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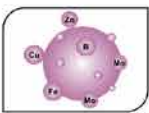





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Freight train with hopper
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Nutrients for sustainable agriculture

by **Edmundas Akstinas**, Innovations Director, Orij Group, Lithuania

Today, environmental responsibility and sustainability in agriculture are amongst the top priorities for farmers in Europe. Consumers are demanding produce that is grown with sustainable practices, food companies are prioritizing suppliers based on environmental and sustainability criteria and farmers are rewarded with higher prices for such production. But the solutions that enable the farmer to achieve quality yields, as well as implement the sustainability criteria, are still lacking. As natural resources become increasingly scarce, the transition to a more resource-efficient economy must be a top priority over the years to come. Fortunately, the European Commission and companies around the EU are recognizing this challenge.

The sustainability challenge

Healthy soil builds the foundation of food production, but this is being threatened by degradation and erosion. Projections suggest that 19.8% of EU arable farmland could be abandoned by 2030. The EU Common Agricultural policy (CAP) specific objectives, amongst others, identify

The challenge for agriculture lies in securing sufficient food supply for future generations while maintaining soil health and increasing input efficiency

the following threats to the European soils: soil erosion, soil organic matter decline, soil biodiversity loss, soil compaction, soil contamination. The 12 mn hectares of agricultural areas in the EU that suffer from severe erosion are estimated to lose around 0.43% of their crop productivity annually and the annual cost of this loss in agricultural productivity is estimated at around EUR1.25 bn.

The challenge for agriculture lies in securing sufficient food supply for future generations while maintaining soil health and increasing input efficiency.

One of the recycled nutrient flows to which innovative companies are giving their time and resources to is pyrolysis produce from bio-based raw materials. Or, simply put: ash. Over the last decade many projects have been

successfully implemented in countries such as the Netherlands, Spain and the UK. In recent years the development of such technologies has been a focus in Germany, Austria, Finland amongst others. The raw materials for such technologies include sewage sludge, struvite, animal blood and bone meal and biomass. While there are still debates about the suitability of sewage sludge and animal based raw materials, the road ahead is much clearer for the biomass sector.

Biomass consumption

When it comes to biomass energy producers, bioenergy by the year 2020 is expected to contribute to half of the EU's 20% RES target. Even with increased consumption, the EU-28 forests have grown 34% over the last 25 years. The biomass share in the gross

final energy consumption will surely increase in the future.

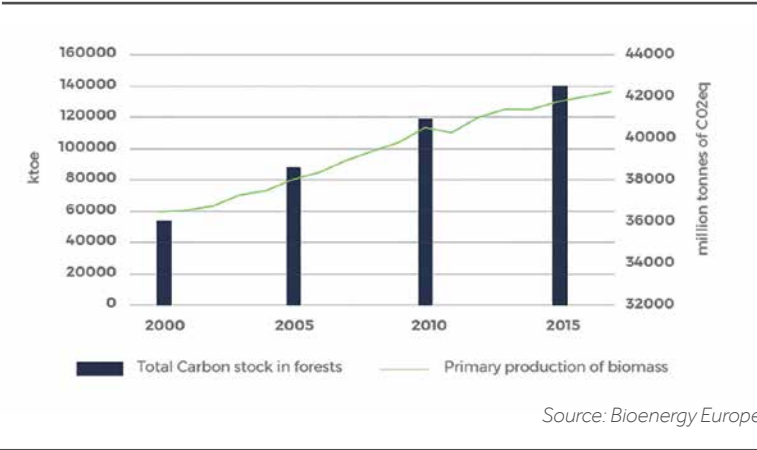
Solid biomass used for energy purposes amounts to 267 mn t per year. This burned biomass leaves around 13.4 mn t of ash per year. Despite the fact that numerous scientific researches in the EU have proven that biomass ash has great value as a fertilizer, the majority of ash is still being disposed of in landfills and deposit sites and generally viewed as 'waste'. With tighter restrictions on waste allowance to be disposed in landfills, ash utilization is becoming a threatening environmental challenge. The challenge for biomass raw materials is to maximise the nutrient levels while keeping heavy metal levels under the allowed norms. This can be done with access of numerous biomass raw materials sources and added value natural substances to improve product efficiency. These include minerals that prevent nutrient leakage, sustainable organic additives to increase soil organic matter and bacteria to improve nutrient uptake efficiency. These 'next level' fertilizers could empower farmers throughout the EU to farm in sustainable and cost-efficient way.

The new EC fertilizer directive

Back in December 2018, the EU institutions have found an agreement on new EU rules on fertilizers proposed by the Commission in 2016 as a key deliverable of the Circular Economy Package. The agreement on the Fertilizing Products Regulation will open the market for new and innovative organic fertilizers by defining the conditions under which these can access the EU single market. The regulation will provide common rules on safety, quality and labelling requirements for all fertilizers to be traded freely across the EU. Producers will need to demonstrate that their products meet those requirements before affixing the CE mark. The regulation will then be directly applicable in all member states and will become mandatory in 2022.

The European Union has recognized the challenge of nutrient recycling and numerous research projects

Figure 1. Evolution of carbon stock in EU-28



With tighter restrictions on waste allowance to be disposed in landfills, ash utilization is becoming a threatening environmental challenge

have been launched for the purpose of understanding the properties of recycled nutrient fertilizers. Orij Group's affiliate company, Litorij UAB, as a partner in a consortium, has won the Rural Renaissance call H2020-RUR-2018-2020 under the Acronym LEX4BIO. Partners include LUKE (FI), University of Amsterdam (NL), University of Vienna (AT), University

of Hohenheim (DE), FiBL (CH), University of Sevilla (ES), University of Gent (BE), University of Copenhagen (DK), Agrana Research and Innovation Center (AT), Julius Kühn-Institut (GE), BOKU (AT), University of Sevilla (ES) and others. The outcome of this Project will shape the upcoming EU legislature for the recycled nutrient fertilizers.



Figure 2. LEX4BIO Project consortium



Figure 3. Root development analysis. Bio-based development in centre

Technologies for the future

Some of the promising technologies in the field include: the Dutch BMC Moerdijk's ash utilization from chicken manure, the UK's Fibrophos and Kalfos ash utilization from animal blood and bone meal, ICL Netherlands phosphate recycling from sewage sludge and bone meal ashes, EcoPhos in Bulgaria producing fertilizers from sewage sludge ashes, Ecolan Finland making fertilizers from biomass ash and EuPhoRe and TetraPhos sewage treatments in Germany.

Orij Group's 20-year experience lies in the field of bio-based ash. EcoPlant technology is certified for Organic farming under the EU directives. Recently, EcoPlant technology has been awarded the EU Organic Innovation of the Year.

Numerous case studies have been carried out with various recycled

“Implemented on EU level, ash nutrient recycling technologies have the potential to fully cover the EU-28 demand for both potassium and phosphorus fertilizers

nutrient products. In Orij Group's case, the most successful results of using bio-based fertilizers included increased soil fertility, prevention of nutrient leaching, long term humus preservation and increased yields.

In case of wheat, quicker growth at the early vegetation stage and strong root development are the properties that ensured the health and longevity for the plants. High success comes with plants that demand potassium and phosphorus, but are sensitive to chlorine. Today, bio-based fertilizers

are valued not only by traditional wheat, vegetable and fruit growers, but also by organic producers.

By 2021/22, Fertilizers Europe forecasters expect consumption figures to reach 10.8 mn t nitrogen (N), 2.6 mn t phosphorus (P) and 3.2 mn t potassium (K), applied to 134 mn hectares of farmland. Implemented on EU level, ash nutrient recycling technologies have the potential to fully cover the EU-28 demand for both potassium and phosphorus fertilizers. ■

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“FLA was a tremendous success and enabled us to better understand the market trends regionally and to further develop our network of contacts in this important industry.”

Daniel Anderson, Managing Director, Solex Thermal Science

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EU Fertilizing Products Regulation: where next?

by **Tiffanie Stephani**, Senior Agriculture and Environment Manager, Fertilizers Europe

On 21 May 2019 the European Council adopted new rules for placing fertilizing products on the EU market. From summer 2022 onwards, fertilizer producers, traders and farmers will be confronted with the new Fertilizing Product Regulation (FPR), which will radically change the way fertilizers are receiving the CE mark and the labelling requirements provided on the products. In the future, it will be possible to market, within the EU, a very wide range of fertilizing products such as organic fertilizers, organo-mineral fertilizers, growing media or biostimulants – provided that they comply with the environmental and safety requirements of the new legislation. The new regulation is complex and a recurring question keeps coming back: what are the consequences on the ground and what should the industry do to meet the requirements of this new regulation?

With the main objective to provide a better understanding of this complex subject, Fertilizers Europe organized a conference in Brussels on 28 May 2019.

The presentations of experts in legislation, production, distribution and the panel discussion session that closed the event, were seen by the participants as the ideal forum to acquire a better knowledge of this very important evolution for the plant nutrition sector.

“It will require time and energy within the fertilizer industry to adapt to this new framework

A paradigm shift

The aim of the first session of the EU Fertilizing Products conference was to provide all participants with a practical overview of the different changes, which manufacturers will have to implement in order to be ready for the application of the FPR in summer 2022.

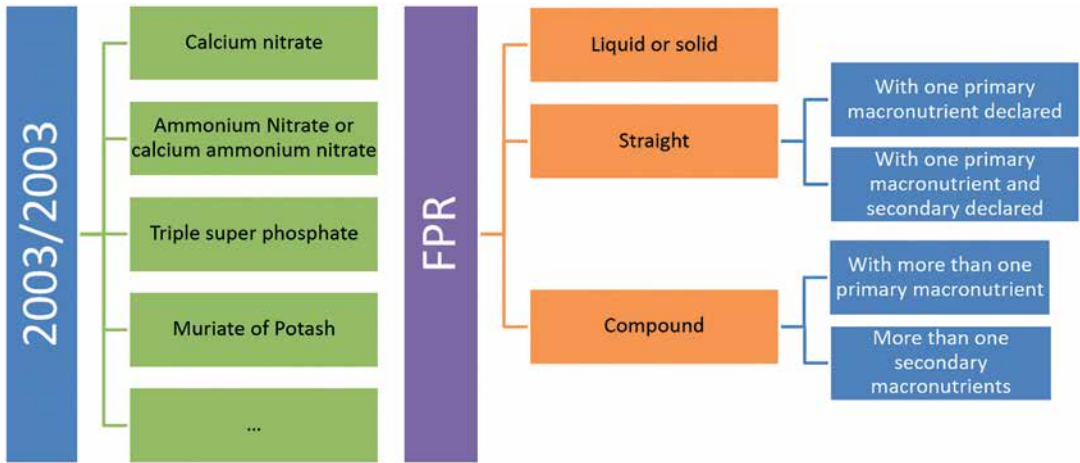
Silvana Lyubenova, Director for Technical harmonization and consumer policy at the Bulgarian ministry of economy, explained the defined roles of the different actors (i.e. manufacturer, importer or notified body) as well as the procedures to follow depending on what the product is made of and under which category it would be put on the market. This is why we can consider it a paradigm shift. The 2003/2003 Regulation was only regulating the characteristics of the final product in a very precise way, such as nutrient levels. The FPR will be regulating both the end characteristics (contaminants and nutrient levels) as well as the input materials contained in every fertilizing product (e.g. REACH registration).

A new toolbox available for manufacturers to get a CE mark

The new regulation basically establishes a common legal framework for fertilizing products in the form of a toolbox of measures, with different pathways depending on the product category and its content. This is to be understood as a ‘conformity assessment’, i.e. a process demonstrating whether specified requirements relating to a fertilizing product are fulfilled. It will definitely require time and energy within the fertilizer industry to adapt to this new framework – and so challenges remain.

The FPR will exist in parallel to national legislation and mutual recognition as it is only creating an optional harmonization. It will therefore be up to a manufacturer to decide whether it applies for a CE mark to benefit from free circulation in the EU’s internal market. Manufacturers of fertilizers that do not bear the CE marking will still be able to place fertilizers on their national market.

Figure 1. The FPR will exist in parallel to national legislation



“The new framework will support the current innovative pathway that mineral fertilizer industry has undertaken

A new player: notified bodies

An additional actor in the new FPR will be the ‘notified bodies’, which are considered to be conformity assessment body officially designated by the national authority to carry out the procedures for conformity assessment within the meaning of the FPR. These notified bodies are not obliged by any binding timeframe for giving their assessment to the requesting manufacturers. There is actually nothing specified in the FPR. But in practice, Cecile Monnier (Regulatory Affairs Manager at EUROFINS) clarified at the 28 May conference that the market will determine the acceptability of timelines and that the timelines will depend on the repeatability or the standard nature of the product concerned.

In practical terms, all the notified bodies will be listed in a public database on the internet (called NANDO). A manufacturer, here to be considered as a customer, asks for quotations before sending its application form to the notified body selected. The market and

local competition are both determining the price range as much as the work performed. For instance, 200 notified bodies are listed across all sectors in Italy, whereas in France there are only 80.

The big challenges of standardization and labelling

Being acquainted with the new procedures and the role of notified bodies will not be enough to be able to apply the FPR. Fertilizer producers want to rely on a mutual understanding about the respective specifications and technical information required for the different product function categories – and this is why standards exist. This is what the convener of the working group seven on chemical analysis (part of the Technical Committee 260 on fertilizers and liming material within CEN, the European Center of Normalization), Jan Chys, explained during the Fertilizers Europe conference in Brussels.

To implement the FPR for all product categories concerned, about 230 standards need to be created or at least updated. And these standards are a key pillar to ensure a well-functioning EU market for fertilizing products, not least because they are providing a common method for compliance verification during the different conformity assessments. Still, ahead of summer 2022, substantial work within CEN will have to be done for establishing the frame of harmonized standards in place for the FPR – and this will hopefully be achieved before the FPR applies in June/July 2022.

A similar challenge remains as far as the labelling requirements for the different product function categories are concerned. The labelling information placed on the bag if the product is not bulk, will at least double in comparison to the current provisions under the 2003/2003 Regulation. It will have to include instructions for intended use, including application rates, timing and frequency. It will need to target plants or mushrooms, recommend

storage conditions, include a list of all component materials above 5% by product weight in descending order of magnitude by dry weight. In addition, any relevant information on measures recommended to manage risks to human, animal or plant health, to safety or to the environment will need to be covered.

To create a common understanding within the industry, the European Commission has been requested to prepare a specific guidance on what the label should include and how it should look. This guidance will be prepared by a dedicated task force designated by the EU Commission with the aim of being published during summer 2021. It will also create a common understanding within the different national authorities performing the market surveillance and product checks.

The challenge of this task force will be in finding the balance between how the requested information should be organized, while still providing valuable information to farmers. The new labelling requirements are much more complex than before, but they might also give opportunities to manufacturers to communicate not only about the quality of their products but also about the environmental impacts of different fertilization choices. The challenge will be to adapt the regulatory requirements to the needs of the farming sector, i.e. digitization and targeted fertilization.

Team work needed during transition phase

The new procedures for placing mineral fertilizers or other fertilizing products on the market – as created by the FPR – should ensure confidence of consumers and public authorities regarding the conformity of the



New Fertilizer Regulation: Where do we go? Conference held on 28 May 2019 in Brussels

products. This new framework will also support the current innovative pathway that the mineral fertilizer industry has already undertaken, being in the context of circular economy, biodegradability of polymer coatings for controlled release fertilizers, or combining mineral fertilizers with biostimulants.

The conference saw a great level of participation from EU agri-food stakeholders and served as a reminder

that fertilizer producers should remain at the fore-front of the discussion, especially to be fit to meet the expectations of farmers. While the road ahead upholds new challenges and opportunities one thing is certain: a successful transition phase demands the cooperation of the entire value chain. Fertilizers Europe invites every actor in the EU agri-food sector to continue engaging in the dialogue and working on common solutions. ■



About the author

Tiffanie Stephani is Fertilizers Europe's Senior Manager in Agriculture and Environment. Before joining Fertilizers Europe in March 2016, Ms. Stephani was a senior policy officer in the European and environmental affairs department of the German Farmers' Association (Deutscher Bauernverband, DBV) in Brussels. Ms. Stephani is member of the executive team of Cool Farm Alliance, and of the Council of The International Fertilizer Society. Having worked in European affairs and farming for ten years, she has developed an in-depth expertise in the sector.

Organic-based fertilizers

Market outlook

by Jessica Fitch, Consultant, ECOFI Secretariat, Belgium

Organic-based fertilizers are made-up of three core product categories – organic fertilizers, organo-mineral fertilizers and organic soil improvers. These are derived from organic materials such as discarded animal and vegetable materials, usually sourced according to the principles of the circular economy and industrial symbiosis. Organic-based fertilizers increase the organic matter in soil, feed soil micro-organisms, contribute to better plant health and can restore the land's physical-chemical properties. They are also a rich source of primary nutrients: nitrogen, phosphorus and potassium.

The majority of producers of organic and organo-mineral fertilizers only act locally, selling in their own country or to sub-contractors, which makes it extremely challenging to compile data on the true value of the global market. Fewer than 10 industrial producing companies – mainly based in western and southern Europe – operate at a

truly global scale. In Europe, several companies export organic-based fertilizers on a global scale, including the European Consortium of the Organic-Based Fertilizer Industry (ECOFI) member companies, based mainly in Italy and France.

Sustainability and specialisation driving demand

Valued at USD2451 mn in 2016, the European organic-based fertilizer market is projected to reach USD3260 mn by 2023 with a compound annual growth rate (CAGR) of 4.2% from 2017 to 2023. This increase is driven by several factors, in particular the growth of organic farming for which many organic-based fertilizing products are suitable. 'Fertilizers approved for use in organic farming' are almost always 'organic-based fertilizers', although not all 'organic-based fertilizers' are approved for

such use. Organic fertilizers, organo-mineral fertilizers and organic soil improvers make up three sub-product function categories under the forthcoming European Union (EU) Fertilizing Products Regulation (FPR). They are to be used in organic farming organic fertilizers and soil improvers and would then need to meet additional requirements to qualify for organic certification under a separate set of regulations.

As industrial co-formulations comprising one or more mineral fertilizers combined with one or more organic fertilizers and/or organic soil improvers, organo-mineral fertilizers (covered by the FPR) are not eligible for certification for organic farming.

Other drivers of demand for organic-based fertilizers include precision farming. Various initiatives to render conventional farming as a more sustainable, specialized practice include viticulture or cut flowers and the proliferation of green spaces such as golf courses.



Organo-mineral granules being produced through extrusion (courtesy of Italtipollina)

Mineral and organic forms of nutrients: Stronger together

ECOFI is keen to promote the complementarity between mineral and organic fertilizers combined in one product such as organo-mineral fertilizers.

Organo-mineral fertilizers contain mineral forms of nutrients that become immediately available to plants and organic forms that feed plants over their lifespan. Furthermore, the organic materials form a coating that prevents the mineral forms from releasing too much, too soon. These organo-mineral products are particularly relevant for soils in southern Europe and in regions where levels of organic carbon are naturally low - perhaps too low for producing fruit and vegetables, especially under the fairly intensive farming conditions that are now practiced in these areas.

Organic fertilizers also improve soil structure and water-retention, which is particularly important in drier climates and the more extreme weather events associated with climate change.

Distinctive characteristics of organo-mineral fertilizers include the interaction between the organic and mineral components, designed to provide controlled-release properties to the delivery of nutrients in mineral forms while enhancing plant uptake. These fertilizers help roots absorb nutrients more efficiently, reduce run-off and/or the accumulation of nutrients in the soil. These can be tailor-made to meet production and soil needs, particularly for precision farming. The combined use of both organic and mineral fertilizers has been proven to have a greater impact on crop yields than using one of these products alone.

Regions like Brittany and the Netherlands suffer from an excess in organic materials as a result of livestock farming. Transforming these products into organic-based fertilisers makes it possible to use them in places like the Mediterranean Basin, where soils often lack organic matter. This creates a win-win solution.



Organic-based fertilizer market outlook

“*ECOFI is keen to promote the complementarity between mineral and organic fertilizers*”

Regional and global markets

The particularities of soil needs in southern Europe have driven growth among some of the larger industry players, including producers in Spain and Italy. However, as climate variability is increasing in other regions and more global regions face similar conditions to southern Europe, this is likely to expand the potential for market growth even further in years to come. Greater awareness of the benefits of organic fertilizers accompanied by growing demand for organically farmed produce are also drivers. Greater demand for organic produce across other European countries should increase the market in central and northern Europe in the coming years, too. Thus, organic-based fertilizers meet a growing appetite in a market that has increasing pressure exerted on farmers by society, regulators, distributors and even the climate itself. In response, some EU companies are branching out into export markets to meet the greater demand worldwide.

Although countries such as China have substantial amounts of their own raw

materials to use as organic fertilizers, there is nowhere near enough to satisfy their own growing needs. China has to import raw materials which creates an opportunity in the market for an increase in exports for finished products too.

Logistics

Until recently, long-distance travel costs have restricted the export of organic-based fertilizers. However, processed organic-based fertilizers are dried and much cheaper to transport than manure and other raw materials, both financially and environmentally. Transporting finished products is also safer because the production process neutralizes potential pathogens and allows for contaminants to be controlled.

The development of domestic industries producing organic-based fertilizers sourcing raw materials locally is also an opportunity for many developing countries. Final products may then serve the domestic market or be exported regionally.

ECOFI membership includes some global leaders. ILSA exports its organic and organo-mineral fertilizers to over 48 countries, mainly in Europe, but also in South and Central America, North Africa, the Middle East and Asia. It already has several secondary production plants, including one in Brazil, with plans for another in the pipeline.

Production projects in North Africa and Chile are also under way, aiming to increase ILSA's production capacity, reduce transport costs and diversify production with new raw materials. By the end of 2020, ILSA expects to double its production capacity – a good indication of sector growth.

Italpollina produces around 120 Kt of organic and organo-mineral fertilizers,

“*A common thread across ECOFI member companies and other leaders in the sector is their penchant for innovation*”

65% of which is exported to 70 countries worldwide, and is evaluating international development plans for Europe and beyond to better respond to growing customer demands.

Until now, SCAM, another Italian company and market leader in the country for organo-mineral fertilizers, has largely focused on the domestic market. However, with plans for international development and expansion abroad the company is reaching out to potential partners abroad to cooperate and promote the company philosophy and its high-quality products on a global scale. Other ECOFI members include Angibaud, Frayssinet and Sopropêche, would also have some international activity beyond their domestic market. A clear outward-looking trend is emerging within the industry.

Innovation and diversification

A common thread across ECOFI member companies and other leaders in the sector is their penchant for innovation and future perspectives. Some ECOFI members also produce plant biostimulants, underlining the importance of synergistic approaches to plant nutrition, soil health and reducing environmental impact. This approach tends to attract complementary fertilizing products based on environmental best-practices coupled with the preservation of biodiversity and natural resources with a focus on high production standards. Other companies produce plant protection products and mineral fertilizers focussed on more traditional products in addition to organic-based fertilizer. This highlights their complementarity in the use of mineral fertilizers, while not competing for market share – and this should be promoted to farmers as such. Many organic-based fertilizer producers also produce animal feed, with its strict safety and quality requirements.

ILSA has gone one step further in market diversification with several ongoing projects related to other sectors, including the tanning industry, construction, abrasives and bioplastics. It uses the trims and shavings of leather discarded in the final stages of the tanning process, thereby reducing the sector's environmental footprint while generating valuable organic-based fertilizers and biostimulants at a lower environmental cost than other recovery or disposal solutions. It is this circular and symbiotic nature of the organic-based fertilizer industry which enables manufacturers to continually explore new raw materials and, consequently, novel, effective and safe products.

Challenges and opportunities

It is clear there is huge demand for organic-based fertilizers which seems likely to continue to grow. Manufacturers are already struggling to meet demand and will have to overcome several challenges to develop products at the required pace. A key challenge has been the regulatory framework for organic-based fertilizers, with varying national rules and burdensome requirements for cross-border trade. However, the newly adopted EU Fertilizing Products Regulation aims to address this by giving organic-based fertilizers access to the single market and the CE-mark for the first time. Previously only mineral fertilizers and liming materials could obtain the CE mark as an EC Fertilizer.

However, some challenges remain in the implementation of this regulation, which is due to enter into force in the second half of 2022. ECOFI is involved in the development of the appropriate

harmonized standards for organic-based fertilizers needed to support the implementation of the new regulation. These standards can also foster global harmonization for these products. This regulation is expected to give the sector a solid foundation for growth and may set an example for other parts of the world in times to come.

Other challenges remain for an industry which needs to become more structured - and earn credibility.

Justification

Manufacturers must provide organic-based fertilizers that perform reliably, based on consistent product composition and component traceability. Further clarity is required regarding definitions, terminology, standards and boundaries for these products, as well as the respective roles of raw materials suppliers (B2B) and manufacturers of organic-based fertilizers which incorporate raw materials into high-quality end-user products (B2F).

Finally, and most importantly, the sector must be able to provide farmers with added-value products tailored to their specific needs and nutrient requirements with added crop resilience through improved soil biodiversity, health and structure. The industry, including ECOFI, must advocate for an innovation-friendly regulatory framework that allows organic-based fertilizers to make their full contribution to plant nutrition and soil fertility through enhanced soil carbon and biodiversity. This will enable the sector to continue to grow and meet the escalating demand for products from Europe and worldwide. ■

ECOFI would like to thank the following companies for providing input for this article: Angibaud & Spécialités, Frayssinet, ILSA, Italpollina, SCAM

News in brief

EUROPEAN UNION

thyssenkrupp to build new plant in Poland

thyssenkrupp’s Industrial Solutions business area has received a new order for the construction of a fertilizer plant in Poland. The customer for the project is ANWIL, a subsidiary of PKN ORLEN, one of the largest oil industry corporations in Central and Eastern Europe from Poland. The new facilities for the production of 1,265 t of nitric acid and 1,200 t of ammonium nitrate per day will be located in Wloclawek, some 200 km northwest of Warsaw, at an existing chemical and fertilizer complex. thyssenkrupp’s patented EnviNOx process will be used to remove green house gases from nitric acid production.

“More than ever, the chemical industry faces the challenge of growing profitably and at the same time protecting the climate. With the realization of this new, low-emission plant in Poland, ANWIL and thyssenkrupp are making an important contribution,” says Sami Pelkonen, CEO Chemical & Process Technologies at thyssenkrupp Industrial Solutions. “We look forward to our further cooperation and are proud to bring decades of plant engineering and process know-how into the project.”

The order includes the provision of technology licenses and the engineering, procurement and construction (EPC) of the new facilities. The contract value is in the lower three-digit mn Euro range. The project is a substantial part of a larger investment program implemented by ORLEN to expand its fertilizer portfolio and open up new value chains in the petrochemical industry. By 2022, ORLEN aims to increase its fertilizer production capacity in Wloclawek by 50% to 1.461 mn t per year to meet growing demand.

“With thyssenkrupp, we have found a reliable partner for our investment project. The company combines extensive plant engineering experience with efficient technologies that meet and exceed the highest environmental standards. Together, we will drive growth and sustainable development of the chemical industry in Poland”, said Agnieszka Zyro, CEO at ANWIL S.A.

EU mulls microplastics law in 2021

The European Commission is aiming for entry into force of a draft regulation on microplastics, also covering fertilizers, by summer 2021. Following this, the commission could target microplastics in tyres and textiles.

The commission will build its legislation around proposals published in January by the European Chemicals Agency (ECHA).

The agency outlined proposed restrictions under the EU’s registration, evaluation, authorisation and restriction of chemicals regulation (REACH). When approved by EU member states and the European Parliament, it is expected

apply to sales of microplastics that are inevitably released to the environment and could establish stricter labelling and monitoring requirements.

"I agree with the objective. We should limit and get rid of microplastics in the environment. But biodegradability is not easy. We have not yet found it for controlled-release fertilizers," said Fertilizers Europe director general Jacob Hansen.

The proposed Reach restrictions are expected to cover controlled-release fertilizers, albeit with a transition period of 5-10 years. Also included are plant protection products and biocides as well as a range of other microplastics in cosmetic and cleaning products, detergents, paints and coatings, construction materials, medicinal products and products used in the oil and gas sectors.

"Materials are simply not available today for controlled-released fertilizers. It's been a rough awakening for industry," said Johanna Bernsel from the commission's environment directorate.

Sirius Minerals signs European supply and distribution agreement with BayWa

Sirius Minerals has entered into an exclusive 10-year supply and distribution agreement with a European agribusiness group, BayWa Agri Supply & Trade (BAST), a wholly owned subsidiary of BayWa AG, for the distribution of POLY4 into Europe. BAST intends to actively distribute POLY4 through its Cefetra business, a well-established distributor and trader in Europe active across the agricultural value chain to the farmgate.

BayWa AG is a publicly-listed entity headquartered in Munich, Germany with revenues of EUR16 bn (2018). The group distributes over 30 mn t per annum of agricultural goods across Europe including sales of approximately 2.0 mn t per annum of fertilizers. Across Europe the group has a strong footprint and agricultural platform with strategically located assets such as warehouses, hubs and ports. BayWa is also active in developing and managing digital farming platforms to strengthen the ‘One-Stop-Shop’ strategy for farmers.

Chris Fraser, Managing Director and CEO of Sirius, comments: “The European fertilizer market is highly advanced and the second largest in the world behind China. We are delighted to be partnering with a leading agribusiness to distribute our POLY4 product into this key market. Our exclusive partnership with BAST will enable us to reach downstream customers through the groups’ well-established and extensive logistics network and long-term, trusted relationships with farmers. Our exclusive partnership is structured to enable us to achieve maximum value for our POLY4 product.”

Daan Vriens, CEO of BAST, comments: “We are excited to be partnering with Sirius to bring a high

performing, multi-nutrient fertilizer like POLY4 to customers across Europe through Cefetra. We believe in long term partnerships and we feel confident that this will be a successful new endeavour. POLY4 fits with our sustainability and farmer services strategies across our markets. This will provide farmers, via our extensive networks, a fertilizer product that promotes sustainable agricultural practice in our home market, Europe.”

The Agreement provides for the exclusive distribution of guaranteed minimum t of POLY4 across most of Europe for a 10-year term that commences from first production and includes two five-year extension options. Pricing under the agreement is unique in that it aims to incentivise both parties to optimise product value appreciation as well as logistics excellence.

EU holds firm on US trade talks

EU trade commissioner Cecilia Malmstrom said there is "absolutely" no chance of the EU including agriculture in trade negotiations with the US. Washington insists any trade agreement with the EU covers agricultural products.

"This is what we offer. It is good. It will bring mutual benefits to take away tariffs on all industrial goods, including cars. There could be quite quick delivery."

On 17 May, US president Donald Trump ordered continued negotiations with the EU and other trading partners. If, after 180 days, talks fail, the US will consider tariffs on imports of automobiles and parts.

Sirius Minerals signs supply agreement in India

Sirius Minerals has signed a take-or-pay supply agreement with Indian Farmers Fertilisers Cooperative Limited (IFFCO) for the supply of POLY4 in India. Volumes will ramp up to 1 mn t per annum in year eight, with an option subject to mutual agreement of the parties to increase this to 1.25 mn t per annum.

IFFCO is one of the largest co-operative societies in the world with over 36,000 member cooperatives and access to over 55 mn Indian farmers. Its primary business is the manufacturing and marketing of fertilizers and it is in the top 100 of India's Fortune 500 group of companies.

India is one of the top three fertilizer markets in the world with a total nutrient consumption of around 30 mn t per annum. The demand for fertilizers in India has been growing steadily due to increasing demand for food as the country's population increases. With the need to increase productivity per hectare, multi-nutrient products like POLY4 are well suited to Indian agriculture and soils.

The agreement is for the exclusive supply and distribution of POLY4 throughout India and is on a take-or-pay basis. Volumes ramp up to 1 mn t per annum in year eight of the 11 year term, with the option for an additional 250,000 t per annum by mutual agreement, and pricing is based on a nutrient linked formula on a CIF India basis. IFFCO has a break clause after year eight and there is a 10-year extension option subject to mutual agreement by the two parties.

OTHER EUROPE

Ultramar to invest USD300 mn in construction of a handling terminal in Ust-Luga

Ultramar, a major Russian forwarder of fertilizers, will invest USD300 mn in the construction of a terminal for handling of fertilizers and general cargoes in Ust-Luga with capacity up to 12 mn t/y, said Ultramar CEO Andrey Bonch-Bruevich in an interview.

The project will be implemented within three years, with step-by-step financing.

Ultramar plans to raise USD170 mn from the total investments from a pool of Russian banks. The company expects to close the deal by the end of June, said Bonch-Bruevich.

Yara and IBM join forces to transform the future of farming

Yara International and IBM have announced an agreement to build the world's leading digital farming platform, providing holistic digital services and instant agronomic advice.

Yara and IBM Services will jointly innovate and commercialize digital agricultural solutions that will help increase global food production by drawing on the two companies complementary capabilities: Yara's unrivalled agronomic knowledge, backed by more than 800 agronomists and a century of experience, and IBM's digital platforms, services and expertise in artificial intelligence (AI) and data analytics.

"Our collaboration centres around a common goal to make a real difference in agriculture. To be able to responsibly feed a growing population, it is critical that farmers increase food production on existing farmland to avoid deforestation. Yara and IBM will develop digital solutions that empower professional and smallholder farmers to optimize farming practices to increase yields, crop quality and incomes in a sustainable way," said Terje Knutsen, EVP Sales and Marketing in Yara.

The joint global digital farming platform will apply artificial intelligence, machine learning and in-field data to unlock new insights for farmers. The digital platform will have worldwide coverage and aspires to reach 100 mn ha of farmland - which is equivalent to twice the size of Spain or close to 7% of all arable land worldwide including mns of smallholder farms.

"As demand for food rises along with the world's population, the digital farming platform will play a key role in increasing global farming yields in a sustainable way. The collaboration is a perfect symbiosis of IBM's capabilities in AI, big data management and blockchain technology and Yara's agronomic knowledge, farmer-centric digital innovation, and proven track record in improving farming across the globe," said Luq Niazi, IBM Global Managing Director Consumer Industries.

As a first step, Yara and IBM will establish joint innovation teams, collaborating at digital hubs in Europe, Singapore, the US and Brazil. The teams will work closely with IBM researchers to develop new capabilities, such as visual analytics and machine learning techniques for crop insights. The first services are planned for end 2019.

The Yara/IBM partnership will focus on all aspects of farm optimization. One specific area of collaboration will be weather data. The ability to respond optimally to weather conditions is critical for farming. By merging analytical insights from IBM's Watson Studio, IBM PAIRS technology, The Weather Company and other services, with Yara's unrivaled crop knowledge and modelling capabilities, the joint platform will not only provide hyperlocal weather forecasts but will in addition give real-time actionable recommendations, tailored to the specific needs of individual fields/crops.

As the joint digital farming platform expands, the teams will explore innovative business solutions to integrate the joint platform into the IBM Food Trust, IBM's blockchain-enabled network of food chain players. This will allow for greater traceability and supply chain efficiency as well as ways to tackle food fraud, food waste and sustainability. It will firmly link the farm into the full food chain, creating a holistic approach to food production from farm to plate. The contract was signed in April 2019.

EuroChem opens new USD1 bn ammonia plant in Russia

EuroChem Group has opened a new ammonia production plant, EuroChem Northwest, in Kingisepp, Russia. The plant has the largest single-train production capacity in Europe, at 1 mn t per year.

An opening ceremony took place at the St. Petersburg International Economic Forum on Friday. Joined by officials including Sergei Ivanov, Special Presidential Representative for Environmental Protection, Ecology and Transport; Denis Manturov, Minister of Industry and Trade; and Leningrad Region Governor Alexander Drozdenko; EuroChem beneficiary Andrey Melnichenko turned a symbolic valve to signify the start of the ammonia flow from the plant, where EuroChem staff were watching by video-link.

"The opening of EuroChem Northwest marks an important milestone in the company's growth story, and cements our position as a global leader in fertilizer production," said Petter Ostbo, Chief Executive of EuroChem. "By investing in the latest technologies, this landmark facility will help deliver world-class nutrients to our growing customer base, allowing farmers to get more out of their land."

Over the last three years, EuroChem has invested USD1 bn in the development of the plant, which has a design capacity of 2,890 t per day, ensuring self-sufficiency for EuroChem in an important component of its fertilizer production needs. EuroChem will supply ammonia to its fertilizer production plants in Antwerp, Belgium, Lifosa in Lithuania, and Phosphorit, the Group's adjacent phosphate

fertilizer facility in Kingisepp. About 25% of total output will be sold to third parties, offering them a more cost-effective supply of ammonia.

Close proximity to the Group's existing rail and shipping facilities allows the ammonia to be easily transported to production units and world markets.

Maire Tecnimont subsidiaries Tecnimont SpA and Tecnimont Russia OOO, were retained for the engineering, procurement and construction of the plant. EuroChem Northwest incorporates the latest production technology.

Sensitive to local environmental concerns, the plant was built on a brownfield site, and care was taken to avoid any negative impact on the surrounding areas. The facility features a closed water recycling system to prevent effluent discharges into the nearby Luga River, which flows into the Baltic Sea in the Gulf of Finland. EuroChem continues to work closely with the John Nurminen Foundation on a major environmental project to prevent water runoff from any of its operations in Kingisepp.

EuroChem Northwest has created 300 permanent jobs within the local community. At the peak of construction, which began in 2016, more than 5,000 people were employed in building the facility. Some 12,000 t of steel were used in construction and more than 64 km of piling was installed.

Mozyr refinery in Belarus installs large-size equipment for sulphur production

Mozyr refinery continues the construction of its new heavy residue hydrocracking complex (H-oil). The last process includes the installation of large-size equipment for the sulphur production on technology of the Italian company Siirtec Nigi.

The total cost of the complex is over USD1.2 bn. The complex consists of the heavy residue hydrocracking unit (3 mn t/y), the hydrogen production unit and the sulphur unit (71,200 t/y).

As a result, the oil refining depth will increase from the current 75% to 90%. The construction was previously expected to complete much earlier, however, now it's planned to finish construction works this year and then to start commissioning, said BelTa.

Currently the refinery produces both liquid and crushed lumps sulphur.

Stamicarbon signs contracts for urea melt and granulation plant for Shchekinoazot in Russia

Stamicarbon, the innovation and license company of Maire Tecnimont Group, has signed a contract for License, Process Design Package (PDP) and Proprietary Equipment supply for a grass root urea melt and granulation plant for ShchekinoAzot, to be built in Pervomayskiy, Tula region, Russia.

The scope of work for Stamicarbon is the complete license and PDP for a 2000 mtpd melt and granulation plant including supply of proprietary equipment. The urea melt plant will use Stamicarbon's Pool Reactor Design and Flash Design. These designs simplify synthesis loop operation, lower investment costs and reduce steam consumption. The Safurex high pressure stripper and pool reactor will be equipped with a radar level measurement system.

The granulation plant will use Stamicarbon's Optimized Granulation Design and the MicroMist Venturi Scrubber technology. This high-performance multi-stage gas scrubber for granulators is designed to remove urea particles and ammonia gas at extremely high efficiencies. It is capable of meeting most stringent emission levels by capturing submicron dust and removing ammonia efficiently via the injection of an acid solution, while minimizing energy consumption by keeping pressure-drop low.

Yara reports improved results reflecting higher margins

Yara's first-quarter net income after non-controlling interests was USD96 mn (USD0.35 per share), compared with USD116 mn (USD0.42 per share) a year earlier. Excluding currency effects and special items, the result was USD0.59 per share compared with USD0.42 per share in first quarter 2018.

First-quarter EBITDA excluding special items was USD464 mn, up from USD377 mn a year earlier, reflecting higher production margins and a stronger US dollar.

"Yara shows improved results in first quarter, with EBITDA excluding special items and IFRS 16 up by 17%. The improvement is largely due to higher European nitrogen margins and a stronger US dollar," said Svein Tore Holsether, President and Chief Executive Officer of Yara.

"Our production performance in the quarter was unsatisfactory, with technical issues after turnarounds in three of our largest plants. Although production improved towards the end of the quarter, these issues impacted our overall results and improvement program performance in the quarter. We remain focused on improving returns through strict capital discipline and driving operational excellence," said Holsether.

Total sales and marketing deliveries were 1% lower compared to a year earlier. Excluding the Cubatão acquisition in Brazil, deliveries were 4% lower, reflecting a drop in all regions except for Europe.

New Business deliveries were 10% higher than a year ago, or 3% higher excluding the Cubatão acquisition. Yara's ammonia production was 3% lower than a year earlier, while finished fertilizer production was 3% higher. Excluding portfolio effects, ammonia and finished fertilizer production was respectively 9% and 1% lower.

Yara's near-term focus is on improving returns through strict capital discipline and driving operational excellence. Yara's investments peaked in 2018, with revenues ramping up in 2019 as growth projects come on stream and further operational improvements are realized.

NORTH AMERICA

Nutrien's first quarter impacted by harsh weather

Nutrien has announced its 2019 first-quarter results, with net earnings from continuing operations of USD41 mn (USD0.07 diluted earnings per share). First-quarter adjusted net earnings was USD0.20 per share and adjusted EBITDA was USD697 mn. Adjusted net earnings (total and per share amounts), adjusted EBITDA and related annual guidance are non-IFRS financial measures.

"Nutrien's first-quarter adjusted EBITDA was 22% higher than 2018 despite being impacted by the second wettest six-month period in the US in 125 years. While some regions are still receiving excess moisture, planting is underway and we expect strong crop input demand in the second quarter. As such, we are maintaining our annual guidance for 2019," commented Chuck Magro, Nutrien's President and CEO.

"Our organization is focused on what it can control and how best to deliver long-term value to stakeholders. In the first quarter, we allocated almost USD1 bn towards growing our Retail business in core markets and repurchased over USD800 mn of our stock. We also continue to pursue operational enhancements across our world-class integrated network and to lead the way in digital transformation of the ag-retail industry," added Mr. Magro.

Corteva Agriscience completes separation from DowDuPont

Corteva has successfully completed its separation from DowDuPont, becoming a leading, global pure-play agriculture company that offers the complete solutions farmers need to maximize yield and profitability. Corteva Agriscience has now launched with global scale and a balanced offering across seed and crop protection, underpinned by expanding digital capabilities and powered by the broadest and most productive innovation pipeline in the industry.

The distribution of Corteva common stock was completed on 1 June 2019, with each DowDuPont stockholder of record receiving one share of Corteva common stock for every three shares of DowDuPont common stock held. DowDuPont stockholders will also receive cash in lieu of any fractional Corteva shares. Corteva common stock begins trading today on the New York Stock Exchange (NYSE) under its new ticker symbol "CTVA".

"This marks the launch of a new kind of agriculture company, well positioned to compete and win by providing farmers the complete solution they need for sustainable, long-term growth and improved profitability," said Jim Collins, Chief Executive Officer of Corteva Agriscience. "As a global leader in the combined USD100 bn seed and crop protection market, Corteva Agriscience has the most robust pipeline in the industry, a world-class innovation engine, and advantaged routes to market that provide us with unparalleled customer relationships – all of which will fuel our growth as an independent company and drive value for stockholders. Our more than 21,000 dedicated

employees are committed to fulfilling our purpose to enrich the lives of those who produce and those who consume, ensuring progress for generations to come.”

With a presence in more than 140 countries, Corteva Agriscience generated USD14 bn in net sales in 2018. The Company has more than 150 research and development facilities and more than 65 active ingredients.

“As a new, independent agriculture company, we are intently focused on disciplined investment in innovation to deliver above market organic revenue growth and improve Return On Invested Capital,” said Greg Friedman, Executive Vice President and Chief Financial Officer of Corteva Agriscience. “We are on schedule on our commitment to achieve USD1.2 bn in cost synergies by 2021, and we are confident in our plan to expand margins. Equally important, we are committed to returning significant capital to stockholders through a combination of dividends and share repurchases.”

AlgaEnergy opens subsidiary in Mexico

Following the opening of its subsidiaries in Japan, USA, India and Italy, the biotechnology company, AlgaEnergy, is boosting its international expansion plans with the opening of a new subsidiary in Mexico.

AlgaEnergy Mexico has been established with offices in Mexico City to direct operations in this market.

“We are very pleased to announce the establishment of our business operations in Mexico as a step forward in our international development” said Ry Wagner, Ph.D., President of International Agribusiness for AlgaEnergy S.A. “AlgaEnergy has been recruiting world-class leaders for our business units as we expand our business operations. They will lead our plans for a global business presence with our best-in-class microalgae-based biological products. As we work to establish strong partnership in markets such as Mexico and onboard our senior leadership, I anticipate that we will make excellent progress toward our global business goals for 2019 and beyond”, Wagner continued.

Regarding the presence of AlgaEnergy in Mexico, Wagner stated that “agriculture is an important economic sector for Mexico, both historically and politically speaking. This country is an important producer of crops such as maize, avocado, cereals and some open field vegetables, so with an immense potential. Furthermore, is the world’s third greatest producer in organic agricultural products. In this framework, AlgaEnergy is in a privilege position for providing its innovative, effective and environmentally friendly technologies”, he added.

With the support of the exceptionally strong team within the operations in Spain, AlgaEnergy will be opening additional subsidiary offices in a number of other countries in the near future and continuing to recruit world-class leaders according to the company’s internationalization plan “Project Victoria”.

Nutrien Ag Solutions announces digital collaboration with BASF’s xarvio Digital Farming Solutions

Nutrien Ag Solutions announced today a digital collaboration with xarvio Digital Farming Solutions, part of BASF’s Agricultural Solutions division. As part of this partnership, the

xarvioTM SCOUTING app will be offered within the Nutrien Ag Solutions Customer Portal, to provide its customers easy access to this leading agronomic tool.

Nutrien Ag Solutions is building an open digital ecosystem that leverages deep agronomic data science and leading-edge technology to help growers achieve the best possible outcomes on their farms. Nutrien Ag Solutions will feature BASF’s xarvio SCOUTING app as part of its digital agronomy offerings, further enabling growers to detect and identify weed and pest pressure as they monitor and protect their crops throughout the growing season. In addition, Nutrien Ag Solutions and BASF xarvio Digital Farming Solutions are actively exploring the agronomic intelligence currently within xarvio Field Manager. The solution delivers timing and variable rate map applications in various crops for weed, disease and pest management.

“We are pleased to further our collaboration with leading agricultural companies such as BASF via our Customer Portal,” said Mike Frank, Nutrien’s Executive Vice President and CEO of Retail. “Our goal is to become the ag retailer of the future and partnerships with innovators such as BASF’s xarvio Digital Farming Solutions help enable us to provide more value to our customers.”

“As we build out our open digital ecosystem, we are constantly developing best in industry tools, both internally, as well as seeking apps and tools from across the industry. These tools help improve growers’ results and we’re excited to be able to feature the xarvio SCOUTING app on our Nutrien Ag Solutions Customer Portal,” said Sol Goldfarb, Vice President Digital Strategy at Nutrien Ag Solutions.

SOUTH AMERICA

EuroChem opens third new fertilizer plant in Brazil

EuroChem Group has announced the opening of a third new fertilizer blending plant in Brazil.

The new 27,000 square metre facility at Araguari in Minas Gerais, a state in the south-eastern part of the country, is another step in the continued expansion of EuroChem’s subsidiary, Fertilizantes Tocantins (FTO), a major fertilizer distribution business in Brazil.

The new plant will produce up to 6,000 t (KMT) of fertilizer a day, with a storage capacity of 100 KMT, creating 200 new direct and indirect jobs.

“Brazil is an important growth market for us and our new plant at Araguari marks the latest stage of our expansion in Latin America” said Petter Ostbo, Chief Executive of EuroChem. “I’m delighted by the progress we are making here and we will continue to provide high quality fertilizers to our growing customer base.”

The Araguari site also has a direct rail connection from the Atlantic seaport of Vitoria, about 520 km north-east of Rio de Janeiro, facilitating deliveries to local customers of specialty fertilizers produced by EuroChem in Europe, meeting the specific needs of Brazilian farmers.

“The Araguari plant marks our entry into the south-eastern region of Brazil, a strategically important part of the country”

said FTO’s CEO, José Eduardo Motta. “After the opening of two other major plants within the past year, at Sinop and Catalão, our focus is now on the consolidation of these new markets, so we can continue to maintain our successful rate of growth.”

FTO sold more than 1.8 mn t of fertilizers in 2018, making it one of the biggest fertilizer providers in Brazil. In addition to Araguari, Catalão and Sinop, FTO has six other plants located in Porto Nacional, São Luis, Querência, Rondonópolis, Barcarena, and Anápolis, with a corporate office in Goiânia, employing 600 people.

In 2016, the Group acquired a controlling interest (50% +1 share) in FTO as part of its strategy to strengthen its presence in the fast-growing Latin American fertilizer market. EuroChem also owns Emerger Fertilizantes SA, a distributor of premium and standard fertilizers in Argentina which it acquired in 2017.

MIDDLE EAST

New agri-tech closes USD1.9 mn investment to grow crops in the Middle East

Red Sea Farms, an agriculture technology spinout company from King Abdullah University of Science and Technology (KAUST) specializing in saltwater greenhouse technology, has secured USD1.9 mn of co-investment from the KAUST Innovation Fund and Research Products Development Company (RPDC).

Red Sea Farms is uniquely positioned to serve the growing food security needs of the Middle East. A combination of irrigation water scarcity and hot, arid lands are constant barriers to the region’s ability to achieve agricultural self-sufficiency.

For Red Sea Farms Australian co-founder and KAUST Professor of Plant Science Mark Tester, food security has always been central to his research. “The Middle East is one of the most water scarce regions of the world. Here we often rely on unsustainable sources of water for irrigation, such as groundwater, which is being rapidly depleted or desalinated water,” explained Tester. “Desalinated water requires large amounts of energy to produce which is costly – at least USD1 for every cubic meter and has a high environmental impact.”

With its unique combination of engineering and plant science, Red Sea Farms has developed solutions to grow saltwater tolerant crops in greenhouses cooled using saltwater. In their saltwater greenhouse, 80-90% of freshwater is substituted with saltwater, massively reducing both the water and carbon footprint of food production. The result is a system where both fresh water and energy requirements are reduced up to 10-fold.

The seed investment will enable the company to build a 2,000 square metre saltwater greenhouse on the KAUST campus in Saudi Arabia and plans to produce 50 t of tomatoes annually by 2020. Building on six years of research at KAUST, the tomatoes that will be grown have significantly higher salinity tolerance. The resulting crops can be grown using up to 30% diluted seawater, which will save further freshwater; it also makes the fruits exceptionally sweet, with higher levels of vitamins and antioxidants.

The new patent-pending system can be retrofitted to existing greenhouses, allowing for evaporative cooling with saltwater

resources to save precious fresh water. The company is aiming to retrofit five% of greenhouses in the Kingdom, offering a return on investment for farmers in less than two years.

"RPDC and KAUST share common interests in commercializing intellectual property and supporting high-tech startups in Saudi Arabia. This investment marks a shining example of the transition of KAUST academic research to commercial application, with the potential to revolutionize the future of food production in Saudi Arabia and the region,” said Kevin Cullen, vice president of KAUST Innovation and Economic Development.

ASIA

Government considers fixing nutrient-based subsidy rate for urea

The Indian Government is mulling over fixing a nutrient-based subsidy (NBS) rate for urea in order to promote balanced use of the fertilizer and bring in efficiency in the industry, according to sources.

In 2010, the government launched the NBS programme under which a fixed amount of subsidy, decided on an annual basis, is provided on each grade of subsidised phosphatic and potassic (P and K) fertilizers, except for urea, based on the nutrient content present in them.

The fertilizer ministry is thinking on fixing a NBS rate for urea also.

The industry suggests that fixing NBS rate for urea will encourage balanced use of urea and bring in efficiency in the fertilizer industry by infusing bit of competition.

Currently, urea is the only controlled fertilizer and is sold at a statutory notified uniform sale price. Its maximum retail price is fixed at INR5,360/t. It is the most commonly used fertilizer because it is highly subsidised.

According to sources, the NBS rate for urea had not been fixed so far because of certain apprehensions, which the current officials in the ministry feel can be resolved easily.

“The NBS can be fixed without removing urea from the Fertiliser Control order. Within the broad control parameters, you can have the flexibility to adjust to the market situation. It is possible to fix a NBS rate for urea,” they said.

On concern that urea prices will go up if it is decontrolled like P&K fertilizers, sources said, in that case, the government will not completely decontrol and will keep the price band within a range depending upon the market situation. The price band can be revised periodically.

On apprehension that cheaper urea imports may hit domestic PSUs, sources said, this can be addressed by retaining the channelised imports by keeping control over quantity of shipments to ensure that cheaper soil nutrient is not dumped in the country.

On concern about easy availability of urea across the country, sources said this can be addressed by retaining movement control under the essential commodities act.

“In P&K, we have retained 20% of movement control. Here we can have 40% movement control,” they said. ■

3-5 June • Atlanta, USA



The event began with the Biostimulants focus day, which was held for the first time in Atlanta. It offered valuable updates on the latest regulations as well as agronomic insights from companies including 3Bar Biologics, Rutgers University, Earth Alive Technologies and Timac Agro. Terry Stone of Agrinos chaired the event as well as giving a well-received presentation on "Biostimulants — a unique category of agricultural input".

Other highlights included presentations from Bioconsortia, Koch Agronomic Services, TFI, Miller Chemicals, Yara and Verdesian Life Sciences.



For more information visit www.arqusmedia.com/fertilizer-events

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As is often the case at *Argus* conferences, there were just as many opportunities to get valuable insights in the exhibition room and during side meetings as in the presentation room. With plenty of networking breaks and an informal drinks reception sponsored by ICL Fertilizers, attendees enjoyed getting to know one another and establishing mutual business interests. The round-table discussions were a popular feature of the event. The diverse topics ranged from R&D investment, sustainability in the fertilizer sector; improving growers' access to products and technical expertise, communicating the benefits of AV/FS to growers and complex data analysis. ■

Price watch

NITROGEN

Firm outlook for urea in Q3

The urea market has firmed, unusually, during the second quarter and will continue to do so into the second half of the year. Producers in most regions have begun June in a comfortable position, either fully committed or with only limited tonnages to sell for the second half of the month.

There is little demand left to be covered in June but some spot requirements remain for Europe and Australia.

Prices for urea have moved up to USD285/t fob in the Middle East and Egypt, while Baltic prills have sold in the high-USD250s/t fob. This is approximately USD30/t higher than a year ago.

Average prices for the year to date are running USD9/t higher in the Middle East, USD12/t higher in Egypt and USD19/t higher in the Baltic.

Traders are already positioning for July, booking cargoes in North Africa above USD280/t fob.

We expect prices to remain strong through Q3 ahead of the peak demand period in October-November. There is a risk of the market overheating in Q3 and seeing a consequent price correction if Chinese exports rise rapidly.

Some Chinese urea has traded for July shipment at prices in the mid-USD270s/t fob, but prices do not need to fall further to be competitive. Chinese prilled urea has yet to feature for export and a two-week delay to the summer season is likely to mean that exports only start in significant volumes for August.

India is expected to tender again during the second half of June for July shipment. Under the pre-DBT system of calculation, urea stocks fell to about 1.1 mn t at the end of May, compared to 1.7 mn t at the end of May 2018.

Production of urea is also falling short of planned levels in India due to plant outages. Output in April-May was about 400,000 t lower than in the same months of 2018. Sales have not fallen.

MMTC is expected to seek the maximum possible quantity under its next tender, having bought just 1.1 mn t so far in 2019-20. But as in the first two tenders, securing more than 500-700,000t of urea may prove difficult without substantial Chinese involvement.

Brazilian imports of urea are forecast to rise to more than 500,000t/month in Q3 and will account for much of the

Algerian, Nigerian and Iranian export availability. Iran appears to be shipping about 200,000t/month of urea to Brazil but, despite this, prices in Brazil have firmed by about USD10/t over the past month. Netbacks from Brazil are set to lag those from India for Middle East and Egyptian producers.

In fact, the sale of about 250,000t of urea to India and Pakistan for late-May and June shipment has put Egyptian producers in a very favourable position, compensating for the loss of the Turkish market to Iranian suppliers and enabling them to push fob levels up for the remaining quantities. This situation should persist into July, presenting European buyers with a dilemma.

The lack of forward sales by traders means that the European market is totally uncovered for the 2019-20 season. The main European markets (excluding Turkey) import more than 500,000 t of granular urea in Q3 and more than 1 mn t in Q4 each year.

Buyers currently face the choice of purchasing at current prices, which are seen as high, or waiting until later in Q3 and accepting whatever prices are prevailing at that time. Some may opt to purchase for July-August shipment in view of the likely rise in prices through to October-November.

One consolation for European buyers is that they will face little competition from US buyers for spot urea cargoes in the second half of the year. Persistent wet weather means that corn planting in the US was at a record low as of 29 May and estimates of the area to be planted are being revised down.

The fall in planted area of around 7.5 mn acres may lead to a carryover of urea and other nitrogens into next year. Corn prices have jumped and bode well for demand in spring 2020 if they remain above USD4/bushel, but as we have seen in 2019, the weather can frustrate any plans.

AMMONIA

Ammonia prices close in on market floor

The slow price depreciation that has been a constant theme in the ammonia market this year shows no sign of abating, but there are some signs of improvement in both western and eastern markets and opinions are beginning to diverge about sentiment ahead of the third quarter.

The tone for June was set by another USD17/t drop in the Tampa contract price to USD220/t cfr — a 21-month low — setting a new fob price of around USD180/t. The Americas continues to represent the weakest price point in the market, with good availability in Trinidad and the US Gulf. East of Suez markets are faring better, and Indonesian producers are managing to sell product at above USD250/t fob, representing the firmest region in the market for the second quarter.

With the market split, many are monitoring Yuzhny closely for June and July availability for a sign of which way the market will go next. Yuzhny is traditionally the balancing point in the market, but TogliattiAzot – the largest Russian export through Yuzhny - has given no signals that it is about to reduce production. Exports will be reduced by 55,000 t in July as Rossosh brings its ammonia plant offline for a 30-day turnaround. This, combined with reports of healthy demand levels in Turkey for July, may prevent any further price falls in the region, keeping the 2019 floor at USD200-210/t fob for now.

The picture is mixed in the Middle East, where prices slumped close to USD200/t fob in May and are testing USD190/t fob in early June. More tonnage is available from Oman and Iran currently, with the latter having begun to send regular cargoes to China, a trend that could change the supply outlook in east Asia if it continues into the second half of the year.

Elsewhere, supply disruption at Fertial in Algeria is having a minor knock-on effect in the region, and much excess spot availability in the country has been soaked up to cover European contract shipments. The unit is expected to be offline until the end of July and this combined with a turnaround at one of Sorfert’s ammonia units, will limit Algerian export availability over the month.

The outlook is not expected to change until at least the end of the month, with further price depreciations forecast throughout June. Many participants believe that the market will have to turn in early July as buyers finally accept the market is close to its bottom and start buying in earnest. Further seasonal demand may emerge in July, and the summer maintenance season could offer some support to pricing. East of Suez markets are forecast to be in deficit until the fourth quarter, but the weighty supply outlook west of Suez is unlikely to change in the near term.

Chinese demand is likely to be a key factor in the months ahead. Buying has picked up in the past month and early estimates suggest that it imported around 100,000 t in

May. If buying continues at this level it is likely to offer near-term support to pricing in east Asia, and keep the divergence in place between the east and west of Suez markets.

The east of Suez markets overall have been very quiet in terms of spot trade in the second quarter, but buyers have watched freight costs escalate in the first half of June in the wake of the tanker incidents in the Middle East Gulf. With shipowners unwilling to fix vessels through this key shipping route, the knock-on impact could affect several established trade routes in the second half of the year, unless the tensions in the region subside.

PHOSPHATES

Phosphate prices pressured lower

Phosphate prices continued their decline in the second quarter, as cfr levels in key regions dropped in the face of continued Chinese DAP exports, high Indian DAP stocks and an oversupplied US DAP/MAP market.

The Argus DAP index, which offers a clear snapshot of phosphate trends, fell by around 6.4% from the start of April to mid-June. The index is a basket of averaged fob prices from key export origins – US, Morocco, China, Saudi Arabia and Russia – weighted to the latest IFA trade data.

DAP prices in India continued to fall through April from the high-USD390s/t cfr at the start of the month, as government data indicated stocks as high as 960,000 t at the end of March. Importers continued to buy DAP in the period, as the current subsidy and maximum retail price affords distributors a healthy import margin. The Argus India DAP line-up showed around 425,000 t booked to arrive in India in the month, as buyers pushed cfr prices down to the high-USD380s/t cfr at the end of the month.

Increased DAP arrivals in June, totalling around 850,000 t, pressured the price downwards to USD376/t cfr by mid-May. The price then fell further to USD369/t cfr at the end of May, as further trader sales of Chinese product weighed on prices. The downward trend accelerated through the following month, hitting USD355/t cfr on 13 June following importer NFL’s purchase tender and aggressive trader short sales.

Elsewhere on the subcontinent, Pakistan DAP prices trended in line with Indian cfr levels. The DAP price slipped through April from low-USD400s/t cfr to mid-

USD390s/t cfr, as there was little liquidity and importers rejected offers from trading firms deemed too high. DAP stocks in Pakistan were similarly high, rising to around 508,000 t at the end of March, which strengthened importers' negotiating position compared with last year, when stocks were less by around 320,000 t.

Importer and manufacturer Engro did buy towards the end of May, setting the price range at USD377/t cfr. Prices were assessed on a notional premium to India until Pakarab bought a Chinese cargo in the first week of June, pushing the DAP level to the low-USD370/t cfr.

On the supply-side, Chinese DAP fob levels were weakened through April, May and June, as suppliers had few export outlets besides India. Chinese suppliers shipped a total of around 865,000 t of DAP to India in the period, up from 815,000 t a year ago.

Chinese suppliers attempted to stem the fall in prices, from the high-USD370s/t fob at the start of April, pressured to the low-USD370s/t fob at the start of May. But levels were pushed to the low-USD360s/t fob towards the end of May, as traders sought lower levels, short-selling to Indian buyers. Suppliers instead looked to regional markets, in order to allocate tonnage, selling small lots to Thai, Philippine and Vietnamese buyers, pushing levels to the low-USD350s/t cfr in the first week of June. But traders continued to short into India, driving the price to USD340-350/t fob in mid-June following offers into India.

West of Suez, the US DAP barge price dropped from the low USD330s/st fob Nola to around USD315/st fob Nola at the end of the month. The drop in price compared to Latin America offered trading firms arbitrage opportunities, resulting in one trader buying barges and loading a vessel of phosphates to Brazil in the month.

A combination of heavy imports in the fourth quarter of last year, freezing weather and a lack of demand at the start of the year and record DAP/MAP carryover stocks at the end of March, led to fall in barge prices at Nola in the period. A lack of demand and continued pressure from well-stocked warehouses resulted in the price dropping to the low-USD310s/st fob Nola towards the end of May. But the price rose to USD318/st fob Nola at the end of the first week of June, bolstered by high crop prices and Mosaic's bullish summer fill target price of USD330/st fob Nola for July.

And, with little support from the US market, in Brazil the 11-52 cfr price fell through April, as suppliers sought to hold levels in the USD390s/t cfr Brazil. But the price dropped to USD375-385/t cfr at the start of May, as bids fell lower. Sales to end-users are later than usual, as

buyers have waited for a further drop in phosphate prices compared with crop levels. The average barter rate in Brazil for soybeans was around 22 bags/tonne of NPK through the April to mid-June period. But end-user purchases of fertilizer typically pick up when the ratio drops below 20 bags/tonne, highlighting the comparatively high cost of inputs for soybean farmers in Brazil during this period.

Importers ramp up phosphate fertilizer arrivals for May-July in order for warehouses to be stocked for the safra application beginning in September. But suppliers have continued to stock their supply chains, despite the comparatively low crop prices, in order to allocate volumes in the face of weakening demand in the US. The Argus Brazil MAP line-up shows arrivals at around similar levels to last year at 970,000 t in April-June.

POTASH

MOP dips as demand falls on weather, crop prices and high stocks

The global MOP market has been experiencing demand drops in several key regions, as a poor spring in the US, adverse weather conditions in southeast Asia and price-related cuts in purchases in India, Malaysia and Indonesia all caused buying to slow. Generally though, demand is comparable to 2018 levels and so prices have not fallen by more than around USD10/t, as supply is only modestly outstripping demand.

In Brazil, granular MOP prices were flat again at a midpoint USD345/t cfr. Domestic inventories were at comfortable levels earlier in the year, and port deliveries have added to stocks, but demand is solid and the market is well-balanced.

Imports in January-May are up by just under 800,000 t year on year, and vessel line-ups for June indicate a strong first half, which has prompted bullish expectations on demand this year from some suppliers. But imports should begin to slow from July, year on year.

Many farmers have delayed their purchases, because fertilizer costs are generally higher than they were a year ago — partly resulting from the rise of the dollar versus the real — while soybean prices have been unfavourable, hence the flat pricing.

Southeast Asian standard MOP prices fell from a midpoint of USD305/t cfr by mid-April to USD300/t cfr as the market continued to stagnate on low demand, lower crude palm

oil futures prices on the Bursa Malaysia and high CPO stocks. In Malaysia, potash demand has been sapped this year by delayed plantation purchasing.

Low CPO prices mean some plantation owners opted not to buy for first-quarter delivery and to manage with existing stocks and reduced application programmes. Moreover, a heavy carryover of stocks from 2018 into 2019 means that supply is ample, especially of standard MOP. All of this has kept prices at around USD300/t cfr in Malaysia.

In Indonesia, prices were slightly higher than in Malaysia, at around USD310/t cfr.

In northwest Europe, granular MOP prices were the equivalent of USD318.60/t cfr in June, down from USD328.10/t cfr in early May. Low demand and a period of restocking earlier in the year on the prospect of rising prices have given buyers the chance to negotiate on offer levels, particularly since prices are falling globally.

South African granular MOP prices remained at USD320-330/t cfr until early June where they fell to USD315-325/t cfr on new business. Buying for the new season started in late May, in time for deliveries for late-August/September planting. Drought levels are still manageable in the Cape region, but the area has been hit by severe water shortages in the recent past, and farmers are not ruling out another year of enforced water restrictions which has hit demand and caused pricing to erode slightly.

SULPHUR

Flat to soft on low sulphur spot activity

Sulphur prices have largely trended flat-to-soft during May and June on slim trading activity and persistently bearish sentiment in both the sulphur and phosphates markets.

More sulphur is continuing to be delivered to the Chinese market through contractual agreements, which is keeping cfr China spot activity at a minimum and prices largely flat in the high USD110s/t. Yangtze river port inventories have steadily increased across May and June — largely because of those contract deliveries — and are currently in excess of 1.7 mn t. Buyers are well covered for their requirements as a result, and some bids are heard at lower levels than the high-USD110s/t, putting sellers under pressure. Traders are otherwise keen to protect their positions until a clearer price direction is gleaned, but prices have been at the USD118/t cfr China level since late May, dropping from peaks of USD121/t at the start of May.

In India, spot trading has been notably absent for the past two months as prolonged plant maintenances, steadier domestic supply, and unfavourable weather reduced import demand. Prices have remained flat at USD115-120/t cfr since the end of February but some



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interest is now beginning to stir. Accordingly, prices are set to be tested on the award of PPL's recent tender to buy 30,000 t, which is expected imminently.

Demand is also low in north Africa, and Morocco's OCP has remained largely out of the market as quarterly contract volumes covered its requirements. But cfr north Africa prices softened to USD88-103/t in mid-May on falling spot offers from key supply markets in the Baltics and Black Sea, then in early June to USD88-99/t cfr on OCP's first and only spot purchase of the quarter.

Despite more bearish expectations for Middle East fob values, prices have trended flat-to-mildly-soft. The levels have been supported by the award of Qatari state-owned Muntajat's April and May tenders in the mid-USD100s/t, although other bids were heard at much lower levels. Muntajat's June spot tender has recently been awarded with a price at USD101/t fob attached, which reflects a cfr China value at around USD119-123/t — too optimistically high in the minds of some.

Third-quarter contract negotiations are now on the horizon and will commence in most markets by end-June. Prices are widely expected to settle soft against second-quarter levels, particularly as the outlook remains gloomy for the finished-fertilizer market. But the degree of this contract price reduction has not yet been agreed upon.

The only exception to the softness may be west Europe's third-quarter contract levels, which are settled on a cfr Benelux basis. The regional market continues to be tight, which is so far supporting expectations of a rollover in prices — or even a slight firmer.

NPK

Higher pricing in East Europe supports market

The NPK market has been largely characterised by an east/west schism. In the west, NPK prices firmed slightly through April-May while prices in the east were stable-to-soft. Russian 15-15-15 prices have moved up slightly from USD270-275/t fob Baltic/Black Sea in mid-April to a flat USD275/t fob in early June while Moroccan 15-15-15 moved up from USD260/t fob to USD265-300/t fob with the low-end representing the price for Africa shipments and the high-end for European sales.

The higher pricing has been underpinned by a bullish sentiment in East Europe where distributors started to take positions in preparation for the autumn season. Moreover, strong sales of Russian 10-26-26 to India

has also led to limited availability of this grade for East Europe which has also pushed up prices for high-P and K content grades, which are required for the autumn season. By contrast, western European buyers have remained outside of the market, and are awaiting new season 15-15-15 prices before purchasing pre-storage volumes.

Moroccan phosphates producer OCP has continued to ship more volumes to Europe. It made a sale of 15-15-15 to Hungary at USD300/t fob for May-June shipment. But the producer's main NPK market remains in its home territory Africa. OCP sold 40,000 t of mostly 15-15-15 to Togo for end-May/early June loading and will supply an additional 100,000-125,000 t of NPS and NPS+B fertilizers to Ethiopia as an extension of a tender awarded in January.

In the east, 16-20-0+13S prices dropped from USD245-250/t fob China to USD240-245/t fob, and from USD268-270/t cfr Thailand to USD260-270/t cfr amid weak demand in southeast Asia as a result of a lack of rain. Sales to farmers have slowly improved though in May but heavy imports in southeast Asia in the first quarter of the year mean that there is limited demand left to cover in the run up to the main season in the late second quarter.

In India, 10-26-26 prices declined slightly from USD370/t cfr to USD367-369/t cfr. Indian imports have been lower than expected. Scheduled deliveries for April-May totalled 74,000 t, a 67% decrease from the same period of 2018.

Elsewhere in Asia, China briefly became a net exporter of NPKs. GTT data showed that China exported 130,047 t in March, compared with 105,141 t imports. Exports have been growing steadily since the government removed the export tax on NPKs at the beginning of this year and are expected to continue to do so as Chinese producers look to international business to compensate for the ending of the domestic spring application season. Despite this, exports trailed imports in April, with the former sinking to 63,832 t, down by 51% on March.

Meanwhile, the Ukrainian market has been disrupted by speculation that the government intends to impose a 5% duty on imported Russian fertilizers. Participants await the results of the parliamentary election on 21 July as an indication of whether the duty will be imposed. Demand in the region was unusually low at the start of the second quarter, but picked up from late May as prices bottomed out. The price of 16-16-16 fell from HRN12,500-12,600/t cpt (bagged) in April to HRN11,500-11,600/t cpt (bagged), while 10-26-26 dropped from HRN14,400-14,500 cpt (bagged) to HRN13,300-13,400/t cpt (bagged). ■

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Adapt and lead... or be left behind

Fertilizer rail transportation in North America

by **Derek Wong**, Senior Manager Bulk, CN Transportation, Canada

When I started at CN Transportation over a dozen years ago, the impression of the fertilizer industry was that it was a predictable industry. Year on year expectations would be the same as previous years. It was viewed as a sleepy industry where not much happens. After all, agriculture has been around since humankind decided to settle down and grow the food, rather than search for it. But the fertilizer industry soon started to prove to be more dynamic than I initially thought.

In the early 2000s, natural gas prices were on the rise and North American nitrogen fertilizer production was no longer competitive. In my modest career, this was the first change in fertilizer transportation flows that I experienced. Nitrogen plants were shutting down or idled and coastal import facilities were popping up to take their place. Inland transportation evolved to serve the market. Mega-

warehouses were constructed in the Midwest. Shuttle trains would cycle back and forth from the Gulf Coast to the Midwest, carrying 65 railcars of urea to fill these hungry terminals. It was an adaptation in the fertilizer logistics network, one that serves a market beyond the reach of the Mississippi. These shuttle trains were not limited to urea either. Phosphates travelled the continent in much of the same manner, often passed like a baton between two rail providers.

Seasonal imports

Imports served another function. The fertilizer business is seasonal and because much of the action is carried out in the Spring and Autumn, imports provide a surge of produce to meet the ever-growing demand during the application seasons. Managing the seasonality is an art for the wholesalers and retailers alike. In the lead up to

the application season, wholesalers and retailers face the timely question of 'to buy, or not to buy'. Whether to have sold all of your inventory and run the risk of lost sales or to meet all of your customers demands but have carry over product in the end. Is there a right and wrong answer? During the commodity boom of 2008, the fertilizer industry was experiencing its own bull market. Fertilizer prices rose to unprecedented heights and shipments were trying to keep up. It seemed as though there was not enough produce to go around, until the boom was followed by the bust. Fertilizer prices crashed. Many wholesalers and retailers were stuck holding expensive inventory that they had to take the loss in order to sell. What did it mean to the fertilizer distribution network? It meant that no one wanted to carry inventory out of season. The risk of write-downs and losses were too great. Once bitten, twice shy. This forced the

transportation of fertilizer to adopt a pseudo 'just in time' system. The principle of 'just in time' requires production or supply to adjust to meet demand, thereby avoiding the need of carrying large inventories.

Banking nutrients

It is worth mentioning that when fertilizer prices did not adjust to the market, there was a stalemate. Potash and phosphate prices were still stubbornly high and farmers chose to mine their soils instead. Something they could afford with years of over application, banking nutrients in their soil for a rainy day. The transportation of potash and phosphates was noticeably reduced in 2009.

Nitrogen could not be banked and so the demand and transportation of nitrogen fertilizer continued. Imported produce still served to satisfy the demand of the peak application system. There was the idea that perhaps nitrogen fertilizer was immune to market changes. Then the shale gas revolution occurred. From only a few years prior when nitrogen plants were closing, the shale gas revolution reversed the trend. New nitrogen plants were being contemplated and constructed. At one point, there were so many projects planned in North America that if all were to materialize, the continent would be nitrogen sufficient. As these new plants came into production, nitrogen imports started to fall. Yet, finding a market for the new production is not as simple as displacing imports. Imports were timed to coincide with the application seasons. Nitrogen plants were made to produce consistently throughout the year and there was a question mark over what to do with the supply between application seasons. You could either export it or store it - perhaps 'just in time' was not meant for the fertilizer industry.

New fertilizer terminals are being built in Canada. These larger terminals are capable of handling unit trains, which by now have evolved from 65 to about 100 railcars. Canadian farmers used to have the luxury of a local production of fertilizers and the distribution did not rely as much on



Ilta plant, Saskatoon. Courtesy: Glen Barger/Alpha presse

The optimal size of a unit train is highly dependent on the rail network

onsite storage. However, Canadian crop yields were becoming larger and securing a sufficient supply of fertilizer was critical. Those investing in new warehouses also saw the need for storage on the horizon. Nutrien's Redwater facility will cease producing phosphates in 2019. Up to 600,000 t of phosphate supply will need to be replaced in the Canadian market. Suffice to say, the only certainty is that more produce by rail is required.

New technologies

Railroading has certainly evolved over the years. In fact, CN has been at the heart of many of these changes over the years, with new technologies and a new operating model, 'Scheduled Railroading', which we pioneered 15 years ago.

In the past, each railroad had a different view on the definition of a 'unit train'. The common consensus is that it is a unit train consists of a singular commodity travelling from one origin to one destination. The debate was

often about the number of railcars that make up a unit train. Some viewed 65 railcars as sufficient. The CN view was, and is, a minimum of 100 railcars. Granted, the optimal size of a unit train is highly dependent on the rail network - how long are the sidings? How steep is the grade on a particular route? What can the origin and destination handle? Today, the North American railroads are trying to see how large a train they can run. At CN, we are consistently running potash trains of 205 railcars. That is over 21,000 t of potash per train. However, despite how iconic a unit train is to a railroad, it is not always the optimal choice. Manifest service is really the backbone of a scheduled railroad. Not all customers can ship or receive a unit train and even less can do it on a rateable basis. Unit trains can also disrupt the service schedule, especially when there is not consistent shipments. A spot movement of a unit train requires another train to start, more crews and the search for available slots on the mainline. A schedule railroad is about having consistency and predictability. Filling out the



Between Edmonton and Calgary, outside Red Deer, Alberta. Courtesy: Llyod Sutton/Alpha Presse

manifest train reduces the number of trains in a particular corridor. The next evolution is to invest in the network to allow for longer trains, to add more sidings so that trains can pass each other, to build capacity to handle the growth of the economy and to be more resilient in service.

Cold weather practices

Railroading is an ‘outdoor sport’ and each winter is unprecedented. The snow is one thing, but the long spells of extreme cold has tested the railroads. Trains rely on air as part of

the braking system. The extreme cold prevents high enough air pressure throughout the entire train. Running with distributed power can help. Distributed power is when there are locomotive engines throughout the train. Air cars can also help increase the air pressure through out the train. However, in recent years, it has got so cold in the northern United States and in Canada that these techniques cannot mitigate the cold and the only way to operate is to run shorter trains. This means more crews, more locomotives, more trains on the network and tighter capacity. When

the extreme cold persists, it taxes the railroad on its resiliency.

There is also no denying that the recent Springs have also taken a toll on the transportation sector. In the last couple of years, flooding and high water levels has wreaked havoc on the waterways. The navigability of the Mississippi is starting later every year and many that were counting on fertilizer shipments by barge, have been left high and dry. Those fortunate enough to have alternative modes were able to secure the supply they needed. Old Man River is competing with Old Man Winter to see who is the most cantankerous of all.

What about other forms of transportation? Is trucking immune to disruption? There are the agricultural exemptions today, but what about tomorrow? What about pipelines? Particularly the decommissioning of the Magellan ammonia pipeline. If there is nothing else that I have learned, it is that change is a constant.

Perhaps the only other constant is that the farmer must plant and railroads will continue to invest to keep up. The world needs to be fed. The logistics network needs to be strong enough to provide the nutrients needed for the crop to grow. CN is leading the way with new end-to-end solutions and record investments because we believe that logistics network must be resilient - adapt and lead or be left behind. ■



Prince-Rupert BC. Courtesy: Pascale Simard/ Alpha Presse



The fertilizer sector in Central America

by Sergio Godoy, Regional Director, Yara, Central America and Natalia Villalobos, Marketing Coordinator, Yara, Costa Rica

Central America has a population of more than 44 mn people spread across the seven countries making up the region: Guatemala, Costa Rica, Honduras, Nicaragua, Panama, El Salvador and Belize. More than half of the population lives in rural areas and about 80% of them depend on agriculture.

Physical fertilizer mixtures are very common in the region, predominantly seen amongst traditional farmers. Chemical fertilizer formulations have been introduced more recently over the last 20 years. This practice was driven by progressive farmers who were searching for new technologies that efficiently helped their crops to combat the effects of climate change, diseases and pests.

Central America consumes over 2 mn t of fertilizers annually. The value imported increased by 8%, from USD636 mn in 2017 to USD687 mn in 2018. Throughout Q3 2018, Guatemala

Factors, such as the green revolution, have led to an impressive progress in increasing crop yields

was the main importer accounting for USD174 mn, followed by Honduras with USD148 mn, Costa Rica with USD143 mn, El Salvador with USD64 mn, Nicaragua with USD55 mn and Panama with USD53 mn. During that same period, 18% (value) of imports arrived from Russia, 14% from China, 8% from the US and 8% from Mexico.

Market participation is shared by a few companies and most of them are present on a global basis. There are various types of fertilizers imported by Central America and these include both mineral and chemical products with two or three nutrients (nitrogen,

phosphorus and potassium). The distribution of fertilizers is the same as in other parts of the world: importers deliver directly to large scale farms and use traditional distribution channels to reach smallholder farmers.

Factors, such as the green revolution, have led to an impressive progress in increasing crop yields over the past few decades. This progress, however, is not uniform across all countries in the region. Crop production depends on the nature of the soil, rainfall pattern/irrigation, quality of seeds and nutrition programmes applied to promote growth.



(top right) Potato seed treatment, Tierra Blanco, Cartago, Costa Rica. The highlands of central America offer often ideal conditions for potato growing. At altitudes of between 1 500 and 2 800 m, where average temperatures range from 7°C to 25°C, farmers can harvest potatoes. The potato has become a valuable cash crop for small farmers, who grow it mainly for sale to urban areas and for export to neighbouring countries; (bottom left) Plantain Crop, Guatemala. Plantain and banana crops have high importance in the economy and they're also an important part of the staple food in Central America. Their crops and productions are generating incomes and full time jobs.

Smallholders are key for growth

While farming has continued to contribute less to the GDP over the past few decades, it remains an important economic activity in the region accounting for 2.7-13.5% of GDP (depending on the country) and a large percentage of the agricultural production is conducted by smallholder farmers.

According to the International Fund for Agricultural Development (IFAD), small family farms make a fundamental contribution to the

economies and the food security of the countries in the region - they account for more than 60% of agricultural outputs in Central America.

Although the most favourable regions with the best quality soils were originally dedicated to maize crops, large areas are now used to sow beans and rice. The crops representing the highest percentage of agricultural exports from Central America are: coffee, banana, sugar cane, oil palm, fruits and vegetables. In some countries, these products represent over 50% of the overall exports. However, farming in Central America is going through a deep

crisis because the traditional products have suffered drastic downturn in favour on the global market, with some products falling in price by more than 50%. Coffee, sugar cane and banana concentrate represent more than half of the exports from Central America and all three are experiencing continued price erosion.

In this scenario, knowledge and technical support are crucial for growth. The job of the fertilizer industry is no longer to deliver a 'needs-based' crop programme, it must provide sustainable solutions that improve not only the farmers productivity, but the



Strawberry harvest, Tierra Blanca, Cartago, Costa Rica. Currently, 765 000 hectares of fruit are grown in the region, generating more than USD4.5 mn a year.



Coffee Harvest, Boquete, Chiriquí, Panamá. Central America, in general, produces a very consistent washed Arabica coffee. There are distinct differences from country to country. There are also very defined and unique micro-climates in each country that produce distinctly different coffees and profiles. Guatemalan, Costa Rican and Panamanian coffees are extremely popular, but you can find exceptional coffees in most all of these countries

Central America has the potential to develop a highly competitive agro-sector

quality of the products. The fertilizer industry needs to share best practices and connect farmers with key players in the food chain, so they can unlock the full potential of their crops and make better profits.

Upcoming challenges

Central America is one of the planet's most vulnerable regions in terms of climate change. And yet, farmers are still lacking the access to knowledge and tools that would help them mitigate bad weather conditions and protect their crops.

Moreover, harmonizing sanitary regulations, attaining labour and environmental certifications for

exports, as well as promoting financial instruments for agribusiness and implementing a regional food security programme, are just some of the challenges the region will face within the next 10 years.

It is therefore important to work closely with governments, distribution networks and producers to identify where corrected nutrition could transform crop yields. Central America has the potential to develop a highly competitive agro-sector, but in order to successfully compete on the global market, the region needs to have access to both new technologies and fertilizers with a cleaner production process (e.g. nitrates) with less GHG emissions and higher efficiency. ■

Nutrient innovations

meet demands of modern corn hybrids

As corn hybrid yields continue to increase, researchers provide nutrient solutions that meet plant, grower and soil needs

by **The Fertilizer Institute (TFI) staff**, Washington DC, USA

US corn yields have increased at 1.9 bushels per acre per year since 1955, according to Purdue University. Genetic improvements in hybrids continue to be complemented by advancements in breeding practices and crop production technologies, including fertilizers.

Corn yields have increased 117% since 1980, yet fertilizer use for each bushel of corn produced has decreased by 50%, according to USDA and NASS (see figure 1). A combination of 4R practices, using the right fertilizer source at the right rate, at the right time and in the right place, reduced tillage, cover crops and in-season nitrogen prediction models has contributed to this reduction. It is also indicative of industry sectors working jointly toward improved crop production.

“This gain isn’t solely the result of improved genetics, though genetics likely contributes about 70-75% of the increase in bushels per year, while

“**Nutrients need to be available to plants for longer than they did in years gone by**

management contributes in the 25-30% range,” says Matt Clover, agronomy manager for Corteva Agriscience, supporting the Pioneer brand. “Today we see improved stress tolerance, more grain production on the plants and we see more reproductive portion of the plant compared to the vegetative portion. We see more grain production within the ear itself.

“One of the bigger advancements on the genetics side over the last 10 years is being able to push plant populations,” Clover adds. “Fortunately, plants overcome the additional stress this puts on them.”

He notes that root structure has changed, as has plant density. Earlier planting dates, plants staying green later in the season and higher yields demand that growers understand what nutrients the crop needs to complete its life cycle and to replenish those nutrients.

Nutrition available longer

Sally Flis, director of agronomy, with The Fertilizer Institute, says multiple advances support genetic achievements.

“Data shows hybrids continue to take up nitrogen later in the season and farmers are adding it as late as the V10 stage,” she says. “Enhanced efficiency fertilizers (EEFs) are used with nitrogen applications in early season to prolong its availability to better match the needs of the crop. EEFs are key to a 4R strategy, but site-specific soil and environmental conditions must be considered to get the most out of them.

“The bigger changes to how we apply nutrients are the way we use EEFs and biostimulant products. In situations of later nitrogen applications, liquid application is most often the choice,” Flis says.

EEFs continue to prove their worth in the field. Greg Binford, Wilbur-Ellis Agribusiness director of advanced agronomy training, says the technology behind EEFs is one of the greater advances the industry has made in the last 10-15 years.

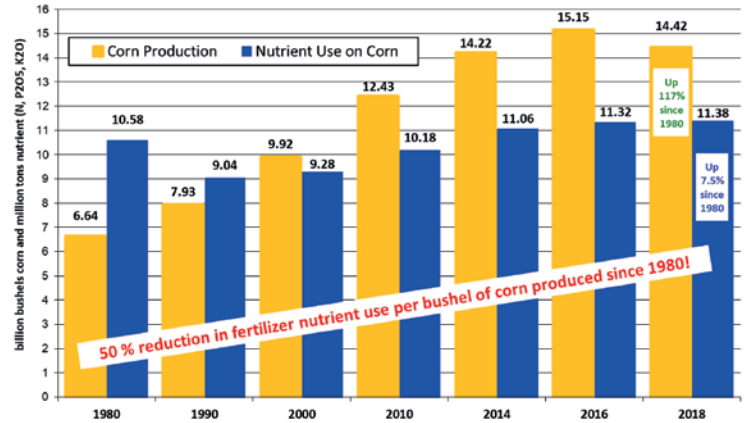
“One of the challenges we have with nutrients is that when we put them into the environment, Mother Nature can wash them off or they can volatilize,” Binford says. “EEFs allow us to protect the fertilizer and ensure that we keep it in the soil, greatly reducing the risk for loss.

“In addition, technology is now available where beneficial soil microbes have been isolated that we can add to other soils,” he adds. “We’ve had clear benefits from applications of these types of materials when we add them to dry or liquid fertilizers. This helps keep the nutrients available for longer periods of time than if the microbes weren’t there.”

Binford says an exciting development is the release of a new humic acid that can be blended with calcium fertilizer blend, a mix that has traditionally been challenging. Field response for the first year for this new technology is exceeding expectations and offers insight into potential new applications or formulations.

Flis’s and Binford’s observations confirm that nutrients need to be available longer than they did years ago. The rest of the industry is aligned with this reality.

Figure 1. US Corn Production and Nutrient Use on Corn - Farmers are using 50% less fertilizer per bushel of corn now than they were in 1980.



Source: Computed by The Fertilizer Institute from data reported by NASS, USDA

“Our goal is to supply the plants with exactly what they need,” Ross Bender, senior agronomist with The Mosaic Company, says. “We understand what plants need, so we now must deliver nutrients and use equipment and fertilizer technologies to supply the plants. Phosphorous, sulphur and zinc are especially important season-long.

“Sulphur has a lot of similarities to nitrogen as far as the plant is concerned, so any technology or tool you can use to make it available longer is helpful,” Bender adds. People will sometimes side-dress it or use sulphur sources in multiple forms, including slow- and fast-release.

“We conduct between 200 and 250 research trials across America every year,” he says. “We observed that plants are responding more to sulphur today than in the past. Because of the higher yield potential, the plants are removing more sulphur from the system and the plants are physiologically different than they were decades ago. Sulphur in any form helps, but if we can find ways to provide season-long availability, the yield responses in trials is strong.”

As one of the secondary macronutrients that includes calcium and magnesium, sulphur is the fourth most-abundant nutrient in corn plants after nitrogen, phosphorous and potassium.

Micronutrients help with today’s hybrids

Bender stresses the importance of addressing soil pH and primary macronutrients, including sulphur, first. However, the importance of micronutrients cannot be overlooked.

“A micronutrient will never fix a major problem, but we are observing strong responses to them when other nutrients are properly addressed,” he says. “If a farmer is employing a comprehensive nutrient management program and frequently addresses items that would detract from yield, a micronutrient that is uniformly distributed, is near the plant root and available all season long will deliver a return on investment.”

In fact, TFI’s Flis says products that combine micronutrients and macronutrients are one of the key innovations the industry has delivered. These products allow for better distribution of micronutrients while making a single application with a product that also provides nitrogen, phosphorous and potassium.

Nutritional balance is important

As vice president of product development and technical services with Nachurs, Tommy Roach is



(top row left to right) Matt Glover, Corteva Agriscience; Greg Binford, Wilbur-Ellis; Lara Moody, The Fertilizer Institute; Sally Flis, The Fertilizer Institute; Ross Bender, Mosaic; (bottom row left to right) Joel Basinger, John Deere; Tommy Roach, Nachurs



Farmers take care of the main fertilizer needs, but there must be total nutritional balance

charged with finding new formulations that deliver increased yield to growers. He accepts the challenges.

“There is continuing focus on how to increase yield from an already high level up to another level,” he says. “New genetics react differently to fertilizer. They need it at a specific time and you have to take into account specific nutrient interactions, such as nitrogen and potassium. We now manage fertility at specific times in the growth cycle of a plant.”

He notes the rapid advancement of the company’s biological research that resulted in a premixed fertilizer and microbial component that remains stable and viable for 18 months.

“One technology that fits in the big picture of nutrition is a potassium-based technology we developed six years ago,” Roach says. “Farmers are good about taking care of nitrogen and phosphorous needs, but you must have nutritional balance. Potassium is the one nutrient that moves everything around in a plant. It functions in water relations and stress tolerance. If potassium is out of balance, you’ve created a situation for the plant not to run as efficiently as it should.

“There is a long list of potassium-containing fertilizers available today,” he adds. “Historically, people think

of potassium as potash, typically of the dry 0-0-60, or murate of potash. It’s not the only source of potassium and now there is more interest in liquid potassium options, which help with nutrient use efficiency via in-furrow, foliar, deep placement, side dressing with UAN and fertigation applications.”

Precision ag data enhances nutrient use

A key component of implementing 4R fertilizer application best management practices is precision agriculture. It also helps farmers develop and maintain critical records.

“We have technologies that deliver precise applications, record this data, then provide it to customers so they can make crop production decisions,” Joel Basinger, production step marketing manager nurture/protect with John Deere, says. “For example, we’re documenting individual nozzles so we deliver the right rate of liquid fertilizer. We can now wirelessly transfer this data through our operations centre to customers’ third-party crop advisors. It is important to note that all data is controlled by customers, who also own it.

“Consider this year for example,” Basinger says. “Some farmers got

nitrogen out early, but with all the rain we’ve had, how much is left in the soil? Once we determine how much is there, we can then figure out how much mid-season nitrogen is needed. We’ll then work with them mid-season to late season and document what we do. This data will be in our operations centre and with farmers’ crop advisors.”

The information flows fast. For example, an agronomist may have written a prescription for nitrogen several weeks ago, but in the meantime six inches of rain fell. Now the agronomist can write a new prescription while the farmer is in the field ready to make that application and instantly transmit this so the farmer applies the new, correct amount.

“Technology lets us speed up farmers’ ability to make changes as conditions warrant,” Basinger says. “A healthy crop is more resistant to insects, fungi and related stresses. If growers can deliver fertilizer and other nutrients when needed, it will help keep the crop healthy to produce the best yield possible.”

Flis agrees. She says the ability for farmers and consultants to collect data on minute levels in soils, yields and nutrient applications, leads to

improved management and decision making for precise placement of nutrients seeds and observation practices.

Basic practices complement innovation

The techniques of sound nutrient management may evolve with innovations, but its foundation remains solid.

“The 4R Nutrient Stewardship framework is designed for continuous improvement,” Flis says. “Decisions for the right source, rate, time and place will change as available products, environmental conditions, software and equipment change year to year. Better sustainability, economic and environmental efficiencies continue


to drive farmers and consultants to continually evaluate the performance of management practices.

Much of industry innovation comes from new ideas intended to solve existing and emerging challenges and opportunities. Lara Moody, TFI vice president of stewardship and sustainability, says farmers, consultants and companies are moving forward with breakneck speed.

“When innovating, it is important to be informed about new policy, new research and evolving trends,” she says. “One role of organizations such as TFI is to provide members opportunities to learn and be exposed to actions that affect our industry. Through our weekly communications to conferences and meetings for networking and discussion, our goal is to support members as they create improve ways to nourish plants and soil.” ■


TFI presents: The InfoAg Conference 2019


Information exchange and education of industry members and crop advisors are key to helping growers improve nutrient stewardship on farms. To help achieve this, The Fertilizer Institute (TFI) is presenting The InfoAg Conference 23-25 July at Union Station, St. Louis, Missouri, USA. A complete schedule is available at www.infoag.org.




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Achieving water reduction and yield increases in California drought conditions

by Brad Klepac, Agricultural Water Market Development Leader, U.S. Water, USA

In the agriculture industry, it is often said that every drop matters. That mantra has never been truer than during recent drought conditions in the Western United States and especially in California. In the

Central Valley, water is an essential component in crop production. The pressures of drought, on top of the ever-increasing usage regulations and environmental stewardship initiatives, create strife throughout

the agricultural community. Now more than ever, growers need to be in tune with how to best manage their irrigation systems. Irrigation maintenance programs must be efficient, effective and cost-conscious to ensure the crops are getting the right amount of water and fertilizer, at the right time, at the right pressure.

Distribution uniformity is a measurement of how evenly water is distributed from the source, through the irrigation system, to the crop. Poor distribution uniformity can result in irregular crop growth - some plants are over watered while others are under watered. A well-maintained irrigation system preserves water quality and ensures uniform water and fertilizer application throughout the field to produce a quality yield.

There have been numerous studies over the years that have established a direct link between low distribution uniformity (DU) rates and yield loss. DU is comprised of several components, including pressure differences, unequal drainage, unequal application rates, and other causes (such as wear and tear, or plugging). When an irrigation system applies water at a high DU rate (which is expressed as a percentage), it is possible to achieve a high irrigation efficiency, and subsequently, a higher

Poor distribution uniformity can result in irregular crop growth



Working with an experienced water management partner to optimize water usage in irrigation systems ensures the proper delivery of water and inputs.



If iron is present in the system it can oxidize quickly and become a hard to remove layer of rust

yield. While no irrigation system will perfectly apply water uniformly across a field, the gold standard is 85% and higher.

Irrigation management

Under drought conditions, when water supplies may be limited, growers must find ways to make sure their various DUs across different fields are as high as possible. That is no time to discover plugged lines and emitters are negatively affecting DU. Growers who stay on top of their systems with a well thought out water management plan will most certainly be ahead of the game. That includes being aware of the other factors that may contribute to lower DU rates.

Mineral build-ups and biofilm growth within an irrigation system can restrict water flow and threaten the health of a crop. Excessive calcium and magnesium leads to a hard scale in and on system emitters, similar to the hard scale that forms on home faucets and showerheads, restricting flow. If iron is present in the system it can oxidize quickly and become a hard to remove layer of rust, reducing water output from the emitter. Furthermore, if suspended solids such as silt and sand get through filter media, emitter plugging may also occur.

Biofilm is the result of organic bacteria, fungi or algae growth in the source water, reservoir or irrigation system. As biofilm quickly multiplies,





In-field water testing and on-site field evaluations of emitter devices can determine the presence of organic and inorganic properties in the water that can cause plugging issues that impact flow uniformity. Immediate treatment of flow restriction issues ensure both water and fertilizer are distributed evenly to crops for efficient and cost-effective water use.



Drip irrigated almond orchard thriving with well-maintained water treatment programme

If organic or inorganic properties are present in the water, treatment plans can be implemented

can be very expensive. On-site field evaluations of emitter devices and in-field water testing can detect potential plugging issues or identify the cause of any current distribution variations. If organic or inorganic properties are present in the water, chemical treatment clean-out plans can be implemented to bring systems back to like-new condition.

Partnerships

Once the irrigation system is back in prime condition, the best way to ensure a consistently high DU is by implementing an ongoing water

treatment plan. Historically, irrigation water treatment has consisted of chlorine as a disinfectant and acid as a cleaner. However, better chemistry is available and should definitely be considered based on source water conditions. For instance, a blend of hydrogen peroxide and phosphonate will do a much better job of keeping lines and emitters from fouling. There are also a variety of other chemical treatments to improve well conditions, reduce algae in reservoirs and maintain an overall clean distribution system.

In an industry where water use can drive up costs and impact



It is important to stay ahead of problems, particularly during drought conditions

yields, growers need a partner that understands the process. U.S. Water’s agricultural team helps growers achieve maximum design efficiency of their irrigation system, ensuring the proper delivery of water and inputs to the crop.

Especially during drought conditions, it is important to stay ahead of problems by performing comprehensive system analyses such as water testing, irrigation flow uniformity evaluations, field studies and irrigation equipment



inspections. State-of-the-art automation and monitoring capabilities allow for real-time monitoring and alarming so any flow issues can be mitigated immediately, and regularly scheduled service visits verify and validate the effectiveness of the overall water treatment program. ■

Contact U.S. Water to learn how its agricultural water products and services can help ensure both water and fertilizer are uniformly distributed to crops for efficient, cost-effective water use and enhanced yield potential. www.uswaterservices.com

The role of value-added fertilizers in driving sustainability

by **Hugh MacGillivray**, Chief Commercial Officer, Anuvia Plant Nutrients, USA

The earth's population is expected to reach 10 bn by 2050 which means large scale farming has the onerous task of feeding our increasingly crowded planet from a finite amount of land. Furthermore, this needs to be achieved while simultaneously reducing the environmental impact of modern agricultural practices.

While modern farming practices have brought about unparalleled food quality and quantity, some of these practices have put increasing stress on the land, the air and our waterways.

Farmers are on the front line to meet these challenges, but consumers and retailers have become a formidable force driving change and demanding more sustainably produced products. Field to Market CEO Rod Snyder explains that consumer-facing brands are developing upstream relationships with farmers in their supply chain. He points out that many companies set specific sustainability targets or commitments. These range from goals such as 100% sustainably-sourced ingredients to some percentage

“Over the last 150 years, we have already lost half of the world's top soil”

reduction in greenhouse emissions to water quality improvements. The industry is responding. New technologies and practices that support farmers, who are focused on profitable and sustainable crop production now and in the future, are available and being adopted.

Rooted in the soil

According to the World Wildlife Federation, over the last 150 years, we have already lost half of the world's top soil and there is a risk of losing more if we fail to curb the degradation. Given that 95% of our food comes from soil, this issue must take centre stage for the agricultural industry in the years ahead.

Revitalizing our soil requires implementing sustainable practices that not only mitigate farming demands on the environment, but also promotes soil health. All this need to be addressed while taking an approach that allows farmers to increase crop yield using less resources. It is no simple feat, but the reasons for change are compelling:

- The ecological and financial impact from losing nutrients into the environment
- The degradation of soil quality resulting from farming
- Agriculture's significant contribution to greenhouse gas emissions
- Rapid global population growth

The sustainability issue can be daunting and complicated. The



(left) Farmers are adopting sustainable practices to protect the land for future generations; (above) Anuvia's manufacturing facility in Zellwood, Florida is a fully automated closed loop system

perception is that sustainable practices are difficult to implement. However, many farmers have practicing this for decades, if not generations, and forward-thinking growers continue to find new ways to preserve and protect their land and the environment. These approaches address the immediate economic needs, and protect soil, air and water.

One practical approach to help farmers meet production and environmental goals that has begun to gain traction is the use of sustainable bio-based fertilization strategies. Considered a key contributor to soil health, plant nutrition and crop yield, innovative fertilizer technology is garnering new attention among farmers and farm supply retailers.

Dr. Jerry Hatfield, USDA Agricultural Research Station, Iowa, helps farmers put sustainability in perspective. A climatologist who advocates improving nutrient efficiency and soil health, says farmers can rapidly change soils as they grow crops under

a system that uses cover crops, diverse rotations, less tillage and bio-based nutrients. This is about changing aggregate soil structure within the first year allowing the cycling of nutrients throughout the growing season, so they remain available during the crops reproductive period to help improve yield. Hatfield reminds farmers that this is not a decade process – it is a yearly process and it is cumulative.

Improving fertilizer efficiency

Nitrogen, phosphorus, potassium and sulphur are the essential macro-nutrients for healthy plant growth and productivity. Unfortunately, often nutrients from conventional fertilizers are not efficiently used by growing plants and are lost through volatilization or leaching. This loss of nutrition not only results in loss value, but it translates into risk of run off into lakes, streams and rivers, causing de-oxygenation of the water and harming aquatic ecosystems.

Nitrogen in many situations is not efficiently used by the growing plant, but prior to use volatilizes into the air in the form of greenhouse gases. These gases contribute to agriculture's greenhouse gas footprint. Looking for strategies to reduce these losses is an important focus for the industry.

The catalyst for sustainable practices

The stimulus for agriculture's move towards sustainability comes from both external pressures and internal. Most notable among these outside influences perhaps is the increasing demand from consumers that food producers implement eco-conscious practices. Their purchase decisions increasingly reflect a desire for food produced using environmentally-friendly production practices, forcing the supply chain to take note. Food retailers such as Walmart, as well as food companies such as Unilever and General Mills, are responding by seeking out food ingredients that are



(above) Sustainable practices are growing as industry responds to the market demands; (below) SymTRX was applied to these rice research plots in Arkansas. At harvest, yield checks indicated an increase of 7.1 bu/acre when substituted for urea or ammonium sulphate. More than 81% of Anuvia's rice trials reported a positive net income over the last three years.



“It is a true industry effort, with organizations from all corners of agriculture looking to find solutions

sustainably sourced and this translates down to the farm.

Other external influences include non-government organizations such as the Environmental Defense Fund who recently partnered with Walmart to set aggressive greenhouse gas reduction goals. One of the avenues they have taken is to help educate farmers about how they can realize a positive economic return by implementing more sustainable practices.

It is a true industry effort, with organizations from all corners of agriculture coming together to find solutions. Industry organizations such as Field to Market, The Soil Health Institute and the Soil Health

Partnership are working with farmers to implement sustainable practices such as cover crops, no-till and innovative fertilizer technologies. These diverse groups have common goals and promote sustainable food production.

Formula for moving forward

The Fertilizer Institute (TFI), the voice of the fertilizer industry, notes that successful agriculture begins even before the first seed is planted. They advocate environmental stewardship measures that protect air and water as well as nutrient management practices that reduce nutrient losses

to the environment while increasing availability to the plant.

The use of enhanced efficiency fertilizers is a good method to accomplish this goal by slowing the release of nutrients or altering nutrient conversion to other forms less susceptible to loss. TFI's sensible and practical 4R Nutrient Stewardship programme – using the right nutrient source at the right rate at the right time in the right place – is embraced by industry partners who promote fertilizer best management practices.

Keep it simple

Farming is complex. With technological advances in every realm, farmers are faced with daunting decisions that affect every facet of their livelihood. For most, their future hangs on the next

harvest, not the next generation of farmers who may face diminished resources if measures are not put in place today. Any advances in fertilizer technology must be easily adaptable to existing equipment and practices if they are going to be adopted by agriculture professionals.

Our global community does not have long to prepare for the dramatic increase in population that we are facing. While many forward-thinking farmers have moved to more sustainable practices and realize benefits on both their bottom-line and their future, there is much work to be done. As the path to sustainable farming becomes clearer, with economic benefits proven in both the short and long term, adoption is inevitable. It is a significant development in the world of farming and one that could have a profound impact on generations to come. ■

Technology for an abundant tomorrow

Anuvia Plant Nutrients manufactures enhanced efficiency fertilizers to drive sustainability at the farm level. Their bio-based technology delivers a positive yield benefit, feeds the soil and contributes to reducing agriculture's carbon footprint. Advantages include:

- Increased nutrient efficiency
- Improved soil health
- Reduced nutrient loss
- Reduced greenhouse gas emissions

This plug and play technology works as a complement, or an alternative, to conventional fertilizers. For every million acres that receives an application, Anuvia's technology will reduce greenhouse gas emissions by the equivalent of removing 20,000-30,000 cars from the road. While having important environmental benefits, this technology also recycles nutrients and organic matter contributing to healthier soils.



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Acron and Ultramar sign transhipment agreement

Acron Group and logistics company Ultramar have signed a long-term agreement to tranship over 1.2 mn tpy of mineral fertilizers.

The two companies also executed a lease agreement for four warehouses in the Russian port of Ust-Luga with a capacity of approximately 140 000 t of mineral fertilizers, scheduled for commissioning in the 2H21.

Chairman of Acron's Board of Directors Alexander Popov commented, "Acron Group continues to steadily develop its export potential around the world. Co-operation with Ultramar is in line with Acron's strategy to redirect transhipment of our product flows to Russian ports, which will help increase the Group's contribution to the Russian economy and ensure reliable supplies to our customers."

Under its redirection strategy, last year Acron Group started to tranship its products through Murmansk Bulk Terminal, owned by EuroChem, and signed a long-term agreement on mineral fertilizer transhipment with European Sulfur Terminal, which owns a modern transhipment complex at the Ust-Luga commercial seaport.

Ultramar's CEO Andrey Bonch-Bruyevich said: "Ultramar is implementing a large-scale project to construct a new 12 mn t mineral fertilizer transhipment terminal in Ust-Luga port. Once commissioned, this terminal will eliminate the shortage of port transhipment capacity in the Russian northwest, provide conditions for redirecting all Russian fertilizer cargos to Russian ports, create new jobs, and put fresh energy into economic development in Leningrad region. We believe that the terminal's maritime infrastructure (the length, draft and loading standards of accommodated vessels)

will help shippers save significantly on freight and efficiently participate in global trade. We are glad that the long-standing co-operation with Acron Group, a sustainably developing Russian producer, has transformed into an agreement that is important for the implementation of our project and in line with the long-term programme to develop Russian ports. We thank Acron Group for working with us and hope that our co-operation on the new project will create opportunities to increase Acron's export sales using our terminal. We will do our best to successfully implement these plans".

Safety firmly on the radar at Northfleet

A new, GBP1.1 mn radar tower, to guide ships up and down the tidal River Thames, UK, has been unveiled by the Port of London Authority (PLA) at Northfleet, near Gravesend in Kent.

FREIGHT RATES

POTASH	Price type	Units	Timing	Low	High	Date
Dry potash Vancouver - China 60-65kt	outright	USD/t	prompt	18	21	19-Jun-19
Dry potash Red Sea - WC India 25-30kt	outright	USD/t	prompt	15	17	19-Jun-19
Dry potash Baltic Sea - Brazil 30-40kt	outright	USD/t	prompt	17	20	19-Jun-19
Dry potash Baltic Sea - SE Asia 25-30kt	outright	USD/t	prompt	51	53	19-Jun-19
Dry potash Vancouver - SE Asia 25-30kt	outright	USD/t	prompt	34	36	19-Jun-19
Dry potash Baltic Sea - China 60-65kt	outright	USD/t	prompt	36	37	19-Jun-19
Dry potash Baltic Sea - US Nola 50-55kt	outright	USD/t	prompt	15	17	19-Jun-19
Dry potash Vancouver - Brazil 30-35kt	outright	USD/t	prompt	28	30	19-Jun-19
Dry potash Hamburg - Brazil 30-35kt	outright	USD/t	prompt	16	18	19-Jun-19

NPK	Price type	Units	Timing	Low	High	Latest	Change*	Date
Baltic-China 50-60kt	outright	USD/t	prompt	37	39	38	1.5	13-Jun-19
Morocco-WC Africa 15-20kt	outright	USD/t	prompt	27	29	28	3	13-Jun-19
Norway-Brazil 20-25kt	outright	USD/t	prompt	20	22	21	0	13-Jun-19

*from previous week

SULPHUR	Units	Low	High	Date
50-60kt – Vancouver-China	US\$/t	18	20	20-Jun-19
Below all 30-35kt				
Mid East – EC India	US\$/t	14	16	20-Jun-19
Mid east – North/River China	US\$/t	20	22	20-Jun-19
Mid East – South China	US\$/t	18	20	20-Jun-19
Mid East – Brazil	US\$/t	18	20	20-Jun-19
Mid East – North Africa	US\$/t	19	21	20-Jun-19
Black Sea – North Africa	US\$/t	25	27	20-Jun-19
Black Sea – Brazil	US\$/t	25	27	20-Jun-19
Baltic – Brazil	US\$/t	21	23	20-Jun-19
Baltic – North Africa	US\$/t	21	23	20-Jun-19
35-40kt – US Gulf - Brazil	US\$/t	13	15	20-Jun-19

Overlooking a particularly busy stretch of the river, the 49-metre high structure is topped by a state-of-the-art radar scanner and houses the latest low-energy navigational lights, CCTV and telecommunications technology.

It's part of an 18-strong network of PLA radars that operate day and night to help vessels navigate their way in and out of the UK's second biggest port – from cruise and container

ships, to recreational boats of all shapes and sizes.

The facility is close to the new port infrastructure, Tilbury2, being developed by Forth Ports in Essex.

In 2018 freight handled at terminals on the river reached a ten-year high of 53.2 t. The target in the long-term development plan for the river, the Thames Vision, is for this to rise to up to 80 mn t by 2035.

Robin Mortimer, PLA chief executive, said: "This project is a classic example of the largely hidden investment we make to keep the river operating effectively day in, day out.

"It's key to the long-term vision for the tidal Thames, keeping both our customers and the public at large safe when they are out on the river."

The construction of the mast was overseen by Nick Jordan, one of the

company’s youngest engineers. Nick, from Canterbury, joined the PLA five years ago after graduating in civil engineering from the University of South Wales in Cardiff.

Konecranes celebrate 2,000th Gottwald Mobile Harbour Crane

The 2,000th Konecranes Gottwald Mobile Harbour Crane was inaugurated in a formal ceremony at the Ership terminal in the Mediterranean port of Cartagena in southeastern Spain.

The crane is Ership’s new eco-efficient Konecranes Gottwald Model 6 mobile harbour crane, in the G HMK 6407 B four-rope variant. They will use it mainly for continuous-duty bulk handling, and also for general and project cargo up to 100 tons.

Attended by representatives of Ership, Konecranes and other interested parties, the inauguration event was a celebration of mutual achievement. The popularity of Konecranes Gottwald mobile harbour cranes is a result of the success of their customers and strong, lasting customer relationships. A good example of this is the relationship with Ership.

With roots going back more than 100 years, Ership offers a wide range of shipping services in more than 40 international ports. Some 20 years ago, they purchased their first Konecranes Gottwald mobile harbour crane. Since then, they’ve bought over 20 cranes in total, a success story for both Ership and Konecranes.

Gonzalo Alvargonzález, CEO of Ership, is very satisfied with Konecranes Gottwald mobile harbour cranes. “These are very reliable cranes,” he explains. “They are very high-performance and extremely solid. That helps us to serve our customers, who expect their cargo to be unloaded quickly. Time is a very important factor in our work. So, the faster a ship is unloaded, being careful with the cargo, the better.”

It’s success stories like this that illustrate what has kept Konecranes going in the 63 years since it invented the mobile harbour crane. Since then, increases in cargo handling rates, technological developments and strengthening customer demands have shaped the market. Konecranes has introduced many innovations, including this four-rope variant, and sold over 300 units of the versatile Model 6 crane, its bestselling model. In total, Konecranes Gottwald mobile harbour cranes have been sold to more than 100 countries. Number 2,000 is a milestone worth remembering.

“Our mobile harbour cranes offer added value for customers and the port industry,” says Heribert Barlage, Senior Vice President for Konecranes Mobile Harbour Cranes. “The 2,000th crane is a sign of our commitment to both. But just like every other important milestone we reach, this one is also an incentive for us to constantly develop our cranes and in so doing, make them fit for the future.”

Armada of barges cleared for Mississippi River shipments after floods

The upper Mississippi River has reopened to barge traffic as vessels were cleared to ship through St. Louis harbour, the U.S. Coast Guard (USCG) has said. The situation quickly became a logistics nightmare as dozens of towboats and hundreds of delayed barges tried to manoeuvre upriver.

After what many grain shippers have called the worst river flooding ever in terms of timing, breadth and duration, the vessels may finally be able to reach elevators in the heart of the U.S. farm belt to haul away export-bound corn and soybeans.

But the economic pain of this year's floods on farmers, barge operators and grain traders like Archer Daniels Midland Co, Bunge Ltd and Cargill Inc will likely continue.

The Mississippi River, which transports 60% of all export-bound U.S. corn and soybeans to terminals near the Gulf Coast, has not been fully navigable since November due to winter closures in the north and widespread flooding this spring.

Shippers have moved some grain to port by rail, shipped it to domestic users by truck or simply left crops in storage and dropped prices offered to farmers.

Shipping delays were the latest hit to a reeling U.S. agricultural sector, already clobbered by slumping farm incomes, delayed spring planting and reduced exports due to the U.S.-China trade war.

Petty Officer Brandon Giles said the Coast Guard lifted its ban on northbound shipping through St. Louis harbour on Friday morning, allowing vessels to transit the busy port for the first time since a brief shipping window opened for a week and then closed a month ago.

Giles had no estimate as to when southbound traffic will resume. Barge shippers said southbound vessels may be cleared as soon as Saturday.

An armada of at least 50 towboats, each pushing multiple barges, was already converging on St. Louis harbour, a barge broker said. The vessels may experience lengthy delays at upriver locks that have also only recently reopened from flood closures.

Shipping restrictions due to strong currents and river-bottom obstructions from flooding were likely to remain in place for the foreseeable future.

Avenues to set up fertilizer storage facilities in Jammu and Kashmir will be explored

Indian Union Minister Mansukh Mandaviya Sunday has said that avenues will be explored to set up storage facility for fertilizers for

creating buffer stock and ensure availability during peak season in Jammu and Kashmir.

Mandaviya was also apprised of the problems being faced in the fertilizer movement in the state, and the need for augmenting current infrastructure, including requirement of additional rake points.

He asked the fertilizer supplying companies to ensure timely stocking of fertilizers, particularly in the valley in view of the closure of JammuSrinagar National Highway during winter and inclement weather conditions.

The State Agriculture Production Department officials and fertilizer supplying companies were asked to adhere to the guidelines and deadlines to bring transparency in the fertilizer business and to ensure timely supply of quality fertilizers to the farmers.

He pitched for monitoring the correct data entry regarding fertilizer stocks and sale records by the wholesalers and retailers in their respective areas.

Stressing on the importance of inculcating sustainable and organic agricultural practices in farmers, the minister said indiscriminate and injudicious use of chemical fertilizers is harmful for health.

Mandaviya asked the department to actively promote use of organic/bio-fertilizers in the state, and directed them to engage with agriculture experts to identify sustainable ways for adoption of need-based technology in farm sector.

ADNOC partners with OCI to form fertilizer powerhouse

The Abu Dhabi National Oil Company (ADNOC) and the Netherlands-based OCI, a producer and distributor of natural gas-based fertilizers and chemicals, are joining forces.

The new joint venture will create the world’s largest exporter of nitrogen fertilizer, as well as the largest producer

NITROGEN		Units	Low	High	Date
Middle East - US Gulf	45kt	US\$/t	23	24	13-Jun-19
Middle East - Thailand	30kt	US\$/t	19	20	13-Jun-19
Middle East - Brazil	40kt	US\$/t	17	18	13-Jun-19
Baltic - Brazil	30kt	US\$/t	20	21	13-Jun-19
China - India	60kt	US\$/t	12	13	13-Jun-19
Algeria - Brazil	30kt	US\$/t	14	15	13-Jun-19
Algeria - French bay	12kt	US\$/t	12	14	13-Jun-19
Baltic - EC Mexico	30kt	US\$/t	25	26	13-Jun-19
Baltic - WC Mexico	25kt	US\$/t	37	38	13-Jun-19

PHOSPHATES		Units	Low	High	Date
Morocco – Brazil	30kt	US\$/t	13	15	13-Jun-19
Tampa – Brazil	30kt	US\$/t	20	22	13-Jun-19
Baltic – Brazil	30kt	US\$/t	21	23	13-Jun-19
KSA – EC India	30kt	US\$/t	14	16	13-Jun-19

AMMONIA	Units	Low	High	Date
Yuzhny - NW Europe, 23kt	US\$/t	50	56	21-Jun-19
Yuzhny - Morocco , 23kt	US\$/t	40	45	21-Jun-19
Ras al Khair - South Korea, 23kt	US\$/t	63	73	21-Jun-19
Ras al Khair - WC India, 23kt	US\$/t	30	39	21-Jun-19
Ras al Khair - EC India, 23kt	US\$/t	36	46	21-Jun-19
Point Lisas - East Asia, 23kt	US\$/t	90	100	21-Jun-19
Point Lisas - US Gulf, 23kt	US\$/t	36	46	21-Jun-19
Point Lisas - NW Europe, 23kt	US\$/t	45	58	21-Jun-19
Bontang - East Asia , 23kt	US\$/t	38	53	21-Jun-19

in the Middle East and North Africa region.

Speaking to CNBC’s Hadley Gamble in Abu Dhabi, OCI CEO and Egyptian billionaire Nassef Sawiris pointed to consolidation as a key strategy for improving returns.

“This is an industry that is not very proud that we can’t achieve high single-digits return on capital employed. We have to do something to improve the returns and one is consolidate our various manufacturing platforms, pool them together and be able to serve our customers along multiple geographic regions,” he said.

The joint venture aims to expand the companies’ market share and the diversity of its Middle Eastern and African production channels.

“ADNOC is very well positioned to serve the Asian market, our assets in Egypt are well-positioned to serve East Africa as well as Eastern Europe, our assets in Algeria are incredibly close to the Western European markets as well as Latin America,” the CEO added. “So this platform will be unique in terms of its ability to deliver to our customers the products in a timely manner and in a cost-efficient way in terms of mitigating freight costs.” ■

Multi-functional boron in fertilizer granulation

An innovative approach to incorporate micronutrients

by **Dr Igan Hayati**, Technical Director, Kemitel, UK

Boron as an essential micronutrient for plant growth and economical yield in agriculture is well known the world over. Gone are the days when agronomists had to preach the multiple benefits that boron brings the farmer in his pursuit of positive economic returns from agriculture production. Today the knowledgeable farmer demands fertilizer compositions that include the micronutrients his fields and crops need, boron among them. It demands that these micronutrients should be evenly distributed, which has until now been a challenge for production managers of fertilizer plants.

Managers know the different forms of borates used in agriculture, from the very soluble products which are specifically designed for foliar applications, to the standard borate products, typically powders used for granular fertilizer addition. These powder products have been refined by crystallisation from natural minerals such as tincal and kernite. They include borax decahydrate, borax pentahydrate, anhydrous borax and boric acid. Other borate minerals are also commonly used for fertilizer applications such as

“Compacted or granulated borate products are commonly used for bulk blending with NPK fertilizers

ulexite and colemanite. These contain calcium and are not as soluble as the refined borates, but are sometimes used in the belief that they deliver a slow release of boron. This, however, has proven incorrect, as a large percentage of the boron applied stays locked in the soil and is consequently not available to the plant. Compacted or granulated borate products are also available on the market, commonly used for bulk blending with NPK fertilizers, and use borax pentahydrate as their boron source.

Methods of incorporating boron are not always ideal

There are two methods for incorporating boron into a complex fertilizer. The first is by bulk blending,

the second is in compounding. In blending, a granulated boron product is mixed with other fertilizer nutrient granulates. Since the amount of micronutrient boron added to the fertilizer is very small, obtaining an evenly distributed mix within the fertilizer is quite a challenge, even with the most sophisticated of mixing equipment. As an example, taking a typical NPK formulation containing 0.03%B would be equivalent to mixing a 50 kg bag of a borate product with a 25 t road tanker of fertilizer. It is near impossible to achieve an evenly distributed mix of the borate granules throughout the bulk of the fertilizer. In some countries, notably Brazil, specific legislation seeks to address this problem by mandating a minimum quantity of micronutrient per t of fertilizer.

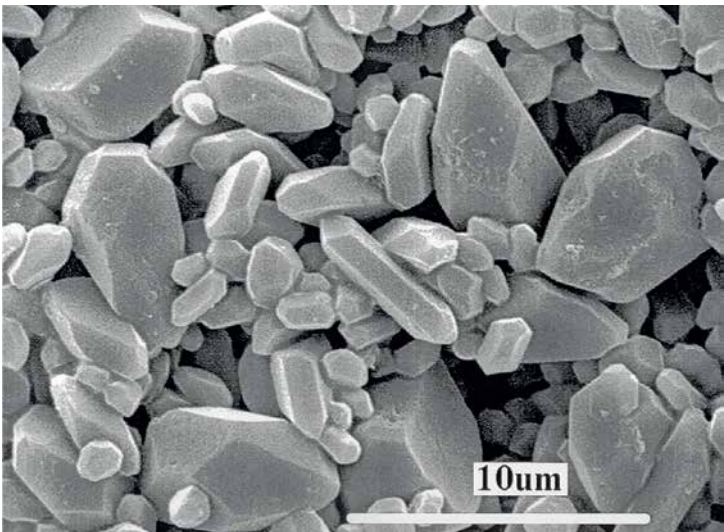


Figure 1. Suspension of micronized particles (<10um)

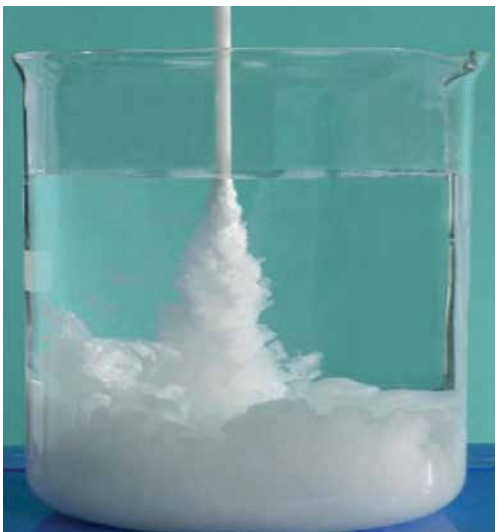


Figure 2. Highly soluble and reactive suspension

In addition to the problem of poor mixing, there is always the potential problem of segregation of the boron from the fertilizer. This separation and de-mixing of the borate granules occurs if the granule size, shape and density are different from the bulk of the fertilizer. The poor homogeneity of the boron in the fertilizer has severe consequences when the fertilizer is applied in the field, as some parts of the field will receive no or very little boron while other parts will receive an excessive amount which might be damaging to the crop if it exceeds the toxic boron level for the plant.

The second method of incorporating boron into the fertilizer involves the mixing of a borate powder and other micronutrients with the fertilizer powder before granulating the mix to form a compounded granular product. In this process a binder is sprayed onto the powders required to produce the granules during the intensive mixing stage in the granulator. The formed granules are then dried and screened to the required granule size. There is no risk of segregation of the micronutrient in this method, and for this reason compounded granules command a premium over blended products. However, in this case also, a very small amount of the borate powder is still mixed with a large amount of the fertilizer powder, and this could also lead to poor mixing of the powders during

“Boron is a reactive element and can react with almost all of the component elements in fertilizers

granulation, with some granules containing no boron while others have an excessive amount. In certain fertilizer formulations, the addition of boron powder during granulation can lead to processing problems because the granulation process becomes unstable. This is often experienced when boron addition levels exceed 0.1%B in the final product formulation. The causes of this problem arise from the chemical reactions taking place between boron and the fertilizer powder during granulation.

Reactivity of boron during granulation

Boron is a reactive element and can react with almost all the component elements within fertilizers. Boron reacts with potassium to form potassium borate, it reacts with ammonia to form ammonium borate, with phosphate to produce a boro-phosphate. Boron also reacts with some secondary nutrients such as

calcium to produce calcium borate and with magnesium to produce magnesium borate. These reactions are accelerated at the elevated temperatures usually experienced during granulation and drying.

This reactivity is the main reason for the destabilising effect observed when boron is added to a fertilizer formulation during granulation at higher concentrations. The chemical reaction between the boron and the other fertilizer components can generate water which dissolves the borate resulting in a sticky mass of product which agglomerates the fertilizer powder and the partly formed granules in an uncontrollable manner. Plant shutdown and cleaning is required when such a problem occurs. For this reason, the addition of boron is usually limited during granulation to 0.1%B when using refined borates. Alternatively, a less soluble and less reactive borate mineral is used which might not be the ideal product of choice.

“One advantage of using borate liquid as a binder is that the granules produced have good anti-caking properties

Improved granule hardness

The reactivity of boron which can be a disadvantage during granulation with fertilizer powders, can be turned into an advantage if used in a controlled way. Adding boron in a liquid form either as an aqueous solution or suspension can be used to achieve this turn-around.

In liquid form, boron becomes more reactive with the various component elements within the fertilizer and forms micro-crystalline chemical bonds between the fertilizer particles which will harden upon drying at high temperatures. As a result, very strong granules are obtained which are less prone to degradation and attrition during handling. These granules are readily soluble and dispersible because the borate compounds produced are themselves very soluble. This reactive bonding effect eliminates the need to use a binder to produce the granules since the boron liquid itself acts as a binder. To ensure that the borate suspension is highly reactive and soluble, it is important that it consists of extremely fine micronized particles <10um in size (see figures 1 and 2).

Boron properties

Another advantage of using borate liquid as a binder is that the fertilizer granules produced have very good anti-caking and storage stability properties, a major problem facing

fertilizer suppliers. The lower caking tendency is mainly due to the lower hygroscopicity and higher stability of the borate-based molecules that are formed as a result of the reaction between the borates and the other fertilizer elements during granulation.

Crucially, spraying the boron liquid onto the fertilizer powders during granulation, will also ensure that the boron is homogeneously distributed within the fertilizer granules. The amount of solution or suspension used will depend on the boron level required in the final product. The borate level could range from 0.01-1.0%B – far higher than hitherto. At low levels (0.01%B), spraying a borate solution will ensure even distribution of the boron. At high levels (up to 1.0%B), the controlled spraying of the borate suspension will ensure that no processing problems are encountered. The concentration and viscosity of the borate suspension can be adjusted by dilution with water. And beyond this, the boron suspension can additionally act as a carrier for other micronutrients such as zinc, manganese, selenium, and molybdenum. As a result, these micronutrients can also be homogeneously distributed within the granule.

An alternative method of incorporating the borate liquid is to spray it onto already formed fertilizer granules just prior to drying. Again, this method will ensure that all the

granules will receive an equal loading of the required amount of boron. The granules will also be stronger and less dusty due to the boron reactions taking place on the granule's surface.

Achievements from incorporating boron and other micronutrients

The use of the borate liquid addresses the three major problems that are faced by fertilizer suppliers: segregation, degradation and caking. Depending on the specific fertilizer formulation, the feedstock powders and the granulation process involved, borate suspensions or solutions of various strengths and compositions can be used as granulating or coating agents to produce fertilizer granules with the following benefits:

- Homogenous incorporation of boron and other micronutrients
- Flexibility in boron content ranging from 0.01-1.0%B
- Strong granules with crushing strength ~70N
- Granules which readily disperse and dissolve in the soil
- Non-dusty granules
- Elimination of the binding agent
- Reduction or elimination of the use of anti-caking agent

Several granular products with the above properties have been produced by granulating or coating NPK and potassium-based fertilizer powders with this multi-functional borate suspension. ■

Conference review:
Summit of the Organic Fertiliser Industry in Europe (SOFIE)

The SOFIE summit in June 2019 brought together, for the first time ever, the European carbon-based fertilizer sector. The meeting was organised by the European Sustainable Phosphorus Platform (ESPP) in partnership with the International Fertiliser Society (IFS).

As well as market and agronomic opportunities, the meeting addressed the implications for the organic fertilizers sector of the new EU Fertilizing Products Regulation. This regulation is now formally adopted (expected to be published before end June 2019) and will cover mineral, organic and organo-mineral fertilizers, soil improvers, growing media, biostimulants and liming materials.

Opening up the single market

The European Commission (Johanna Bernsel and Theodora Nikolakopoulou, DG GROW) explained that this new EU Fertilizing Products Regulation will radically restructure the carbon-based fertilizers and soil amendments markets in Europe, by opening up the entire EU market for products bearing the CE mark as evidence of complying with the EU criteria. Even if derived from waste or animal by-products, the CE marked products will be able to be sold freely across the entire EU without further regulatory restrictions under national fertilizer rules or waste or animal by-product rules. This will mark a big change compared with

today, where organic fertilizers have to face a plethora of different national regulations. Furthermore, it will be a big opportunity for processing technology providers possessing the know-how how to comply with the new EU rules.

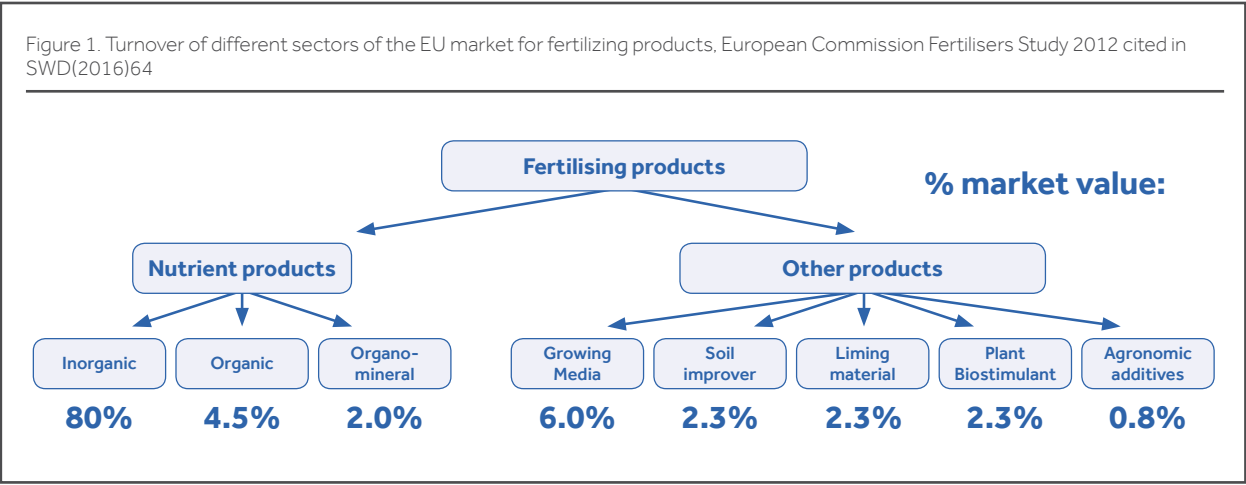
This first SOFIE summit attracted over 125 participants, from industry, regulators, stakeholders and R&D, covering 14 European countries, as well as India and North America.

Presentations and stands included industry federations, agronomists and experts, R&D and recycling technology providers.

SOFIE sessions addressed:

- Industry and markets: examples of companies with new products, providing added value to farmers, export growth, circular economy for nutrients and organic carbon
- Agronomic evidence: scientific knowledge of how carbon-based amendments impact soil health, the environment and crop yields

“New regulations will restructure carbon-based fertilizer market



About the author

Dr Igan Hayati has been the Technical Director of Kemitel since 2009, a consultancy company offering services for the chemical industry. After obtaining his degree and then Ph.D. from Imperial College in chemical engineering, he joined ICL and worked in the research department for three years. He later joined Rio Tinto for the next 19 years focussing on the development of new products for the borate and potash industries. These new products included soluble micro-granules, compacted granules and liquid suspensions for the micronutrient and fertilizer industries. He is the author of several publications and patents. He is based in the UK and can be contacted at: igan@kemitel.com

- Opportunities and challenges for industry from developments in European regulations, in particular the future CE-Mark for organic fertilizers under the new EU Fertilizing Products Regulation.

Organic fertilizers - products and markets

Presentations demonstrated that the organic and organo-mineral fertilizer industry is both innovative and open, with a range of different types of product delivered to farmers. Organic fertilizer products are linked to related sectors such as biostimulants, growing media, composts, digestates and liming materials.

The carbon-based fertilizer industry covers a continuum of markets from

stabilised by-products (manures, composts, digestates, food industry wastes and animal by-products) through to processed, bespoke, high-value products for specialist markets. The industry's circular economy added value combines gate-fees from waste management and recycling local secondary resources with delivery to farmers of products adapted to their specific requirements, including accompanying information and services.

A European Commission study estimates that organic and organo-mineral fertilizers represent 6.5% of fertilizing products (by value), which is a turnover of EUR1.5 bn in Europe (see figure 1). However, one market study from Allied Market Research suggests a higher turnover of EUR2.5 bn (EU sales only). The European Commission study was based on responses from 61 SMEs in 10

member states, The EC estimates there are a total of over 3 000 SMEs operating across Europe. Overall, it is not a clearly defined sector at the EU level.

Measures to be considered

SOFIE identified a number of areas where better information is needed or specific actions should be engaged to further nutrient and organic matter recycling in organic soil amendments

As emphasised by Tiffanie Stephani, Fertilizers Europe, organic and mineral fertilizers are complementary products, acting together to provide different functions which can harmoniously ensure optimal nutrient supply to crops, optimal soil functions and together a full range of services to farmer. The ultimate

Product quality and consistent characteristics

Industry and agronomists underlined the importance of delivering consistent and quality organic fertilizer products to farmers, adapted to their specific agronomic requirements and to practical considerations (logistics, use of existing spreading equipment, packaging, accompanying advice and information). This applies to markets from stabilised manures through to processed export products. Reliable information is needed about nutrient contents of materials delivered, with reliably consistent nutrient levels, but also expected release patterns (crop availability over time). Quality assurance for farmers, and for their customers (food industry, supermarkets), also implies traceability of secondary materials sourcing and processing.



Chiara Manoli, Vice President of ECOFI and Regulatory Affairs Officer at ILSA, explained ECOFI's vision of the sector, based on credibility (traceability of components, standardized processes, scientific evidences) and clarity (harmonized rules at European level) which will lead to products with high added-value being placed on the market.



Laetitia Fourié, Compliance Manager at ECOFI and Veolia group, provided more details on how to achieve those objectives.

Examples of company success through innovation and service to farmers.



Geert Brosens, CEO, Fertikal, Belgium. 270 000 t/y of organic fertilizing products, EUR28 mn turnover, 99% exported outside Belgium, of which around three quarters outside Europe (mainly Asia, South America, northern Africa). Rapid growth in organic farming certified products, and in processed pellets, which ensure a homogenous, consistent, easy to handle product for farmers.



Becky Wheeler, Director, 4R Group, UK. EUR11 mn turnover with 45 staff working with over 150 contractors delivering 750 000 t/y of bulk organic amendments to farmers in the UK. 4R delivers accredited operational, technical and farm assurance services, ensuring compliance for producers and end users.



Hannamajja Fontell, Director of R&D and Business Development, Biolan Oy, Finland. 100 000 t/y organic fertilizing products, produced from a range of secondary raw materials (manures, wood by-products, food industry by-products) and from renewable sphagnum moss. Export to 50 countries worldwide.



Elias Jokinen, CEO, Soilfood Oy, Finland. Around 145 000 t/y of processed organic fertilizers, recycled limes and amendments. Distribution through to field application, with accompanying farmer advice service. Using secondary raw materials from forestry, bio-energy and food industry.



Vincent Walker, Research and Innovation Manager, OvinAlp, France. 45 000 t/y of organic fertilizers, from local PGI (Protected Geographical Indication) Sisteron Lamb sheep manure and from food industry by-products. Development and marketing of innovative active ingredients derived from bio-fermentation of green organic materials.

The changing regulatory context opens new opportunities

A key conclusion from the SOFIE conference is the significance of new opportunities for industry, and for nutrient recycling, opened by the new EU Fertilizing Products Regulation (FPR) and by other public policies (circular economy, carbon mitigation and soil health).

Under the new FPR CE-Mark, companies in sectors which until today have been operating in nationally separated markets (organic and organo-mineral fertilizers, composts, digestates, biostimulants) will have access without barriers to the whole European market. This will open new possibilities for both fertilizing product manufacturers and for suppliers of processing technologies.

However, there is a clear need for the organic and organo-mineral (carbon-based) fertilizer industry sector to engage with the European Commission and with stakeholders to prepare implementation and adaptation of the new EU Fertilizing Products Regulation (FPR) and to address interfaces other regulations. In particular, actions are already engaged concerning inclusion in the FPR of by-products (industrial and organic, CMC 11) and Animal By-Products (ABPs) (CMC 10) and industry input is solicited by the European Commission.

Presentations at SOFIE addressed practical aspects of this context for the organic fertilizers industry:



The perfect storm of evolving regulations (**Mariano Alessio Verni**, SILC Fertilizzanti): REACH, Animal By-Products, Plant Protection Products, as well as the new EU Fertilizing Products Regulation.



The 240 new EU harmonised testing methods which will be developed by CEN to accompany the new EU Fertilizing Products Regulation (**Laurent Largent**, AFAIA). These will include adapting existing standards to new materials, specific new test methods, and some completely new standards.



How to obtain the new CE-Mark for organic fertilizing products in five steps (**Leon Fock**, Eurofema)

goal is reducing environmental impacts of fertilization by increasing Nutrient Use Efficiency.

How can mineral fertilizers and organics be better incorporated into hybrid products and/or be combined in crop nutrition regimes? What challenges need to be overcome to achieve this? The organic (carbon-based) fertilizer industry is not well identified and there is very little data available concerning overall market size, different products, companies. This is partly because of confusion between carbon-based fertilizers and products certified for organic farming. Data collection is difficult because the market is mainly SMEs operating today at the national level and because of the overlap with related markets such as biostimulants and soil improvers, as well as with operators in waste recycling and by-product valorisation. How can the organic fertilizer industry be better defined and measured?

Lack of data

There is a need for agronomic evidence on the performance of processed organic fertilizer products, whereas to date the field trial data available concerns mainly unprocessed organic amendments, such as manures or biosolids.

What specific agronomic, scientific and field trial data is required to fill the current knowledge gaps? There is a lack of scientific data on the stability in soil of organic carbon from organic soil amendments, and therefore difficulties in to assessing the real net greenhouse gas impact of use of these products over time.

Nitrogen losses in processing of secondary raw materials and in field application is significant in terms of climate and air pollution and development of processes to recover and recycle nitrogen emissions need to be addressed

Different organic soil amendments will have different agronomic effects, contributing to soil structure, soil biology, nutrient content, nutrient retention and mobilisation. Benefits will also depend on soil and climate conditions. Information and advice for farmers means added-value.

Future growth

Organic and organo-mineral fertilizers have specific benefits in the Mediterranean region, addressing low soil carbon and improving water retention and drought resilience.

Organic (carbon-based) fertilizers are not necessarily eligible for use in certified organic farming. However, organic farming is a growing and added-value market for organic fertilizers, subject to appropriate raw material sourcing and processing

There are close links between organic fertilizers and biostimulants, because organic substances can reduce nutrient immobilisation in soil or facilitate plant uptake and with growing media, which require nutrient sources.

Plastic contamination in secondary raw materials poses important perception and acceptance problems. In order to prevent this becoming an increasing obstacle to organic fertilizer development and to nutrient and carbon recycling, upstream responsibility should be engaged, by packaging producers, supermarkets and collection systems. Biodegradable plastics are evolving faster than composting or digestion processes.

How can the national-based organic fertilizer companies develop towards pan-European operation and markets? How can producers of organic fertilizers better get to market? Which markets can be targeted? And which routes can products take to reach these markets? Are all questions that still need to be tackled. ■

SOFIE was organised in partnership with the IFS (International Fertiliser Society) technical conference, 4-5 June 2019, which addressed mineral fertilizers production and regulation. IFS proceedings are available at <https://fertiliser-society.org/event/2019-ifs-technical-conference.aspx> SOFIE (Organic Fertiliser Industry in Europe summit), Atelier des Tanneurs, Brussels, 6-7 June 2019: presentation slides and summary (SCOPE Newsletter n°130) soon at www.phosphorusplatform.eu/SOFIE2019

A growing population demands new solutions

by **Mieke Beaujean and Rebecca Giesbers**, Communication Officers Stamicarbon, The Netherlands

Imagine, for a moment, a world without mineral fertilizers. About 50% of the food produced today could not be produced and more than 4 bn people would be chronically undernourished (compared with around 815 mn now).

Significantly more land would be needed to produce the same amount of food. Land clearing and reduced forests would result in more CO₂ and greenhouse gases.



Smart fertilizer with biodegradable coating in development

According to forecasts by the United Nations Department of Economic and Social Affairs, the world's population is expected to grow from 7.7 bn today to 8.6 bn in 2030, before reaching nearly 10 bn in 2050. This growth will not be evenly distributed. India is set to exceed the population of China by 2024, while the biggest growth is predicted in Africa, where the population is expected to expand from 1.3 bn today to 2.5 bn by 2050.

The Food and Agriculture Organization of the United Nations estimates that global crop production needs to increase by over 45% by 2050 if we want to end hunger and malnutrition.

So how can we feed our growing population in a sustainable way? How can we grow sufficient crops to produce enough food with the nutrients people need to be healthy, while having less impact on our environment and planet?

Intensification is a must

It is clear that we need to intensify crop and food production if we want to be able to feed the world population and achieve food security.

While greenhouse gas emissions from fertilizer production and application have increased over the years, the net effect of higher crop yields has avoided emissions up to 590 Gt-CO₂ between

1961 and 2005. So we know the answer does not lie in clearing or using more land. The question is not whether we need to intensify but how to intensify food production in a sustainable manner.

"We need to find a smarter, more sustainable future with fertilizers," said Pejman Djavdan, Managing Director of Stamicarbon, the innovation and license company of Maire Tecnimont. "This challenge requires multiple solutions and demands a collaborative approach from all corners of the agricultural and fertilizer industries."

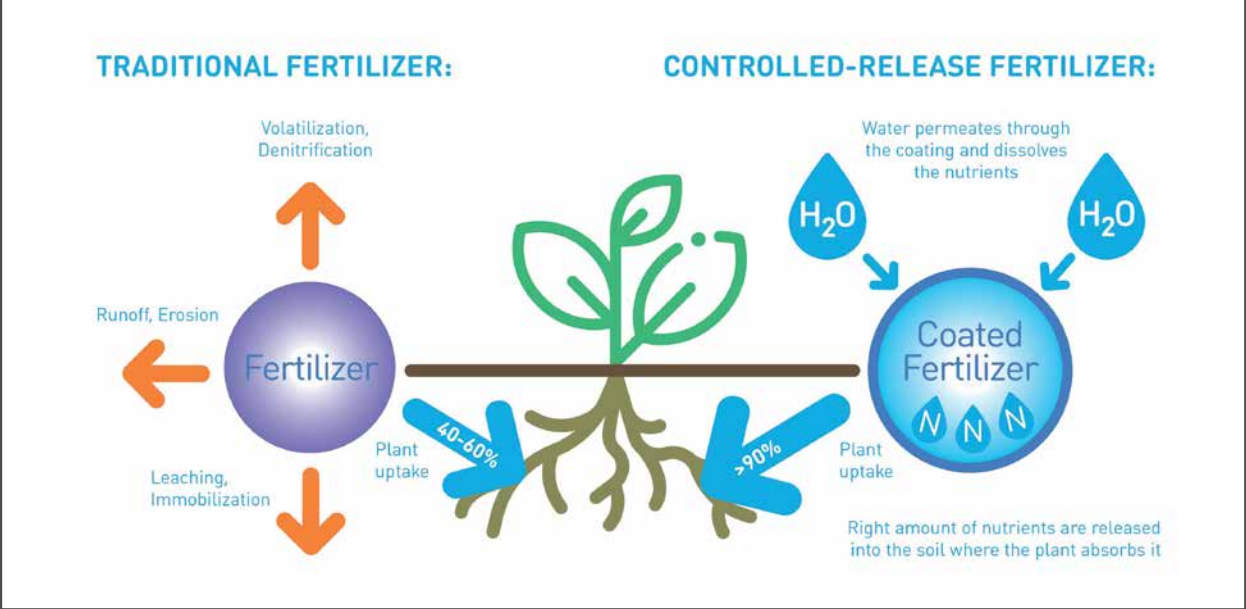
Vertical farming, coating, drones and digitalization

Aimed at sparking discussion and industry collaboration, the company's recent Future Day event in Utrecht, the Netherlands, explored the challenge ahead and considered some of the emerging solutions – from vertical farming and crop monitoring by drones, to digitalization and alternative food sources.

The event was also a platform to announce Stamicarbon's own innovation agenda, focused on three areas:

1. Specialty fertilizers (including controlled release fertilizers, seed cores and micronutrients)

Figure 1. Nitrogen loss and plant uptake



2. Renewable production of fertilizer (using wind or solar energy to produce fertilizer)
3. Digitalization (optimizing plant operations by harnessing the power of real-time data)

"Stamicarbon is determined to be part of the solution. We believe we can best use our knowledge and experience to help develop smarter fertilizers and significantly improve the production of fertilizer," Mr. Djavdan said. "The Future Day was a platform for us to spark conversation and invite others to join the discussion. We hope this day has planted seeds for future collaboration to come up with sustainable ideas and solutions."

From 'the smart use of fertilizers' to 'the use of smart fertilizers'

Providing sufficient food for a global population nearing 10 bn in 2050 will require an increase of more than 50% of current fertilizer consumption when maintaining current fertilizing practices. At the current overall average Nutrient Use Efficiency of less than 50%, this will mean a further significant increase of losses of nitrogen fertilizer to the environment. The lost nitrogen is either volatilized into air as ammonia

and NO₂ or lost to surface and ground water as nitrates. This will lead to an unacceptable pressure on global biosystems resulting in large dead zones in coastal regions, major eutrophication of lakes, increasing quality issues with drinking water resources.

This impact could be reduced by improving the way fertilizers are applied and improving the fertilizers themselves.

While some countries are using too much (e.g. China is over 500kg/ha), other countries and regions are not using enough (e.g. Sub-Saharan Africa is only 16kg/ha). Europe's application rate is 158kg/ha and the world average is 140kg/ha.

New fertilizer products and additional measures are needed to make a step change beyond the 4Rs: right rate, right place, right product, right time. We need to move from 'the smart use of fertilizers' to 'the use of smart fertilizers'. A smart fertilizer is capable of releasing the nutrients from the fertilizer in line with the nutrient demand from the crop. The release would be tuned towards the needs of the crop, creating a perfect balance between supply and demand, preventing losses of nutrients to the environment.

Together with partners, Stamicarbon is already working on several

specialty fertilizers including polymer coated controlled release fertilizers and fertilizers with the addition of micronutrients.

Polymer coated controlled-release urea

This smart fertilizer is produced by coating the urea granule with an extremely thin protective coating that acts as a controlled-release membrane to seal the urea from the environment.

The hygroscopic nature of urea attracts water (rain, moisture) into the membrane, where it dissolves part of the urea. As a result of the high nitrogen concentration inside the membrane and low concentration outside the membrane, a driving force develops. It permeates the nitrogen dissolved in water through the membrane into the soil, ready to be absorbed through the root system of the plant in an efficient and controlled manner.

As the permeation through the membrane is temperature dependent, and the release of nutrients depends on the availability of water, an almost perfect balance is created between the crop need and the fertilizer supply. As a result, losses to the environment (to air or water) are prevented and maximized nutrient use efficiency is achieved (see figure 1).

Important benefits from controlled release fertilizers providing an optimized cropping are:

- Hardly any losses due to ammonia volatilization
- Hardly any losses due to nitrate leaching
- Steady controlled release of nutrients during the 3-4 month growing season
- Nearly all nutrients are available for the crop
- Single application in spring, no need for summer side dress, reducing application costs
- Optionality to choose between two optimized fertilization strategies
- Higher yield as a result of similar application rate (allowing for higher fertilizer cost)
- Similar yield as a result of lower application rate (less application of higher cost product).

Partnership development

This technology has been developed by US-based Pursell Agri-Tech, making use of a novel polymer composition and a novel coating technology, providing an economical solution for producing such smart fertilizers. In 2017, Stamicarbon made a strategic investment, acquiring a 20% stake in Pursell Agri-Tech. This synergic collaboration combines the company's global network and technological capability with Pursell Agri-Tech's leading expertise in coated fertilizers, enabling them to pursue promising initiatives in controlled-release fertilizers worldwide. Stamicarbon's Controlled-Release Fertilizer Design is being offered to the market as a Lump Sum Turn Key technology package.

Modular plant design

The compact design of the plant (see figure 2) has led to relatively low investment costs and provides the capability to erect the plant close to existing logistical facilities near end-user markets.

The first commercial reference plant operating at a 24 hours, 5 days a week regime, is running in Sylacauga, Alabama, USA (see figure 3). It has a capacity of up to 100 kt per annum of controlled-release fertilizer.

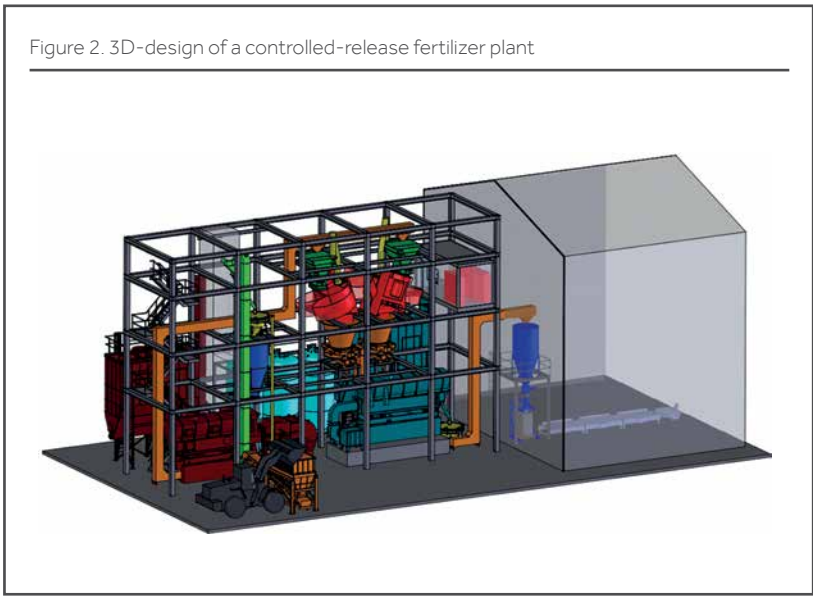


Figure 2. 3D-design of a controlled-release fertilizer plant



Figure 3. First Controlled-Release fertilizer plant in operation in Alabama



Smarter fertilizer solutions and the use of technology will support intensification bringing increased crop yields.

Advantages of this next generation technology over previous technologies:

- Batch processing allows for excellent control of coating thickness and uniformity
- Minimized polymer consumption
- Very clean process, allowing for minimum losses
- Versatile technology, allowing for a wide variety of longevity (1-12 months)
- Flexible technology, having the ability to coat a wide variety of fertilizers (urea, NPK, DAP, MOP, CN)

Biodegradable coatings

In order to have a fully sustainable fertilizer, the recently published EU New Fertilizer Regulation requires a biodegradable coating. Stamicarbon, together with a partner, is currently developing such a biodegradable polymer coating, but there are still some issues to be resolved:

- Processing of the biodegradable polymer
- Adequate permeability/controlled-release
- Biodegradation in line with EU specifications (48 months)
- Adequate handling properties (robust coating)
- Certification and approval process

Digital insight: optimizing the future of plant operations

Stamicarbon wants to tap into the potential offered by new digital technologies - such as the Cloud and the Internet of Things - to succeed in their mission to continuously optimize the operation of new and existing urea plants. This is done by offering traditional services in new and digital ways and by adding new digital services to their life cycle support portfolio. These services are aimed at improving the plant's throughput, reducing its energy consumption, staying within emission limits and avoiding and reducing downtime (see figure 4).

These goals are accomplished by gathering real-time data from the plant, combining this data with the company's in-depth knowledge of the urea process, and transforming

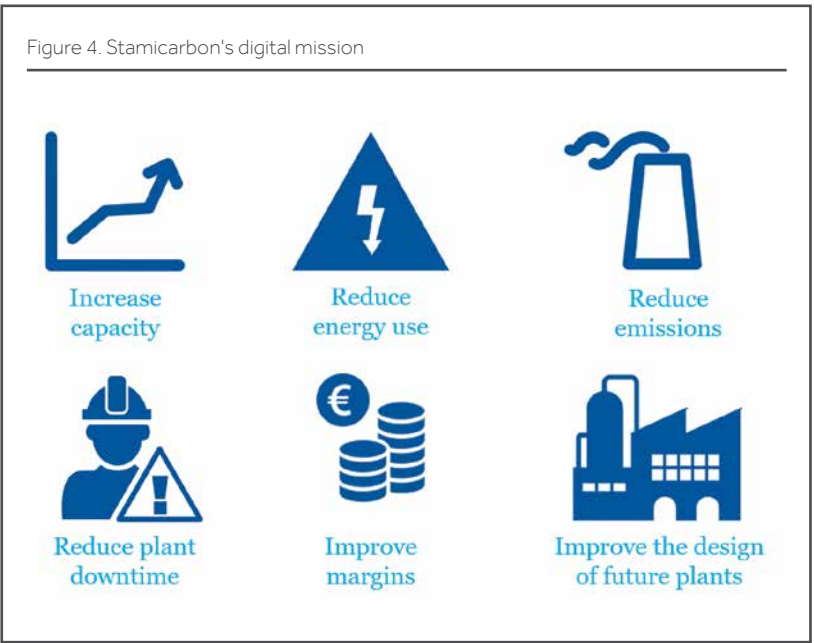


Figure 4. Stamicarbon's digital mission

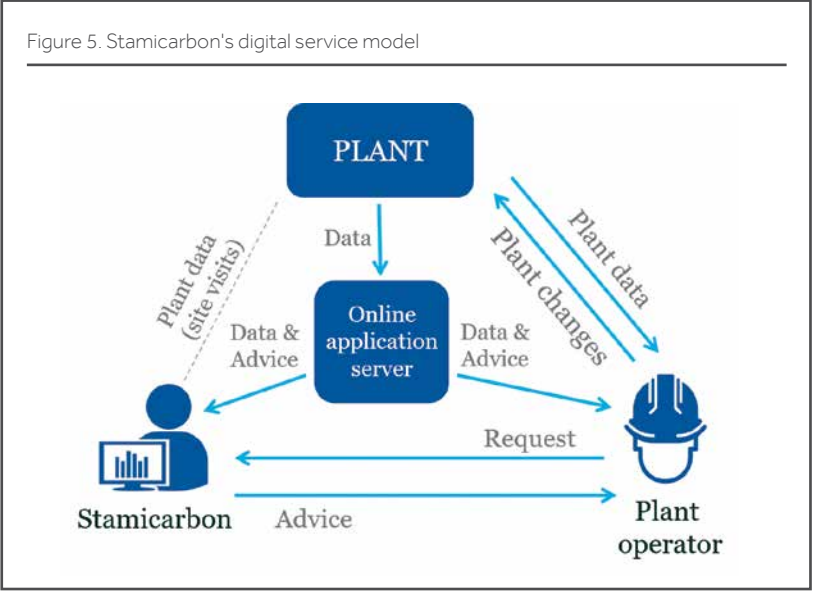


Figure 5. Stamicarbon's digital service model

this into actionable advice for plant operators. Their operator simulators can be used to improve the plant operator's proficiency in operating a urea plant in standard and, more importantly, non-standard situations. Stamicarbon can provide deeper insights into plant operations.

From their experience they know that controlling and stabilizing a urea plant is not an easy task, let alone optimizing a urea plant, because of the lack of the right information, the many recycles, the slow process responses and the constraints present. The urea process

continuously needs operator attention. However, there is potential and value in continuously and automatically pushing the plant to its boundaries, which is very difficult for operators to achieve. A digital application is perfectly capable of doing so 24/7.

The basis for some of these digital services is a plant specifically tuned process model, which provides process parameters that cannot be measured, but are of great importance to improve operation. The same process model is also capable of calculating the optimal operating point of a plant (see figure 5).



By obtaining real-time plant data and thus closing the loop, the urea process design can be validated and improved, resulting in improved future urea plants.

Guest speakers offer inspiration during Future Day

Attended by more than 130 employees and some 40 guests from industry organizations, related companies, and innovation partners, the Stamicarbon Future Day was organized to inspire, spark discussion and plant seeds for collaboration.

Topics addressed during the Future Day included:

- How to feed the world's growing population
- How to make fertilizers more enriching and sustainable
- Digitalization, drones and robotics
- Future food sources (including insects and alternative proteins)

The keynote speaker was well-known Dutch futurist and trend watcher Mr. Richard van Hooijdonk, speaking

on the future of agriculture. Topics mentioned included genetically modified crops, the use of artificial intelligence with sensors and climate data, crop monitoring by drones, and vertical and urban farming.

Mrs. Saskia van den Muijsenberg (Director of biomimicryNL) introduced biomimicry, which means 'imitate life'. She gave insights on how nature can inspire us to design sustainable technologies.

Mr. Bas Godschalk (Owner of Insects-for-all) talked about the food of the future and explained how insects can play a key role in meeting the growing demand for sustainable protein. During the event, participants were dared to taste insects and foods made using insects.

During the event, Stamicarbon put out a call to action to individuals, companies and organizations who may like to collaborate to reach the goal of food security and sustainable agriculture. ■

Stamicarbon BV is the innovation and license company of the Maire Tecnimont Group. We are a pioneering company specialized in the fertilizer industry with a vision to help enable the world to feed itself and improve quality of life. As a global leader in fertilizer technologies, Stamicarbon has licensed more than 250 urea plants and realized more than 100 revamping and optimization projects. This leading position is based on more than 70 years of experience in licensing and is maintained by its continuous innovations in technologies, products and materials. Stamicarbon's headquarters is in Sittard, The Netherlands with a sales office in the USA and representative offices in Russia and China.

Please feel free to contact Mr. Robert Smulders, Vice President Innovation: robert.smulders@stamicarbon.com

For more information: www.stamicarbon.com

Note: Controlled-Release Fertilizer Design is a trademark of Stamicarbon

China's phosphate fertilizer industry

by Ying Wang, Director, China Phosphate and Compound Fertilizer Industry Association

Over the past three years the phosphate fertilizer market recovered in China due to the advance of supply-side structural reform, the continuous clearing of inefficient production capacity and industrial integration, as well as the continuous strengthening of safety and environmental protection supervision. In 2018, production and consumption of phosphate fertilizer decreased, while exports and price levels increased. The continued prosperity of the phosphorus industry chain is mainly due to the fact that the raw material, phosphate rock, is governed by mining policies that promote price increases.

Enterprises with industrial chain integration and location logistics advantages have more development space. In the short term, benefiting from the expected recovery of global agriculture, the industry boom continues to rise. In the long term, the global economic situation remains complex and volatile and the

“International capacity expansion slowed the growth of China's phosphate export market”

problem of oversupply has not been effectively alleviated. International capacity expansion slowed the growth of China's phosphate export market and also to declining agricultural demand.

Phosphate output

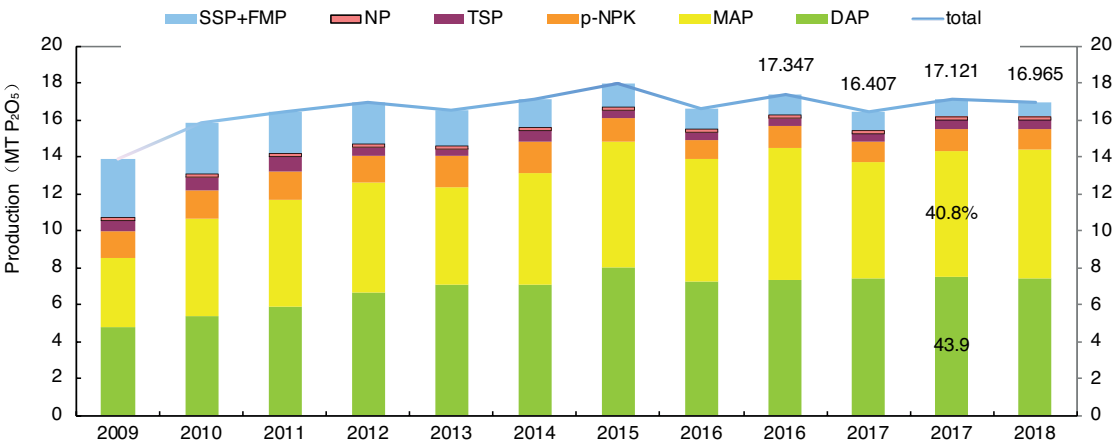
According to the China Phosphate and Compound Fertilizer Industry Association (CPFIA) total production capacity of phosphate fertilizer in China was 23.5 million tonnes P_2O_5 by the end of 2018 and 1.07 million tonnes P_2O_5 phosphate capacity was withdrawn. In 2017, the phosphate fertilizer capacity was on a downward trend. This decline is mainly the result

of Chinese government policies and the reduction of corporate benefits.

In 2018, China's phosphate fertilizer output was 16.96 million tonnes P_2O_5 , down 0.9% y/y, but it is still the world's largest producer of phosphate fertilizer. The output of high-concentration phosphate fertilizer was 16.1 million tonnes P_2O_5 , an increase of 0.2% y/y, accounting for 94.9% of the total output of phosphate fertilizer in China. The output of DAP and MAP was 14.4 million tonnes P_2O_5 , up 0.3% y/y, accounting for 84.6% of total phosphate fertilizer production.

In 2018, the operating rate of the phosphate fertilizer industry reached

Figure 1. China's phosphate fertilizer production in 2009-2018



Market trade

According to China Customs statistics, China imported 0.29 million tonnes P₂O₅ phosphate fertilizer in 2018, up 30.1% y/y and exported 5.45 million tonnes P₂O₅, up 10.9% y/y. This accounts for 34% of global trade volume with a net export of 5.2 million tonnes P₂O₅, up 10.0% y/y. DAP and MAP are still the two most exported products. In 2018, the export volume of MAP and MAP was 7.5 million tonnes and 2.5 million tonnes respectively, up 16.7% and 8.2% y/y.

The apparent consumption of phosphate fertilizer in China in 2018 was 11.8 million tonnes P₂O₅, down 5.0% y/y, accounting for 26% of the world's total consumption. According to the data of China Agricultural Development Research Report, since 2005, China's phosphate fertilizer consumption has been stable about 12 million tonnes P₂O₅. In 2015, the Ministry of Agriculture and Rural Development of China formulated the 'Zero Growth Action Plan for Fertilizer Quantitative Use of 2020'. By the end of 2017, China's fertilizer use had reached zero growth targets. In 2019, the government proposed to continue to increase agricultural fertilizer-saving operations to achieve negative growth in fertilizer use.

Figure 4. China's phosphate fertilizer imports and exports 2010-2018

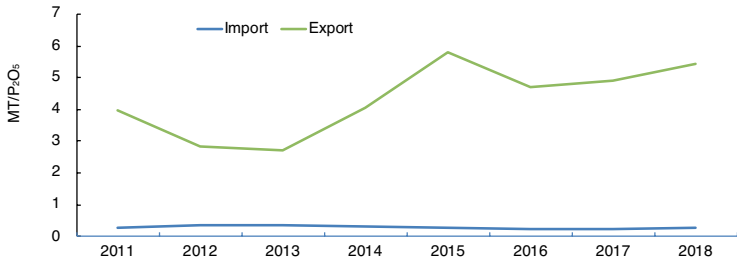
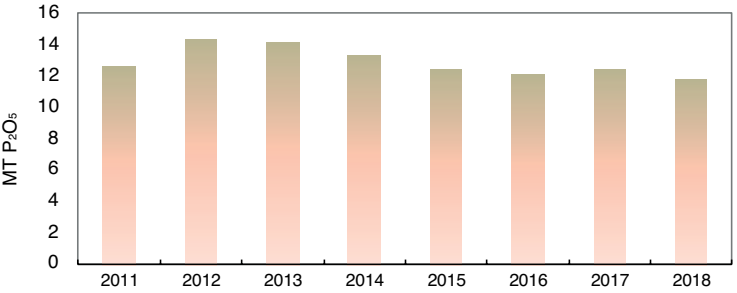


Figure 5. China phosphate fertilizer apparent consumption 2011- 2018



a rate of 72.2%, an increase of 4.9% y/y. The increase in capacity utilization rate is not only related to the smooth operation of the macro economy, but also closely related to China's continuous promotion of supply-side structural reform. DAP capacity utilization rate was 76.6%, up 2.9% y/y.

China's phosphate fertilizer production is mainly concentrated in the four provinces of Hubei, Yunnan, Guizhou and Sichuan. The combined output of the four provinces in 2018 accounted for 81% of total China's output. Despite the impact of safety and environmental protection inspections, some phosphate ore enterprises and phosphate fertilizer enterprises in Hubei Province started to decline in 2018. However, due to the transportation advantages of waterways, roads and railways, the output still ranked number one in China. In 2018, the output of phosphate fertilizer in Hubei Province reached 5.83 million tonnes P₂O₅, down 1.0% y/y, accounting for 34.4% of the total China's output. The second and third places were Yunnan Province and Guizhou Province respectively, with output of 4.1 million tonnes P₂O₅ and 2.6 million tonnes P₂O₅, respectively, accounting for 24% and 15% of the total China's output.

Figure 2. Phosphate fertilizer capacity utilization rate in 2016-2018

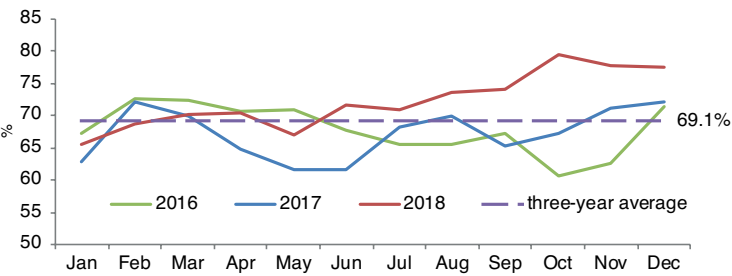
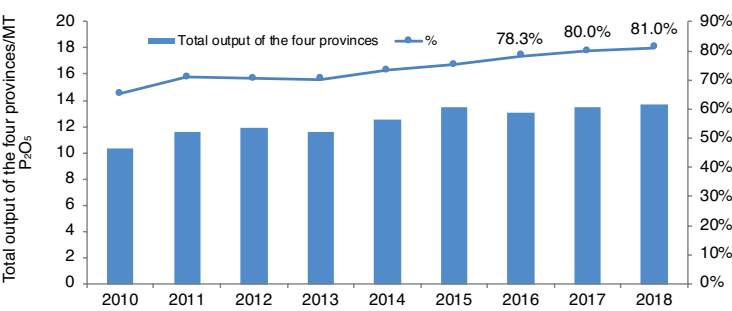


Figure 3. Phosphate fertilizer sum production of Hubei, Yunnan, Guizhou and Sichuan 2010-2018



Factors impacting future trends

In 2019, there is still uncertainty in the world economy, and the trend of Sino-US trade friction will become the most worrying factor for global economic growth. The fundamentals of China's economic strength will not change. However, the agricultural planting structure continues to adjust, the implementation of the fertilizer negative growth strategy and the promotion of agricultural policies such as the application of organic fertilizers for economic crops. These factors will affect the future development of China's phosphate fertilizer industry.

China's fertilizer supply will continue to shrink in 2019 and the country's demand is also declining. The phosphate fertilizer industry continues to remove inefficient capacities

China's fertilizer supply will continue to shrink in 2019 and the country's demand is also declining

and adjust production structure. Enterprises with resource advantages have established a green sustainable industrial system, enterprises that do not have the advantage of resources will need to improve their core competitiveness.

In 2019, the goal of 'negative growth in fertilizer use' will mean the need to adjust the area planted with rice, wheat and corn, implement soil testing and formula fertilization and organic fertilizer replacement projects, these will lead to a reduction in the application of fertilizers.

In recent years, the Chinese government has stepped up efforts in ecological management. Phosphate mining, phosphate fertilizer production and phosphogypsum treatment have adopted strict restrictions, which have an impact on the supply of phosphate fertilizers. In 2019, the Yangtze River protection and rehabilitation and other pollution prevention and control policies continue to be implemented. In addition, China's phosphate fertilizer industry will enter a green development period throughout the entire chain. ■

People & events

AlgaEnergy announces two new appointments in the Asia Pacific region



After the recent incorporation of Douglas Ry Wagner as President of International Agribusiness of AlgaEnergy, the company has announced the appointment of Debabrata Sarkar (pictured left) as Vice President, Asia Pacific.

Debabrata Sarkar is Agricultural Graduate with MBA from the Indian Institute of Management

Calcutta (IIM Calcutta) and brings over 20 years of experience in the international agricultural sector.

During this time, he has worked in commercial roles and business development, and in the fields of marketing, brand management and registration, development and launch of new products. He also brings in-depth knowledge of the Asian market.

Mr. Sarkar has held executive roles in leading global companies such as Monsanto (as Business Manager, Profit Centre Head, Regional Product Leader), Chemtura (as Head of Marketing and Business Development in South Asia), and as a Country Head for India for a US-based biologicals solution company.

AlgaEnergy has also announced the appointment of Dr. Lokesh Singh (pictured below) as Country Manager for AlgaEnergy in India. Dr. Singh carried out his Ph.D. in Plant Breeding & Genetics at the University of Haryana (HAU) and brings over



15 years of experience. He has held executive roles with a strong commercial and technological profile in leading companies such as Monsanto (as Regional Technology Development Manager and Regional Sales Manager), Alliance Manager for a US-based biological company for India. He has also worked as Senior Research Fellow in the State Agricultural University in India.

Nutrien announces Actagro Managing Director

Nutrien Ltd. Has announced that Casey McDaniel has been hired to serve as Managing Director of Actagro.

Mr. McDaniel has a long history in sales, marketing, business development and strengthening strategic alliances. He has held various executive roles with Pinnacle Agriculture, including Vice President of Proprietary Businesses, as well as responsibility for the Meridian wholesale business.

“Casey is well acquainted with both Nutrien and Actagro, and he is excited to lead Actagro as a separate business within the Nutrien family,” said Mike Frank, CEO of Retail for Nutrien. “He will strive to build on our existing partnerships and develop domestic and international markets for Actagro’s industry-leading soil and plant health technology.”

Mr. McDaniel will be headquartered out of Fresno, California, which is where Actagro is based. Nutrien concluded its acquisition of Actagro in March of 2019.

Board changes at EuroChem Group

EuroChem Group AG has announced the election of Petter Ostbo to the Board of Directors.

Mr. Ostbo, who joins the company as Chief Executive Officer, has a proven track record in the fertilizer industry. He previously served as EVP and Chief Financial Officer of Yara International, before which he held the position of EVP Production at the same company, with responsibility for 28 production sites and four mines in 16 countries.

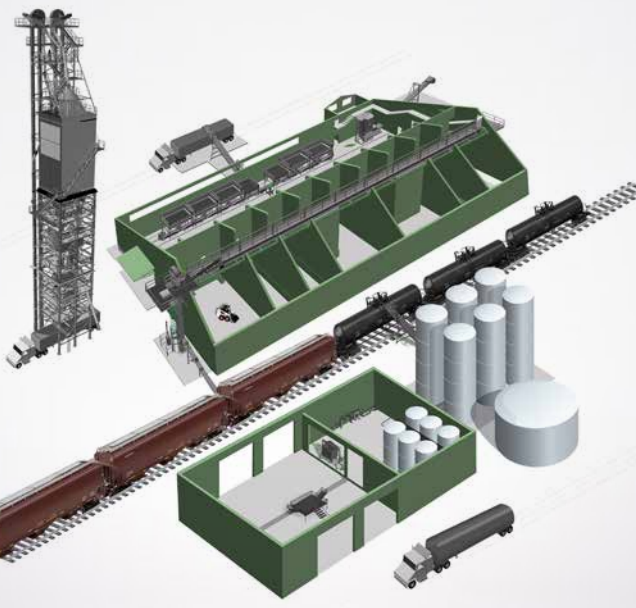
Separately, former CEO Dmitry Strezhnev, who served as a Board member for more than 15 years, has stepped down from the Board after deciding not to stand for re-election and to focus instead on other business ventures outside EuroChem.

“We are delighted to welcome Petter to the company’s Board. He has a wide range of experience and is highly regarded in our industry,” said Alexander Landia, Chairman of the Board of EuroChem. “I am also grateful to Dmitry for his long service to EuroChem. He has been instrumental in the successful development of the company into a global force in the fertilizer industry and we wish him every success in the future.”

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SOPerior Fertilizer appoints Ian Smith to Board of Directors

SOPerior Fertilizer Corporation has announced the addition of Ian Smith, B.Com, to the Board of Directors of SOPerior Fertilizer Corporation.

Mr. Smith is an experienced mining engineer with over 45 years of experience in corporate operations, project management, and consulting internationally. Mr. Smith was President and founding partner of MRDI, one of North America’s most successful mining consultancy company that was ultimately purchased by Canadian interests in 1995. Mr. Smith has managed strategic planning and engineering studies on large scale mining projects around the world and has an extensive network in the industry.

“We are pleased to appoint Ian Smith to the Board of Directors,” stated Andrew Squires, the Corporations CEO. “Ian brings a wealth of hands-on mining-processing and project development experience which will be extremely valuable to the Company when it moves forward with production plans.”

The International Fertilizer Association elects Morocco’s Mostafa Terrab as President

Mostafa Terrab was elected president of the International Fertilizer Association (IFA), becoming the first African leader of the organization on 13 June 2019.

The IFA is a global body which promotes the interests of the fertilizer industry

Terrab is the CEO of the world’s largest fertilizer exporter, the Morocco-based OCP Group, which is committed to feeding the growing global population in a sustainable manner.

Both OCP Group and the IFA were founded nearly a century ago and while OCP Group has always placed emphasis on improving agriculture within Africa, the IFA has shifted its focus to the region as well.

The IFA aims to promote efficient production and distribution of fertilization around the world as well as serving as a space for collaboration among its 480 members. Members are spread across 68 countries and account for 80% of the world’s fertilizer production - 45% of members are based in developing countries. ■

Sulphur – the 4th plant nutrient

by **Dr. Patricia Imas**, Chief Agronomist, ICL Fertilizers, Israel

Sulphur is gaining recognition for its crucial role in crop growth and productivity. However not all sulphur fertilizers are the same. It is important that farmers recognize the differences in order to choose

the nutrient input that is going to effectively provide adequate and prolonged sulphur availability for crops, improve nitrogen uptake efficiency and minimize negative environmental impact.

Seeing sulphur as key to unlock performance

Sulphur (S) is an essential plant nutrient and is recognized as the fourth most important nutrient after nitrogen (N), phosphorus (P) and potassium (K). Sulphur is part of every living cell and is a constituent of three S-containing amino acids (cysteine, cystine and methionine) which are the building blocks of plant proteins. About 90% of plant S is present in these amino acids. Sulphur also plays an important role in photosynthesis, as chlorophyll synthesis requires S. In addition, S activates numerous enzymes in biochemical reactions in the plant.

Sulphur has a synergistic relationship with N. Amino acid production to create plant proteins requires both N and S and they are each needed in adequate amounts to ensure they are utilized efficiently in this process. Demand for N and S is very closely correlated. For example, during stem elongation in wheat the N uptake averages 2.5 kg/ha per day. At the

same time the S uptake is, on average, 0.5 kg/ha per day meaning the ratio of the requirement of N to S is 5:1.

In the past, the deposition of S to agricultural land from atmospheric S was well above crop and livestock requirements, so it was not discussed as a crop nutrient. However, over the last 20 years, this source of S has declined significantly. Only about 25% as much atmospheric S is available today as compared to 40 years ago. Emissions of S – usually as sulphur dioxide (SO₂) from the burning of fossil fuels, particularly coal – have reduced so much, and so widely, that S balances in agricultural fields are now often negative.

Sulphur fertilizer has become of enormous importance to counter S deficiency in crops and grassland. Farmers need to look to the nutrient inputs they apply to effectively provide the S their crops need.

Sulphur uptake, role and deficiency symptoms in crops

Plants take up and use S only in the sulphate anion form (SO₄²⁻). Similar to the nitrate anion (NO₃⁻), it is very mobile in the soil and is prone to leaching in wet soil conditions, particularly in sandy soils.

Table 1. Nutrient offtake by different crops.

Crop	Yield (ton/ha)	N kg N/ha	P kg P ₂ O ₅ /ha	K kg K ₂ O/ha	S kg SO ₃ /ha
Wheat	6.0	180	35	70	50
Rice	3.8	100	30	145	45
Potato	38.0	200	35	220	55
Soybean	3.0	240	40	80	65
Rapeseed	2.3	200	60	50	90
Onion	23.0	120	35	125	70
Sunflower	1.9	100	30	55	40
Oil palm	9.0	120	25	140	40
Tomato	30.0	150	40	170	60

Source: IFA World Fertilizer Use Manual. International Fertilizer Industry Association, Paris, France (1992)

Table 2: Some S-containing fertilizers

Fertilizer	SO ₃ content (%)	Other nutrients	Comments
Ammonium sulphate	60	21% N	Not desired for leguminous crops (N) Immediate S leaching Increases acidity of the soil
Potassium sulphate	45	50% K ₂ O	Immediate S leaching
Kieserite	50	25% MgO	Immediate S leaching
Gypsum	35-45	27-32% CaO	Applied as soil conditioner Difficult to apply at small rates
Potassium magnesium sulphate	43-55	22-30% K ₂ O 10-18% MgO	Immediate S leaching
Elemental sulphur	90% S	–	Needs to oxidize to sulphate Slowly build up
SSP	27-30	16-20% P ₂ O ₅ 25-29% CaO	Applied as P source
Polysulphate	19.2	14% K ₂ O 6% MgO 17% CaO	Four nutrients in one Prolonged availability of S Organic product

Sulphur is important for all crops, but the following crops have particular S requirement:

- Oilseed crops, particularly canola, require S for the development of fertile flowers and improved oil percentage in seeds
- Legumes (like soybean, peas, alfalfa), where N is fixed from the air through Rhizobium bacteria in root nodules of the plants, need S for good nodule development
- Wheat needs S to achieve milling and breadmaking quality by maintaining gluten functionality and protein composition
- Forage crops require S for improved nutritive value by decreasing the N:S ratio which enhances quality and digestibility

Sulphur is immobile in plants and does not readily translocate from older leaves to young leaves. Therefore, S deficiency first appears on younger leaves. Deficiency symptoms show up as a light green to yellowish colour (see image 1). Deficient plants are small, and their growth is retarded. Sulphur deficiencies are most likely to occur in sandy soils with low organic matter and under high rainfall conditions.

Soil S deficiency is likely to worsen over time as each crop harvest removes S from the field. In many crops, the amount of S held within the plant is more than the amount of phosphorus that is removed at harvest (see table 1).

Sulphur fertilizers

Nowadays, because farmers realize that their crops need S, it is applied to maintain crop yields. Common sources of sulphate are ammonium sulphate, potassium sulphate (SOP), kieserite, gypsum, elemental sulphur, potassium-magnesium sulphate and polysulphate (see table 2).

However, S fertilizers are not all the same. They have different levels of effectiveness of supplying S to crops. Most commonly available S fertilizers are in either the soluble sulphate form (SO₄) or elemental forms (S⁰), which are relatively insoluble. As plants cannot take up elemental S, these fertilizers must first be converted to SO₄ before plant uptake can occur.



Image 1. Typical S deficiency symptoms on the leaves of Citrus plants grown in Zhanjiang, Guangdong, China, 2016. Courtesy: Dr Guohua Li, Agronomist, ICL Fertilizers, China.

“Benefits include the fact that polysulphate is a natural product and has a low carbon footprint

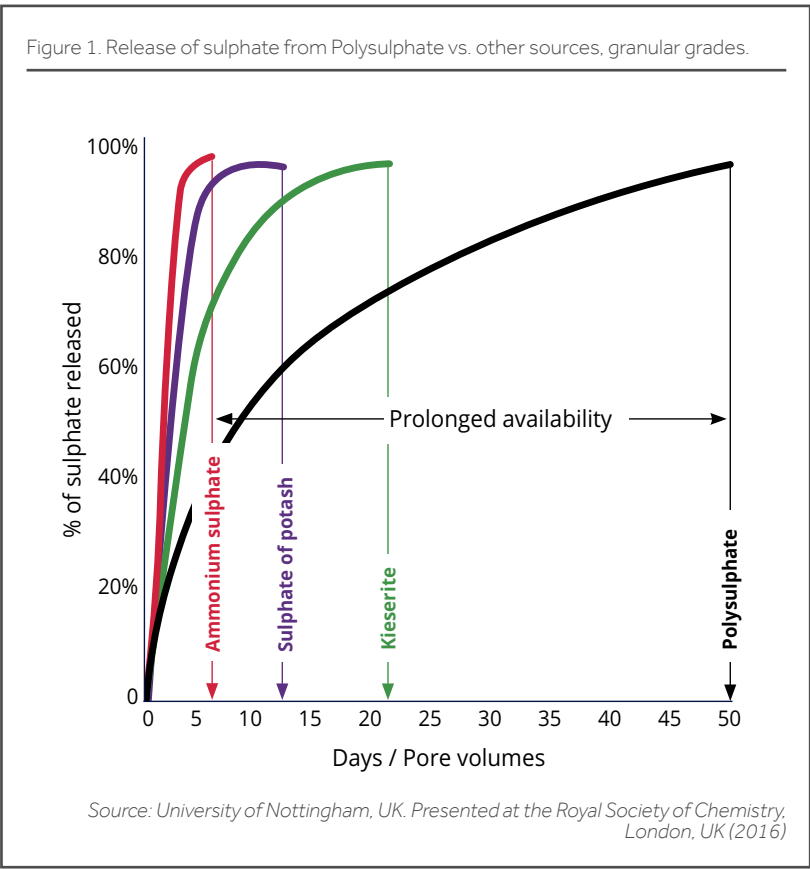
Polysulphate, a new fertilizer with sulphur

Polysulphate is a new multi-nutrient fertilizer, mined in the UK, and available in its natural state. Uniquely, it has four nutrients: sulphur, magnesium, potassium and calcium. All its nutrients are in sulphate form and are readily available for plant uptake.

Polysulphate is mined in the UK by ICL Boulby, from the polyhalite layer of rock deposited 260 million years ago over 3,300 feet below the North Sea off the North Yorkshire coast.

Polysulphate contains 48% SO₃ (19.2% S) as sulphate, 14% K₂O (11.6% K) as sulphate of potassium, 6% MgO (3.6% Mg) as magnesium sulphate and 17% CaO (12.2% Ca) as calcium sulphate. Its chloride content is very low which means it can be applied to sensitive crops. It does not affect soil pH and does not acidify the soil.

Being a natural crystal, it has a very unique dissolution pattern, releasing its nutrients gradually



after being applied to the soil. This prolonged release period of nutrients in polysulphate, particularly the sulphate, offers considerable advantages in practical farm conditions. Additional benefits include the fact that polysulphate is a natural product and has a low carbon footprint. It delivers dependable high value with low negative environmental impact and is certified for organic use.

Delivering prolonged release sulphur and more

The S in polysulphate comes from three sources – calcium, magnesium and potassium sulphate. The unique dissolution pattern of this natural complex crystal releases its nutrients gradually over time ensuring prolonged availability. Polysulphate has been shown to release S over a long enough period to meet the crop’s requirements for S over the major growth period (see figure 1). As well as the gradual and prolonged availability of S to plants, the special solubility characteristic of polysulphate reduces the risk of S leaching from sandy soils and under high precipitation.

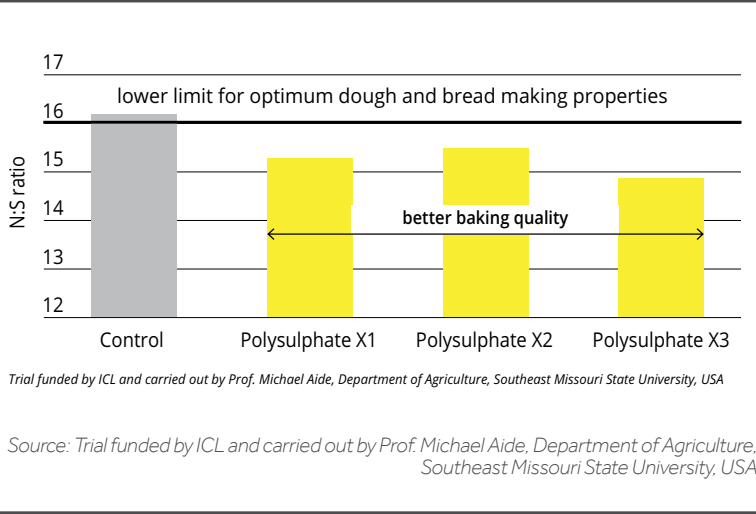
Several experiments have shown that fertilization with polysulphate has a residual effect, maintaining a reserve of S in the soil which continues to supply S to the next crop.

Separating S from N

A common current farmer practice is to apply S with N as ammonium sulphate, but this poses a risk of significant losses of both N and S. Nitrogen can be lost via volatilization, especially on high pH soils, while sulphate is immediately released from ammonium sulphate and thus is prone to leaching below the rooting zone before it is taken up by the crops.

By using polysulphate, N can be applied independently, separating S from N application. Nitrogen can be applied after germination at the right time for the crop, in the right form, and in right weather conditions

Figure 3. N:S ratio of wheat grains at harvest.



“Polysulphate is suitable as a source of sulphate for inclusion with multiple dressings of fertilizer

avoiding N overdosing or leaching. With polysulphate, higher N use efficiency can be achieved without waste and unnecessary cost to the farmer or the environment.

The steady, prolonged release of S over a longer period than other fertilizers is a key advantage of polysulphate. Along with S, polysulphate provides three other nutrients (K, Mg and Ca) in one single application and has a positive effect on crop growth, yield and quality – many experiments worldwide show this steady yield response to polysulphate application (see figure 2).

Financial and environmental benefits of polysulphate for farmers

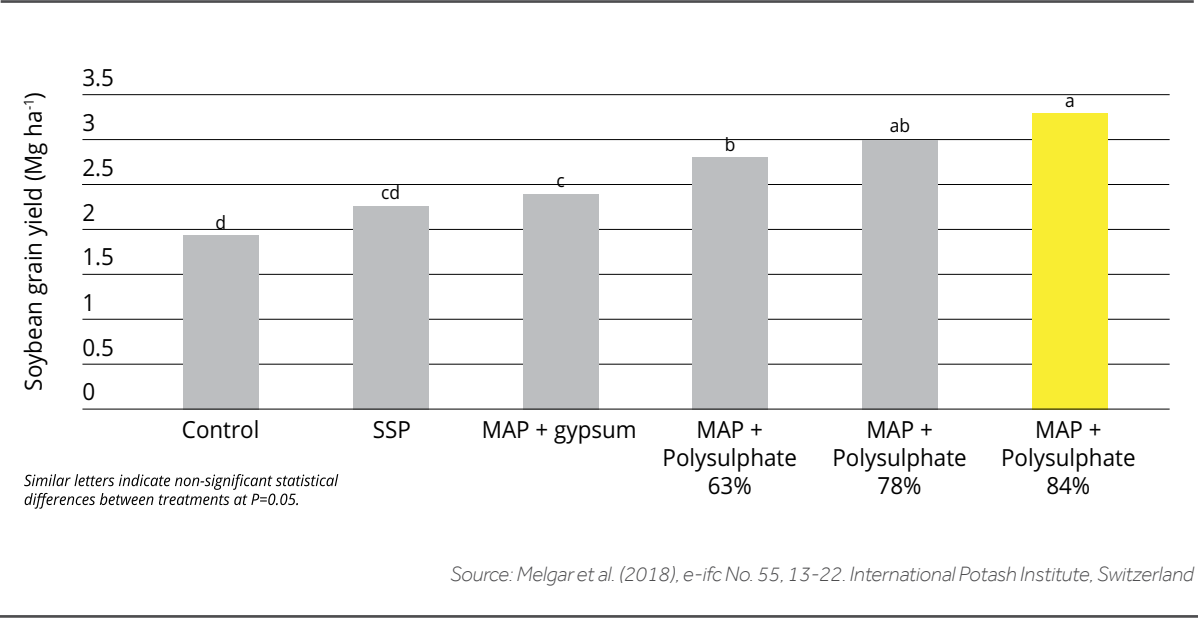
The prolonged release of S from polysulphate helps growers to save money on fertilizer costs, by cutting back on the number of fertilizer applications necessary. In addition, there is an environmental benefit of reducing the risk of S leaching.

Polysulphate is suitable as a source of sulphate for inclusion with multiple dressings of fertilizers over the season, but its strength is that it can be recommended as a single early dressing without causing a sudden high concentration of sulphate in the soil and with minimum risk of loss through leaching.

Polysulphate also improves the quality of produce. There is a growing body of evidence for this in crops in many parts of the world. For example, in an experiment with wheat carried out by Southeast Missouri State University, USA, polysulphate improved the N:S ratio in grains and thus enhanced the baking quality of the flour (see figure 3).

Success in contemporary agriculture requires strategic use of inputs. Targeted, balanced and precise crop nutrition, with gradual and prolonged release of adequate S, is one of the keys to unlocking crop performance and achieving both crop productivity and profitability. ■

Figure 2. Soybean yield response to different S fertilizers at Mercedes, Argentina.



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Production:

Ernest Worsley Publishing Ltd
www.ernestworsleypublishing.com

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ISSN 2631-7591

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