reduced CO₂ production emissions – is suitable for foliar and fertigation applications.

GreenSwitch® Potassium is produced by Cinis Fertilizer at its newly opened 100,000 t/a capacity SOP plant at Örnköldsvik, Köpmanholmen, Sweden. The Örnköldsvik plant is powered by fossil-free and renewable energy and produces SOP from sodium sulphate (Na₂SO₄) using patented technology. Cinis has contracts in



Van Iperen International is located in Westmaas, South Holland, The Netherlands.

place for upcycling sodium sulphate from industrial residues – including those from electric car battery manufacturing and ashes from pulp mills.

This first-of-its-kind production method – based on the glaserite process – uses half as much energy as conventional SOP production, according to Cinis. The company quotes an energy consumption of 50,000 MWh for its production process versus 100,000 MWh for conventional manufacture, based on 100,000 tonnes of SOP production.

The result is a fertilizer with a low carbon footprint that, say both companies, is making a “unique and circular contribution” to sustainable agriculture.

Green Switch projects and products

The introduction of sustainable SOP to the market is just the start of Van Iperen's Green Switch Journey. The company has, in fact, a roster of groundbreaking new projects:

- **GreenSwitch® Potassium**, as already mentioned, is the outcome of a new business partnership with Sweden's Cinis Fertilizer. A fossil fuel-free production process transforms industrial waste residues – from paper and electric car battery manufacturing – into sustainable potassium sulphate (SOP) fertilizer.
- **GreenSwitch® Nitrate** is manufactured using Pure Green Agriculture technology, the world's first patented process for turning manure into liquid nitrate fertilizer for the high-tech greenhouse sector and open-field fertigation. The innovative production process generates a pure and transparent liquid nitrate end-product with a carbon footprint that is close to zero.
- **Plants for Plants®** are plant-based biostimulants derived from cultivated crops. This new biostimulants range is suitable for organic and conventional agriculture and was developed by Plants for Plants, a project funded by the EU's LIFE research programme.

Baseline carbon footprint

As a starting point, Van Iperen decided to benchmark its carbon footprint for the year 2021 to provide an accurate baseline for reducing emissions in future years. This footprint encompassed all of the company’s activities and the products it sells, using calculations based on credible and transparent databases such as ecoinvent to fully map its business impacts.

Van Iperen calculated the contribution to its carbon footprint of every process and activity behind all of its end-products. This thorough and comprehensive analysis included the impacts associated with the upstream production of raw materials sourced from its suppliers, as well as the impacts of the downstream delivery of products to customers/distributors by road haulage in trucks and by shipping container. (Note that the impacts of product deliveries from distributors to growers were not included.)

Main carbon emission sources

Van Iperen identified four main categories of carbon emissions resulting from its business activities – production, transportation, packaging, and office and travel. Emissions for each of these four categories were calculated to determine their individual contributions to total emissions.

The company reported its carbon footprint for the reference year 2021 (1.3 kg CO₂ eq / kg) on a total emissions per kilogram of fertilizer sold basis (Figure 1). It was decided that this was a more relevant metric as, being a growing company, Van Iperen’s absolute CO₂ emissions will be heavily affected by the total quantity of fertilizers it supplies to the market in any given year.

Carbon footprint findings and results for the four main categories were as follows:

- 1. Production:** Mineral fertilizer manufacturing is generally known to be energy-intensive and have a high carbon footprint, with Van Iperen’s production processes being no exception. This category includes estimated carbon emissions of all the fertilizers products sold by Van Iperen in the reference year, whether from in-house production or those associated with products and raw materials sourced from third parties (embodied emissions). This category, unsurprisingly, represents the largest proportion of the company’s carbon footprint by far, accounting for 93.29%

COMMITTED TO SUSTAINABILITY



Van Iperen International is currently implementing the EU’s Corporate Sustainability Policy Directive (CSRD). This aims to improve and standardise sustainability reporting across the region’s companies, based on environmental, social, and governance (ESG) goals.

“By adopting the CSRD, we are committed to transparency and accountability in our sustainability practices – we will start reporting in January 2026,” Marine Lair, the company’s Director of Marketing, told *Fertilizer International*. “Right now, we are fully focused on preparing for this, ensuring we can accurately measure our ESG progress and identify areas for improvement.”

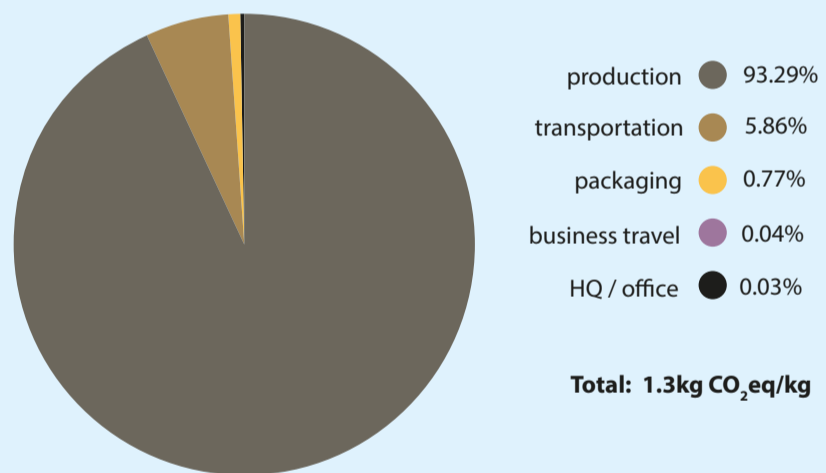
Marine was also keen to emphasise the role of specialty fertilizers in the company’s Green Switch Journey.

“Specialty fertilizers, such as water-soluble products for drip irrigation and foliar applications, offer practical benefits by enabling precise nutrient application, reducing leaching and evaporation, and improving uptake efficiency,” Marine said. “Our range of high performing products – by promoting water use efficiency and nutrient use efficiency – are also part of our sustainability journey.”

Erik van den Bergh, Van Iperen’s Managing Director (pictured), summed up the company’s aims and ethos:

“Sustainability is something that everybody speaks about. But how to make it really a win, not only for the planet but also for all the actors involved? That is the challenge.” ■

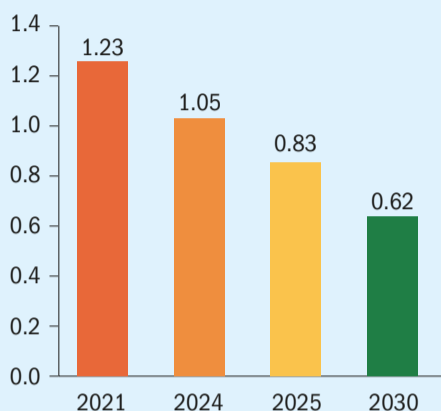
Fig. 1: Van Iperen’s CO₂ equivalent emission for the reference year 2021.



Source: Van Iperen International

- 2. Transportation:** This is Van Iperen’s second-largest emissions source, accounting for 5.86% of the company’s total footprint. It includes the transportation of raw materials from suppliers to production plants, as well as the onwards transportation of products to customers. It therefore includes both upstream and downstream transport emissions by sea and road.
- 3. Packaging:** Van Iperen’s third largest emissions source is packaging, which surprisingly – says the company – only accounted for 0.77% of its carbon footprint. This category includes the embodied emissions of all types of product packaging, such as bottles, cans, boxes, bags, and labels, as well as pallets. Reducing plastic packaging waste was identified as a priority by the company due to its potential for environment pollution as well as its carbon impacts.
- 4. Office and Travel:** This final category represents just 0.07% of the total

Fig. 2: As part of an action plan, Van Iperen has committed to reducing its carbon footprint in stages to 0.6 CO₂ equivalent per kg of fertilizer sold by 2030.



Source: Van Iperen International

footprint, being divided between the impacts of running the company office (0.03%) and business travel (0.04%), the latter including office employee travel and international visits to partner businesses. Emissions from business travel in 2021 were, however, lower than normal as employees were mainly working from home due to the Covid-19 pandemic.

What concrete actions is Van Iperen taking?

Van Iperen’s emissions in 2021 totalled 1.3 kg CO₂ equivalent per kilogram of fertilizer sold – a level the company has committed to bringing down in the years ahead.

Following the benchmarking of its carbon footprint, the company published updated business and action plans, with

these including a clear target to reduce Van Iperen’s carbon footprint per kg of product sold by more than 50% by 2030. In practice, this means reducing its footprint in stages to 0.6 CO₂ equivalent per kg of fertilizer sold (Figure 2).

Van Iperen will report on progress towards this target in its annual reports – and says it will act more quickly if actions to speed up carbon cutting to meet the 2030 target are identified.

Achieving dramatic carbon reductions will require action in a number of key areas. This notably includes developing new technologies to produce greener, more sustainable fertilizers and bring these to the market for high-tech farming.

“Our GreenSwitch® Nitrate and GreenSwitch® Potassium are two innovative production processes that use organic sources or by-products with a close to zero carbon footprint,” comments Van Iperen. “These processes have resulted in the creation of two new fertilizers: GreenSwitch® Original HG, which is the first liquid nitrate fertilizer from an organic source, and GreenSwitch® SOP, the first potassium sulphate fertilizer using by-products of recycling industries.”

The introduction of these product lines is instrumental to driving down the company’s average carbon footprint per kg fertilizer sold. Indeed, Van Iperen has plans to introduce other new fertilizers under the GreenSwitch flag in the near future – to allow growers to practice sustainable crop nutrition without any compromise on yield and quality.

2024 progress update

Van Iperen made concerted efforts during 2022 and 2023 to address the various underlying factors responsible for its carbon footprint. Details of the actions taken for various business activities, alongside projected CO₂ footprint for 2024, are shown in Table 1.

Results show the potential for substantial carbon reductions from the implementation of GreenSwitch® technology. Furthermore, while the results in Table 1 show the positive impact GreenSwitch® SOP production can make, they do not yet include CO₂ reductions resulting from the expansion of the GreenSwitch® Nitrate plant. This unit will produce low-carbon GreenSwitch® Original HG and GreenSwitch® Nitric Acid products in future.

Table 1: Summary of main carbon reduction actions taken by Van Iperen and their projected impact* on the company’s 2024 carbon footprint

Business activity	Action taken	Results* (kg CO ₂ eq/kg product sold)
Production	The CO ₂ footprint per kilogram of product produced is substantially reduced by implementing GreenSwitch® SOP production. Calculations do not yet include the CO ₂ reduction resulting from the expansion of the GreenSwitch® Nitrate plant and the production of GreenSwitch® Original HG and GreenSwitch® Nitric Acid.	1.05
Transportation	The 2024 footprint is unchanged and remains at its 2021 level. Container shipping companies are, however, pursuing carbon-neutral ship propulsion as a concept, while road haulage companies are spearheading the adoption of hydrogen-powered trucks. Van Iperen is actively monitoring these developments and their potential for future carbon reductions.	0.077
Packaging	While the overall carbon impact of packaging remains relatively modest, in comparison to production emissions, integrating recycled materials into packaging, including cans, bottles, and bags, should still deliver noticeable cuts in Van Iperen’s packaging CO ₂ footprint. The adoption of recycled cans and bottles, for example, is projected to yield a 21% CO ₂ emissions reduction. The anticipated CO ₂ savings from incorporating recycled materials into product bags is still being assessed.	0.01
Office & Travel	Minimising travel needs of sales and agronomist teams, which are necessary to provide on-site customer support, poses a significant challenge. A mix of in-person and online meetings has, however, been successfully implemented since the Covid-19 pandemic. Headquarters staff have also reduced daily travel since a weekly policy of three days in the office and two days remote working was introduced. Van Iperen is also integrating electric cars into its vehicle fleet to help meet sustainability objectives.	0.001

Source: Van Iperen

*Note: Van Iperen now expects to hit these targets when it becomes fully supplied with SOP from the delayed Cinis Fertilizer’s SOP plant in 2025.

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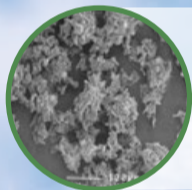
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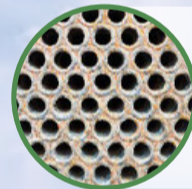
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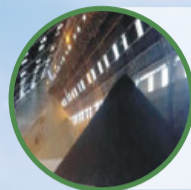
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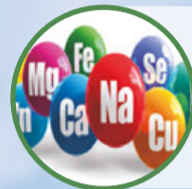
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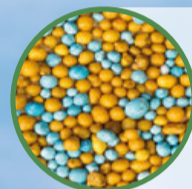
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