Chemicals

Global Agriculture & Materials Conference wrap-up; Focus on macro and sustainability

Industry Overview

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Equity
United States
Chemicals

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Chemical Sector Conference wrap-up

Our 10th annual BofA Global Agriculture & Materials Conference included over 70 companies and 175 investors across global agriculture, chemicals, paper & packaging, building products, and waste sectors. The event featured a keynote presentation from the DOE's Chief Commercial Officer and 12 industry panels spanning the topics of plastics circularity, hydrogen, lithium, seed technology, sustainable aviation fuel, Ag biologics, and several paper & packaging panels (Staphos report here). We also toured Dow and Lyondell petchem facilities in Texas and Mosaic's phosphate operations in FL.

Sustainability Initiatives

Three members of the DOE participated in various panel discussions, which seemed well received by the corporates as they are all evaluating technologies to cost effectively decarbonize. The DOE's approach is to facilitate and enable industry to decarbonize by funding new technology developments and supporting supply and demand relationships (e.g. hydrogen hubs). Our sustainable plastic panel highlighted how the technologies have diversified from mechanical, to molecular, to renewable feedstocks.

Many moving parts in Agriculture

Within the Ag sector, we hosted seed, crop chemical, fertilizer and ethanol companies along with several AgTech companies developing new approaches to gene edited seeds and bacterial products. Within the fertilizers, we would characterize nitrogen as having the most significant near-term upside, phosphate as having the most industry discipline and thus the most favorable pricing, and potash as suffering from aggressive FSU pricing. Our discussion with Corteva and a seed technology panel highlighted expectations for accelerating crop yields in coming years from gene editing. Crop chemical inventories remain elevated in South America, with aggressive generic pricing.

Nearing a bottom in Lithium and Petchems

We hosted discussions with 6 lithium companies, who were all expecting a near-term bottom in pricing with a recovery likely this year, but the timing less certain. The outlook for petchems was more mixed as global demand for PVC was still sluggish, but some pricing strength expected near-term.

Shareholder Activism

We hosted a panel discussion on shareholder activism consisting of attorneys focused exclusively either on the activism side or the defense side. Areas of agreement between these sides is that proxy fights have increased significantly in the post-COVID era, and not just from traditional activists, but more broadly from investors that are willing to go public in pursuit of operating changes or a new CEO as a result of poor performance.

Refer to important disclosures on page 24 to 27. Analyst Certification on page 23. Price Objective Basis/Risk on page 20. 12666945

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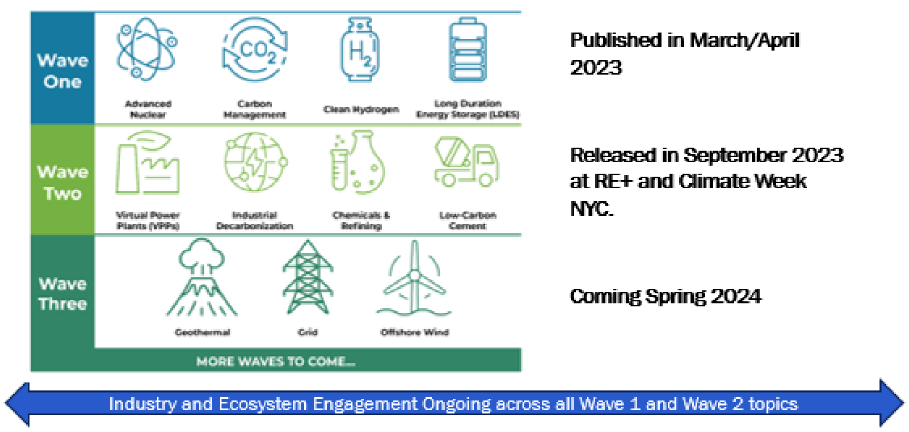
Keynote Presentation

DOE focused on accelerating decarbonization

Our keynote presentation was from Dr Vanessa Chan, the Department of Energy's (DOE) Chief Commercialization Officer and Director of the Office of Technology Transitions, reporting directly to Secretary Granholm. Dr. Chan was pulled into the DOE by the Biden administration and is currently on leave of absence as professor at the U Penn School of Engineering. Dr. Chan's focus at the DOE is to help drive industrial decarbonization with programs that are private sector-led but DOE enabled. Legislation passed since 2021has provided significant funding for these initiatives (CHIPS and Science Act, Bipartisan Infrastructure Law, and Inflation Reduction Act). Collectively, the DOE has $100+bn to incentivize decarbonization via grants, loans, rebates, and tax credits. These programs include 7 regional clean hydrogen hubs to facilitate demand, numerous carbon capture demonstration project, and several tax incentives from IRA such as 45V (clean hydrogen), 45Q (carbon capture), 48C (energy decarbonization), 48E (clean energy).

To help drive innovation and to highlight the opportunities for decarbonization, the DOE has created 8 Pathways to Liftoff reports, which are industry-specific detailed reports on sources of carbon emissions and technologies available and in development for decarbonization. These 8 reports are illustrated in Exh 1 in waves 1 and 2, with another wave expected in coming months. The lead authors for 2 of these Liftoff reports, Industrial Decarbonization and Chemicals & Refining also participated in our conference on the Sustainable Plastic and Hydrogen panels, respectively.

Exhibit 1: DOE's Liftoff Reports
The DOE published 8 industrial decarbonization reports in 2023, with 4 more in development



Source: Dept of Energy

BofA GLOBAL RESEARCH

Panels, Dinners, and Field trips

Fertilizer Dinner and Panel

We hosted a dinner and panel discussion on the outlook for fertilizers with Melih Keyman, CEO of Keytrade, a global fertilizer trader. Our panel discussion also included Don Lambert, CEO of Eurochem Americas, who distribute 4mnt of fertilizer in the US and 8mnt of fertilizer in Brazil. These individuals were quite bullish about near-term strength in nitrogen prices in the US market due to a multitude of factors: 1. US imports of urea in the 2H of 2023 and the first 2 months of 2024 have been well below historical levels, 2. US nitrogen production in January was disrupted from adverse weather events, 3. The US planting season has already started in Texas, roughly a month earlier than normal, and a likely indicator of an early spring throughout the Cornbelt, 4. Retail inventory levels are likely tight, 5. China's urea exports have been curtailed since the beginning of the year and may not restart for another month, and 6. demand should be roughly normal. These factors are expected to more than offset the recent restart of some European production capacity. There are only a few weeks remaining to order new US imports of urea to reach the Cornbelt ahead of spring planting. The longer-term supply outlook is also constructive, as there is very little new capacity under construction and global demand growth requires 1-2 new world-scale nitrogen plants per year. Both Keyman and Lambert view nitrogen as the tightest fertilizer commodity longer term.

Phosphate pricing has been surprisingly firm in the view of both experts, particularly in the US, as the three primary sources of imported phosphate (OCP, PhosAgro and Eurochem) are all blocked due to countervailing duties. Thus, Lambert has had to resort to importing phosphate fertilizer from second tier producing countries. Global supplies of phosphate have been tight due to reduced exports out of China and discipline from OCP. China's phosphate rock supplies have been diminishing from less production and increased use in LFP cathodes, leading the country to import phosphate rock from Egypt in 2023. Keyman believes that China's phosphate rock reserves will last ~30 years, and thus increased demand for LFP cathodes could keep China's exports from returning to historical levels.

The view on potash pricing was the most cautious, with FSU tons nearly back to pre-war levels in spite of sanctions, but with fewer countries willing to buy FSU product, it has led to discounted pricing. Increased supplies out of Laos could keep pricing from improving. While soil nutrient levels of potash are likely low, Keyman and Lambert do not expect above normal application rates in 2024 without a rally in grain prices. Keyman believes that the more agronomically advanced countries of US and Brazil are focused on replenishing depleted soil potash levels, but this process could several years in second tier importing countries in Central America and Southeast Asia.

Lithium Dinner and Panel

We hosted a dinner and panel discussion with Keith Phillips, CEO of Piedmont Lithium, Jon Evans, CEO of Lithium Americas, Robert Mintak, CEO of Standard Lithium, Dale Henderson, CEO of Pilbara Minerals, and Matt DeYoe, EVP for Strategic Development at Sigma Lithium. Most of the lithium corporates had a view that lithium pricing was not likely to move much lower and that there were some signs of increased demand. In general, the view was that current pricing was well below incentive pricing and thus tight market conditions could return in 2-3 years.

Piedmont has several projects underway with continued spodumene mining in Quebec and projects in development in Ghana and North Carolina. The North American Lithium project is an open pit spodumene mine in Quebec (Piedmont has 25% interest) and could approach breakeven economics at current pricing post the installation of a storage facility that will enable more continuous operations. Piedmont's Ghana mine (JV with 50% offtake agreement) has course grained spodumene, similar to Sigma, which does not require floatation, and could be producing in 2026. Permitting activities for a hard rock mine project in North Carolina are seeing recent signs of progress, which could be completed in coming months. If realized near-term, Piedmont's prior plans to build a lithium hydroxide plant in Tennessee, while fully permitted, would be tabled and the North Carolina mine and conversion plant would be prioritized.

Lithium Americas is expecting a very near-term approval ("any day now") on a construction loan from the DOE for the company's mining and lithium carbonate project at Thacker Pass in northern Nevada. The company expects construction activities to commence this year with mechanical completion in 2027 followed by achieving full run rate sometime in 2028. Unlike igneous spodumene deposits, Thacker Pass is a sedimentary deposit, and while the lithium concentration in the deposit is roughly 3000ppm, with some areas as high as 10,000 ppm, below most spodumene mines at 15,000 ppm, the Thacker Pass deposit is not a narrow seam but the entire valley and thus the lithium reserves are extensive. This clay deposit will not require grinding, crushing, or floatation, and thus water use and CO_2 emissions are expected to be well below other mines. The lithium will be extracted with sulfuric acid, produced on site from molten sulfur, which will generate sufficient heat for cogeneration to supply most of the plant's electricity requirements (similar to the phosphate industry). This project will also include an onsite lithium carbonate plant, with 100% of offtake from phase 1 to partner General Motors.

Standard Lithium is primarily focused on the development of their Southwest Arkansas project, 30 minutes west of El Dorado, where Mintak expects operating costs could be closer to $5k/t LCE, or roughly half the cost estimate for the demonstration project, owing to higher lithium concentrations in the brine with an average of 440ppm vs 240ppm in the demonstration project. Further west in the Smackover Formation, Standard has discovered even higher lithium concentrations above 600ppm in Texas. Standard's direct lithium extraction (DLE) project seems to be attracting other interested developers as Albemarle and Exxon are evaluating projects in the Smackover.

Sigma Lithium is expected to reach Final Investment Decisions (FID) on the phase 2 spodumene mining project in Brazil, potentially this month, now that they have a Letter of Intent (LOI) from the Brazilian Development Bank (BNDES) for a $100mn loan at MSD interest rates and potentially 1-2 years interest free. Sigma estimates that each of phase 2 and 3 could be completed for roughly $100mn of capex, reflecting the modest onsite unit operations to concentrate the spodumene using a centrifuge technology, rather than floatation. Sigma has recently updated the lithium reserve in this project, which increased by nearly 30%. After 6 months of operations, the company achieved nameplate production rates in December at 35kt/yr LCE. Sigma's updated operating costs for the phase 1 project are expected to be $445/t for 4Q (FOB the mine), highlighting a very low cost resource and mining operation. The company is still engaged in a strategic review but is simultaneously evaluating the expansion into phase 2.

Sustainable Plastic Panel

We hosted a sustainable plastic panel that included Kevin Kwilinshi, CEO from Berry Global, Howard Coker, CEO of Sonoco Products, Kate Scott from the Dept of Energy, and Pankaj Gupta, IR for Dow.

Berry Global's CEO Kevin Kwilinski and Sonoco Products' CEO Howard Coker provided the packaging perspective on the panel, and highlighted that there is significant demand for recycled resin but there are a number of hurdles to incorporating greater usage of these materials in packaging versus other substrates. To begin, fitness of purpose (i.e., functionality, value, convenience, product protection) were seen as paramount to determining the appropriate package for an application, and there wasn't a "one 'material' fits all" solution espoused by either. Carbon footprint was viewed as favoring plastics on a "virgin" basis but comparisons become much more difficult to make (and plastics' comparative positioning becomes murkier) when looking at recycled materials. And in that regard, one of the panelists stated that paper recycling utilizes well-known, existing technology ("you can just put the old paper in a hydropulper"), while the broader panel commented (as it did last year) that supply of recycled polyethylene (perhaps less than 10mn tons and mostly mechanically recycled) is dwarfed by the global demand of 120mn tons. Once again, legislation including extended producer responsibility (EPR) mandates, education and other factors were cited as imperatives to drive US plastics recycling from 9% to the 50% goals by 2030. Moreover, recycled polyethylene resin was seen as costing 40-50c per pound to manufacture relative to 20c for virgin – our panelists believed that consumers (and consumer product goods [CPG] companies) are willing to pay some premium for recycled and sustainable materials, but there was uncertainty as to the absolute levels.

According to Mr. Gupta, recovery rates for waste plastic in Europe are 4-5x higher than the US. This is largely because regulatory environments that supports EPR and PCR goals are the single biggest factor in driving higher recovery rates. This allows for a more level playing field for all participants involved as it provides certainty around long term demand for recycled content in the market. For example, we have observed GFL Environmental and Waste Management investing in territories and states to develop recycling infrastructure (collecting, sorting) following ERP legislation. Additionally, increasing technology adoption rates at MRFs would also be at catalyst in making the sorting process more economical (less time-consuming, more cost effective) given that materials sorting today is largely done manually. Technology (optical sorters, AI, etc.) could make this process more automated to recover higher quality materials at a much larger scale. We are observing record capital spending in this area on the waste collection and sorting side of the ecosystem.

Both Dow and the DOE highlighted many new technologies in development to lower the carbon footprint of producing packaging polymers, such as using hydrogen or renewable power to generate the 800-1000C necessary for ethylene crackers. Another approach in development by Dow, with funding from the DOE is a modular single nuclear reactor to generate low carbon heat. Another sustainability approach being explored by Dow is pyrolysis of mixed plastic waste to generate "renewable" cracker feedstock. This pyrolysis process is still energy intensive, but enables full circularity.

Ag Biologicals Panel

Our panel on biologics included Ernie Sanders, VP of Product Innovation at Pivot Bio, Marcus Meadows-Smith, CEO of BioConsortia, and John Dombrosky, CEO of Oerth Bio. The panel highlighted many drivers for more innovative and sustainable sources of crop nutrients and crop protection. Ammonia-producing bacteria are an opportunity to avoid the CO_2 emissions from synthetic ammonia production and given that the ammonia is produced directly on the surface of crop roots, there is no leaching into waterways or conversion into other compounds like nitrates (subject to leaching) or nitrous oxides (higher global warming potential than CO_2). New modes of action for crop protection are needed to counter pest resistance development, and some regulatory agencies are making it challenging to use synthetic crop chemicals, which is leading to increased interest in biologicals.

Pivot's ammonia-producing product PROVEN40 was applied to 5mn acres of US corn in 2023, with expectations for further penetration in 2024. This product is capable of producing 40lbs of nitrogen per acre, vs the first-generation product produced 25 lb/acre. In 2023, Pivot made PROVEN40 available as a seed treatment, which was estimated to represent nearly half of applications. This fraction is expected to reach 60-70% in 2024, which we believe could accelerate adoption. Next generation products are in development with increased ammonia production levels, and Pivot is seeking partnerships with seed companies to accelerate market penetration. The company expects to receive registration for PROVEN in Brazil and Canada in the next 1-2 years. Pivot has a pipeline of next generation products that are expected to achieve even higher levels of nitrogen production.

BioConsortia has a diverse platform of biologicals including ammonia-producing products. BioConsortia's products are all derived from gram positive bacteria, which are spore formers, and thus these products have a 2-year shelf life and are well suited for seed treatments. Their ammonia-producing products have been evaluated on a variety of crops including grain crops like corn and wheat, but also extensively within fruits and vegetables. Mosaic is BioConsortia's commercial partner for the grain crops. The company has some fungicidal bacterial products that are now being commercialized by BioConsortia's partner Nichino America. Another product category that BioConsortia has in development are bacteria with nematicidal activity, which represents a significantly unmet need, given the challenges of delivering synthetic chemicals below ground.

Oerth Bio is a JV between Arvinas and Bayer formed 4 years ago to apply a technology developed by Arvinas and other biotech pharma companies for cancer therapies to become a new class of crop protection molecules. This technology has the potential to be very pest specific (weed, insect, fungi) with minimal human risks. In brief, Oerth's technology involves a synthetic molecule called a PROTAC that can identify a targeted protein and link it to an E3 ligase, leading to degradation of the targeted protein. These

E3 ligases are kingdom-specific (e.g. plants, fungi, animals), enabling the development of a PROTAC that targets an essential protein for survival in a pest, with reduced risks to humans. Oerth Bio has products in development for each of these pests, with a fungi target in the lead (e.g. soybean rust) that has outperformed the leading fungicidal control. Oerth also has a partnership with Yara to develop PROTACs to assist crops with drought stress.

Sustainable Aviation Fuel Panel

Our panel on Sustainable Aviation Fuel (SAF) focused on both alcohol-to-jet (ATJ) technologies and feedstocks. We hosted John Hannon, COO of Vertimass, Geoff Trukenbrod, CFO of LanzaTech, Devin Mogler, SVP Government Affairs, Sustainability and Communications at Green Plains, and Victoria Cabello, Investor Relations Officer at Adecoagro. Panelists noted the urgency to work towards renewable aviation fuel given that aviation comprises ~2-3% of global greenhouse gas emissions and there are few alternatives for the airline industry to decarbonize. Such an endeavor would require massive new SAF and feedstock capacity. Given that ATJ SAF typically requires ~1.7 gallons of ethanol feedstock per gallon of SAF, the US ethanol industry could produce ~10bn gallons of fuel annually; that compares to ~25bn gallons of domestic and ~100bn gallons of global jet fuel consumption.

Vertimass, a 10-year old company which is striving to commercialize its ATJ technology, noted that its key differentiation vs other technologies being evaluated is that it can produce SAF from ethanol or methanol in a single step vs four steps traditionally. As an ATJ producer, Vertimass is relatively indifferent on feedstocks, although Mr. Hannon noted that each one has its own advantages – e.g., sugarcane ethanol offers low CI while corn ethanol is more widely available. LanzaTech's core business is the production of ethanol from CO2, but the company is also a 25% owner of ATJ producer LanzaJet. LanzaJet was spun out of LNZA with the latter's IP while other companies contributed capital. In January, it started up its first commercial ATJ plant (and the first commercial scale globally) in Freedom Pines, GA. This plant will initially use sugarcane ethanol, but longer-term using LNZA's CO2-based ethanol will be a key priority, especially outside of the US. With regard to costs, both Vertimass and LanzaTech noted that their SAF should be priced close to carbon-based jet fuel when taking into account a ~$8-9/gallon SAF price and ~$5/gallon credits. At the same time, airline decarbonization mandates and potentially carbon pricing should allow SAF to still sell for a premium net of the credits.

Adecoagro's sugarcane ethanol production in Brazil is highly advantaged vs corn given a CI score of around 25 vs 50-60 for corn. Ms. Cabello noted that the main driver of lower carbon intensity is sugarcane's efficiency, as the crop can produce ~8k liters of ethanol per acre vs under 5k for corn. Given this CI score, Adecoagro is already in the final step of certifying its mills under the CORSIA model, after which it will be able to sell its ethanol for SAF production and is already having discussions with buyers globally. Adecoagro's mills already use the byproduct bagasse for fuel generation which is also sold to the grid. However, the company could consider second generation ethanol – which effectively is a new technology allowing the extraction of ethanol from the bagasse. Ms. Cabello noted that second generation ethanol plants can produce ethanol with a CI score of 16.

Green Plains' Devin Mogler noted that the company is waiting for the final guidelines from the government regarding carbon intensity modelling, but regardless, the main priority is bringing the company's mills to a CI score below 50. The main path to decarbonization is carbon capture, which the company plans to implement on seven out of its 10 mills. Additional CI reduction can be achieved through on-farm carbon management, such as the use of cover crops and reduced fertilizer applications.

Seed Technology Panel

Our seed panel discussion included 4 PhDs all in the plant sciences: Sam Eathington, Head of R&D at Corteva, Tom Adams, CEO of Pairwise, Greg Gocal, CTO of Cibus, and

Fayaz Khazi, CEO of Traitology, wholly owned by GDM. This may have been the 10th Seed panel we have hosted at this conference, but it was the most differentiated regarding a constructive outlook, driven by the potentially transformative impact from the expected new EU law enabling gene edited seeds. While the panel views the primary value proposition of gene editing to accelerate yield gains or to protect genetic yield, there were several other applications that have sustainability benefits, such as to increase carbon sequestration, reduce crop allergens, improve drought and salt tolerance, and to improve nutrient utilization.

While Corteva has gene editing expertise from both DuPont and Dow predecessor companies, the company has been effectively precluded from using the technology in its large Pioneer seed business, as some of US grain and oilseed exports are shipped to Europe. Eathington views gene editing as a way to accelerate yield gains by being able to precisely select the optimal allele (or create new alleles) associated with all the yield-affecting genes from Corteva's massive library of seed germplasm. Corteva is using gene editing to create a non-GMO version of short-stature corn. Similarly, Traitology is affiliated with GDM, the large LatAm soybean seed company, and Khazi's charter is to use gene editing and predictive analytics to drive yield gains. GDM has recently received approval for 2 soybean traits derived from gene editing, a low raffinose trait and a drought tolerance trait.

While Corteva and GDM are utilizing gene editing to accelerate yield gains from selective breeding, the other two panelist, Cibus and Pairwise, are utilizing gene editing to develop novel traits to be licensed by other seed companies. Pairwise has funding from Bayer to develop yield enhancing traits in corn and soybeans, such as a gene edit that increases the number rows on an ear of corn, or to increase the number of seeds per soybean pod. But roughly half of Pairwise's research is focused on fruits and vegetables, such as kale without the pungent flavor (branded as Conscious Greens), or to remove the seeds in cherries and blackberries. After Pairwise launched Conscious Greens, the company conducted large surveys at several state fairs to collect interest levels and perception, and they found that the flavor benefits significantly offset concerns about gene editing. Cibus has several non-GMO herbicide tolerance traits available for licensing in rice seeds, and they also have a trait developed for canola seed that reduces pod shatter, and thus increases harvested yield. Cibus expects to be able to insert gene edited traits into licensee's seed, followed by germination and production of new gene edited seeds within 9 months. Cibus has sclerotinia resistance and nutrient use efficiency traits in development.

Shareholder Activism

We were joined for a panel discussion on activist investing by Amy Lissauer, Global Head of Activism & Raid Defense at BofA Securities, exclusively on the defense side, Elizabeth Gonzalez-Sussman, Partner and Head of ESG Investing at Olshan Frome Wolosky LLP, exclusively on the activism side, Jessica Wood from Sidley Austin, representing the defense side, and Nick Lamplough of Collected Strategies, providing PR support for the defense side. We hosted this panel discussion two years ago, and the focus of activists at that time was primarily on ESG issues. Now the focus is on driving a change in operations or to change the CEO in order to improve performance.

Gonzalez-Sussman described the traditional activist investor as someone looking to fund good companies that are undervalued due to less-than-ideal boardroom dynamics. These investors are sometimes from well-established funds or fledgling funds with individuals who left their former funds, but activism activity broadly results from a disconnect between the company's management team and shareholders. Panelists all noted a clear trend of increased shareholder activism post-COVID in most industries, including Chemicals.

After pin-pointing the factors that are driving underperformance, an activist investor will engage with shareholders speaking about governance and board composition to figure out if there is a clear opportunity to make improvements - if there is, this makes the corporate even more vulnerable to activism. If the activist investor chooses to engage with the board, they can do so initially with a private letter where they express their concerns to the current board and demand certain changes to governance. If the activists' demands are not met by the current board and a settlement is not reached, the activist may go public to shareholders with their campaign. However, the panelists have noted an increase in activism campaigns immediately going public, rather than starting private, which pressures targeted companies to address the issue promptly. A large portion of these activism campaigns target the CEO specifically, so target companies should have a CEO succession plan in place and to be included on the Universal Proxy Card, which lists all potential candidate replacements from both the activist and corporate side.

According to Wood and Lamplough, companies should better prepare for (or ideally avoid) these events by paying more attention to shareholders, keeping engagement with activist investors private, and cooperating/communicating with activist investors since regardless of what may be viewed as aggressive tactics, activist investor are still shareholders. Much of the panel discussion was on the role of boards, and for many underperforming companies, the board often lacks industry experience, and thus limited ability to challenge the CEO. The Universal proxy card has enabled activists to get their board nominees listed on the cards along with the company nominees, but Gonzalez-Sussman highlighted that many boards changed their bylaws making it much more difficult to getting a qualified nominee.

Petrochemical Field Trip in Texas

Prior to our conference we went on a two-day field trip in Houston to tour two large petrochemical facilities, Dow's Freeport plant and LyondellBasell's LaPorte plant. DOW's Freeport facility is the largest petrochemical plant in the US, and comprises several interconnected sites – three chemical complexes, and salt caverns used for feedstock storage and brine assets. We visited the third, and newest, complex, Oyster Creek, developed in 1969 vs Freeport Plant A in 1940 (mainly as a chlor-alkali plant and more recently MDI), and Plant B in 1942 (housing the TX-7 cracker and Olin's chlor-alkali and epoxy assets). Oyster Creek is home to DOW's newest ethylene cracker, TX-9, which came online in ~2017, as well as the TX-8 flexible cracker, and a PDH plant. It also houses several now third-party assets, including EDC, VCM, polypropylene, and phenol/acetone production. The TX-9 cracker can operate at 110% of nameplate capacity and has ~60-65% of the conversion costs vs an average cracker.

We visited LYB's LaPorte plant, home to the Hyperzone polyethylene plant, which was built with in-house developed technology. While the company had to contend with some operational issues from a new technology, it hopes to outlicense this technology to third parties. The LaPorte cracker has expanded several times, and now has 11 furnaces vs 7 initially. It runs on ethane, LPGs, and chemical grade propylene. Beyond ethylene/PE, LaPorte houses an integrated acetyls complex. This includes a methanol plant, a CO production facility which was acquired by Linde, an acetic acid plant, and a VAM plant. The VAM plant was notably built first, in 1969. It has capacity of 700lbs per year, making LYB the 3rd largest producer in the US and the 7th largest globally. Around 55% of the VAM output is further converted into downstream products, with the remaining sold externally. The acetic acid plant was built in 1980. 50% of its output is used in VAM production. LYB has faced issues with acetic acid production in past years, including a force majeure declared in late-2023. The culprit has largely been lack of CO feedstock due to reliability issues at that facility; however, it was noted that the company recently carried out extensive repairs on this asset.

We also met with Huntsman's CEO, Phil Lister. During the meeting we had the opportunity to discuss the outlook for the company's most resilient business, Advanced Materials. Over the past year, HUN has been able to maintain pricing/margins given its customized epoxy applications which cover critical needs for customers in the aerospace, defense, and other industries. The company produces all its commodity epoxy resin, although less than 10% of this is sold in the market (and as such has faced poor fundamentals) with the remaining upgrade to value-add products. The company's Performance Products business primarily comprises the production of amines/ethylamines and maleic anhydride. The latter is used for the production of unsaturated polyester resins, which in turn are made into durable items such as boat hulls. Besides poor demand conditions especially in Europe, maleic anhydride is also facing significant Chinese supply. Lastly, Mr. Lister noted that the polyurethanes outlook hinges on a construction recovery in China and globally, given the significant exposure of the company's MDI and downstream building products assets to that end-market. While the outlook for MDI has improved slightly, Mr. Lister noted that this is compared to the business' worst-ever quarter; additionally, the price increases proposed by HUN and others will largely set to offset higher benzene prices in Q1, offering little margin expansion.

Lastly we held a meeting with Chemical Market Analytics (CMA) to review the outlook for polyolefins and chlor-alkali. CMA's outlook was broadly bearish. In PE, CMA noted continued capacity additions in China that should keep global operating rates at sub-85% levels for many years. In fact their study showed that to hit an 87% operating rate (viewed broadly as a threshold to tighten S/D) the global market would need 15mn tons of extra demand or capacity rationalization. While smaller plants, especially in Eastern Europe, are shut-down candidates, these would be small-scale facilities. Larger plants (~500ktpa) are newer and unlikely to shut down. Additionally, Chinese ethylene production is largely back-integrated with refineries, thus having different economics vs other, non-integrated, naphtha crackers. Meanwhile, in the US, prices increased earlier than expected last month, but CMA remains cautious, especially given that Shell's Pennsylvania plant has been facing production challenges and should continue to ramp up capacity this year. Additionally, given that the company has no other PE facility in the US and has faced production issues, CMA believes it will have to buy its way into the market.

CMA's outlook was cautious for PVC, with expectations of an eventual recovery but a big question mark on timing. Lower interest rates and housing-related stimulus programs globally will be key for demand. However, supply continues to grow, and thus the next cycle peak is seen in 2029-30. CMA also highlighted several large projects in Asia including India and Thailand. Additionally, in the US the two long-delayed expansions by ShinTech (380ktpa) and Formosa (140-150ktpa) should come online by mid-year per the company's information. Pricing could find some near-term support as CMA pegs Chinese carbide costs (at the high end of the cost curve) at $750/mt (~34cpp), while US domestic pricing is now in the low-40s vs low-30s (cents per pound) for export sales, and below pre-COVID levels.

CMA's view was somewhat more positive on chlor-alkali, where we are probably near/at the bottom. Here, chlorine may be a bit more challenged given CMA's PVC outlook. However, specifically in the US we have seen significant production cutbacks, and this is a market with no global trade, supporting domestic prices. Globally chlorine remains cheap, with Chinese prices specifically in negative territory. While caustic soda pricing trends to recover after chlorine (as traditionally governments respond to recessions with real estate stimulus and lower interest rates), this may not be the case this time. The 2022 energy spike in Europe led to a sharp increase in local prices and significant demand destruction. As costs are coming down, demand in Europe should recover, albeit from a low level. Given that caustic is easily shipped by vessel, the European recovery could lift prices in all regions. CMA believes caustic is currently at a trough with some signs of a recovery, and a more meaningful liftoff in the back-half of the year.

Mosaic Phosphate Field Trip

Our post-conference tour to Mosaic's phosphate operations in northern Florida included the entire process from Four Corners Mine where multiple drag lines were in operation for phosphate ore mining, the Fishhawk Office, where Mosaic now remotely operates all the ore slurry and pumping pits (one for each drag line), to the reclamation areas where Mosaic restores the mined areas back to natural areas or farmland, and lastly to the Bartow plant where the phosphate ore is reacted with sulfuric acid and the resulting phosphoric acid is combined with ammonia to produce DAP/MAP for shipment.

Relative to our previous tours of these phosphate operations, there has been a significant increase in automation, particularly within the mining operations. While the behemoth drag lines still have human operators to judge the depths of the overburden and phosphate ore sedimentary layers, the suspension of the ore into water using water jets, and then slurry pumping to beneficiation plants, is now entirely remotely controlled in Fishhawk, which is up to 40 miles away from the mines. Data collection within each pit operation along with automation enables Mosaic to maximize the suspended solids in the pumped effluent. Automation was also a clear focus at the Integrated Operations Center at the Bartow plant where the control room for each of the production areas (sulfuric acid, phosphoric acid, granulation plant, cogeneration) are all co-located to facilitate the product transfers between each of the operating areas at the plant.

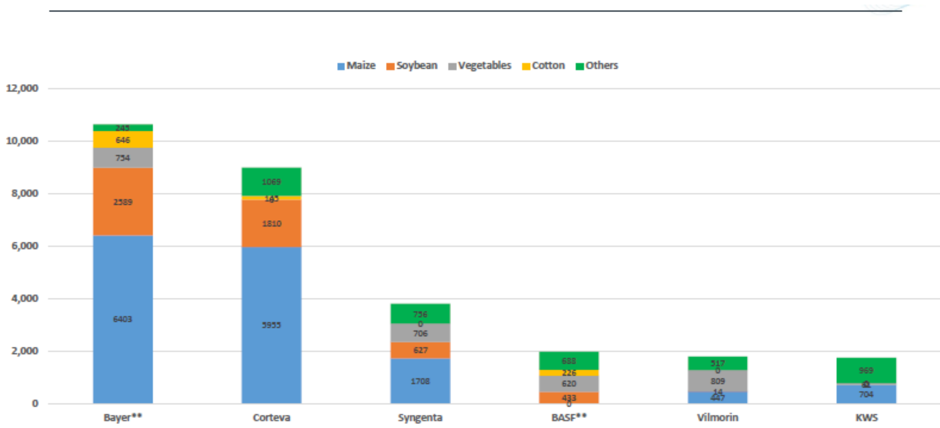
Increasing production run rates within the integrated phosphate operations is a clear objective for Mosaic's phosphate business. Other opportunities being considered include increasing the downstream MicroEssentials production capacity. A second generation version of MicroEssentials (MicroEssentials Pro) is now also entering commercialization. Another opportunity being considered by Mosaic is to develop high purity phosphoric acid for use within LFP batteries. The high quality phosphate rock produced at the Peruvian Misky Mayo joint venture mine may be a preferred source for this high quality phosphoric acid.

Fireside Chats and Company Discussions

AgbioInvestor

The seed and crop chemical experts from AgbioInvestor (Allister Phillips and Derek Oliphant) provided a presentation on their outlook for these industries. We highlight a couple of their slides in the Exhibits that follow. For seeds, Exhibit 2 reflects the duopoly between Bayer and Corteva. Note that Corteva is the only major seed company not involved in vegetable seeds, which we believe may change with their expertise and expansion into gene editing. Corn is clearly the largest seed business and this industry, and US corn seed sales are roughly equal to the global soybean seed market. With respect to crop protection, AgbioInvestor estimates that application rates were relatively normal in 2023, and thus the plunge in sales was entirely due to destocking in distribution channels. They expect a slight decline in global crop chemical sales in the next few years as new product introductions do not offset patent expiries. Longer-term, the primary challenge in crop protection will be regulatory scrutiny on older chemistries while resistance development among insect, fungal, and weed pests will only continue.

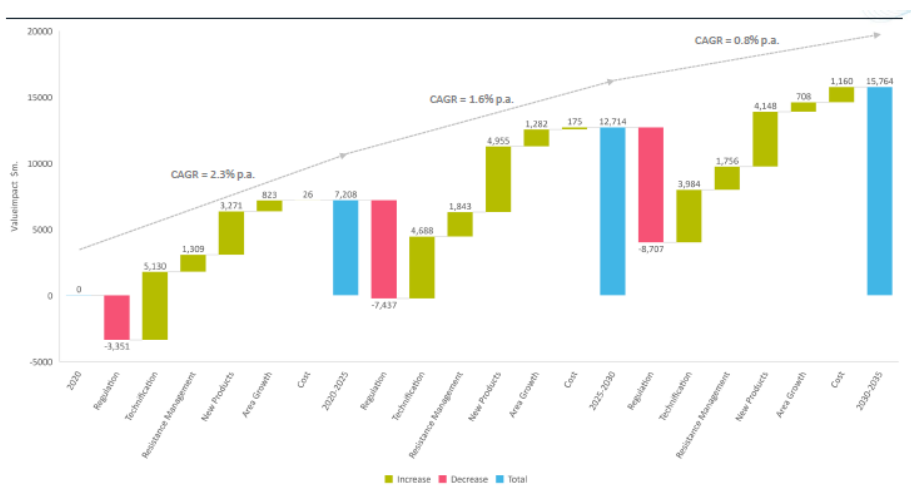
Exhibit 2: Global Sales of Seeds, 2022 ($mn)
US corn seed sales are roughly equal to the global soybean seed market



Source: AgbioInvestor

BofA GLOBAL RESEARCH

Exhibit 3: Sales growth in crop chemicals could slow ($mn)
Regulatory scrutiny is the most significant challenge to crop protection chemicals



Source: AgbioInvestor

BofA GLOBAL RESEARCH

Air Liquide

We hosted Mike Graff, EVP and US Chairman. Investor questions focused on margins after Air Liquide doubled its 2021-25 expansion target. Management emphasized pricing and procurement remain important, but there is also new progress on portfolio mgmt (e.g. shrinking hardgoods offering, restructuring French home healthcare) & industrial efficiencies (digitalization to cut costs). The former has been helped by the 2021-22 CEO/CFO changes, in our view, which we think created a greater cultural shift than investors give credit to. Mgmt highlighted further potential beyond 2025; we note closing even half the margin (& return) gap to peer Linde would lift profits a further 20% vs our (already bullish) ests. On clean energy, Mr Graff described high project activity, with customers moving forward on engineering & some even signing conditional downstream offtake contracts before FID. However, US FIDs are unlikely before the Treasury's final 45V hydrogen tax credit rules (likely Q2) – even for blue projects, as customers weigh 45V vs 45Q CCS tax credit (can't claim both). In the meantime, however, Air Liquide has 9 EU projects which have already received subsidies & so will more quickly boost the backlog in our view Near-term volume trends remain anemic, with February seemingly another flattish month in on-site, merchant & electronics per management and peers. The two bright spots are merchant pricing (management highlighted US CPI still +4%) and healthcare (which we think will remain very strong in H1).

Akzo Nobel

Investor questions focussed on raw material price developments given the Red Sea disruptions' possible impact on chemical pricing, but Akzo suggested they have not seen a change in raw material price trends as a result – still pointing to HSD deflation in H1 and a flat development (y/y) in H2. Visibility on this is helped by signing 3-5 month contracts for commoditised raw materials, and having 100 days inventory on hand, but we note that we see most chemical prices moving up M-HSD sequentially into March. On volumes, Q1 has been ok so far – with powder/industrial a bit better, and China a bit worse. Deco price increases on 1st January in Europe appear to have stuck for small/medium-sized customers (c. 85% of sales), but not for larger customers who are 'allergic' to price increases currently. Akzo expressed no interest in the PPG North American deco business, >50% of which PPG actually bought from Akzo several years ago.

Arcadium

We hosted Paul Graves, CEO of Arcadium Lithium, which resulted from the recent Livent/Allkem merger of equals. Despite the currently less than favorable lithium price dynamics, Graves was quite constructive on the outlook for Arcadium due to the benefits of scale and full integration of resources. Arcadium expects 15kt LCE expansion in volumes in 2024 (40% of 25kt Olaroz project + 75% of 10kt Fenix project) all of which is lithium carbonate. The majority of the battery grade carbonate from the Fenix project will feed downstream hydroxide production and, thus to be developed into contracts (with floors/ceilings) that expand over time. The technical grade carbonate production from the Olaroz project however, will likely stay uncontracted due to the commoditized nature of technical grade carbonate. Graves expressed the desire to convert legacy Allkem's technical grade lithium carbonate (Olaroz) into lithium hydroxide rather than selling it directing into the market (given the technical grade price discount), which will take time due to requalification requirements, but may have some Argentine tax benefits.

Graves hypothesized that while the market is currently unfavorable (caused by already out-the-money African sourced spodumene or Chinese based lepidolite conversion capacity), the demand environment will eventually absorb that additional capacity, perhaps later this year. This dynamic may also accelerate the desire to diversify supply chains to be less dependent on China, but this will likely be an ongoing process given overwhelmingly dominant share China has in conversion capacity. In the near term, the pricing environment has influenced Arcadium to cut back on short-term capital spending ($1bn cut to $650mn) and accelerate synergies of the merger, now estimated at $60-80mn in 2024, primarily driven by cost cutting (headcount reductions, overlapping offices, more efficient procurement) in the near term. There may be additional cost synergies from combining processes of legacy Allkem's Sal de Vida project expansion with legacy Livent's brine process in Fenix (~10km away), sharing infrastructure and labor force.

CF Industries

We hosted Bert Frost, EVP of Sales, Market Development, and Supply Chain. Mr. Frost, like many other fertilizer market participants, was bullish on the near-term outlook for nitrogen. He noted that the spring season appears to have arrived early, and CF is seeing increased sales inquiries. However, the key issue is tight supply. For the past few months, the US market was the lowest-priced market globally, leading to elevated exports and reduced imports. Additionally, the January cold snap resulted in lost production by CF and some of its peers. The combination of earlier-than-expected demand and tight supply has led to increased NOLA prices, but also to a much wider-than-normal Cornbelt premium. Looking ahead, there is little time to bring additional imports to the US on time from overseas, although Mr. Frost doesn't expect US farmers to be short nitrogen, as CF can utilize its extensive distribution network and connections to the Nustar pipeline to move product to where it is needed. We expect this tightness to drive an expanded price premium in the Cornbelt.

Longer-term, CF sees limited nitrogen supply growth, noting that in the past natural gas producing countries saw ammonia/nitrogen fertilizers as the simplest and best way to add value, but now have shifted their focus to LNG. Most of the new nitrogen capacity should come from Russia and Iran. CF remains focused on the blue ammonia market and the potential for Japan and South Korea to replace some of their coal consumption with ammonia, as a means to reduce CO2 emissions. Cargoes of blue ammonia are expected to exported in 2025, which could tighten global ammonia markets.

Corteva

We hosted Corteva's CEO Chuck Magro and CFO Dave Anderson. Mr. Magro noted that ag fundamentals remain constructive, and famers have built strong balance sheets in the past few years. This supports continued strong demand for crop chemicals and seeds at the farmer level. However, the crop chem market should remain "unbalanced" through 1H24 and 1Q will be rough for CTVA's Crop Chemicals segment, where profits could be closer to 1Q21 levels. We believe Corteva's outlook hasn't changed, but rather comments indicated that the Street is likely overly optimistic with in its ~$1.1bn+ 1Q24 estimate. CTVA reiterated its 2024 outlook for revenue sales growth of 2% at the midpoint and faster EBITDA growth driven by $250-300mn in controllables.

Magro and Anderson highlighted that its seed platform comprised of corn, soybean, cotton, and canola seeds will be the key driver of earnings growth and lead to royalty neutrality by 2030 and steady gains in EBITDA margins. Potential acceleration in the Enlist soybean and cotton traits and Powercore corn trait, and increased outlicensing of proprietary germplasm, Magro believes this net neutral royalty expense goal could be achieved a couple of years earlier. The opportunity to accelerate yield gains with gene editing was described as a once in a generation technology development, consistent with the views from our seed panel discussion.

Regarding the outlook for 2025, Corteva indicated it has enough chemical and seed supply should dicamba fail to re-register, as registrations for dicamba were vacated earlier this year, but existing supplies will be available for 2024. Other areas of seed growth longer-term include short stature corn, and steady expansion in biologicals, which Magro expects to represent 25% of the crop chemical platform by 2035.

Element Solutions

We hosted Ben Gliklich, CEO of Element Solutions, focusing on the company's organic and inorganic growth drivers, which consistently command a premium to industrial and electronic market growth. He outlined ESI's goal to outgrow each of the companies end markets regardless of the global macroeconomy. The company has been able to achieve this growth through a targeted sales team and technological innovation both expanding ESI's market participation in faster growth higher margin products. One example of this is ArgoMax, a product used in power electronics (Semiconductors business) where ESI brought to the market new material science which improves the reliability and range in power semiconductors.

Gliklich also highlighted inorganic growth, albeit not in the tradition market consolidation/expansion sense, including recent transactions ViaForm and Kuprion, both completed in 2023 and both unique in the sense that they were not made for market consolidation or conventional market expansion: The ViaForm transaction was a termination of the prior distribution agreement with Integris, and a subsequent purchase of the product line, resulting in streamlined transactions with customers and increased volumes from semiconductor fab customers looking to backwards integrate onto legacy nodes. The Kuprion transaction increased ESI's technical capabilities, providing ownership of a next-generation nano-copper technology with end uses in electronics end-markets, particularly growthier markets (EVs, 5G networks, IC substrates, advanced packaging). 2024 guidance midpoint implies some 2H improvement (above regular seasonality) driven by electronics market recovery, and Gliklich confirmed that in the long term the Electronics segment will be a larger portfolio of the overall company revenue, due to a faster growing topline.

FMC

We hosted FMC's CFO, Andrew Sandifer for a fireside discussion. Mr. Sandifer noted that so far Q1 was progressing as expected, although March is a key month for the quarter. There are some signs of a "return of visibility" into customer needs more recently, with increased dialogue about future needs. Brazil remains the softest market with an inventory overhang through 1Q24 that has led to price rebates to distributors. As the current season comes to an end, inventory should overall be at a healthy level, although in some cases stocks could remain elevated even at the start of the new LatAm season in September. Regarding the price pressure in Brazil, Mr. Sandifer noted that it has less to do with generic price declines and more with excess inventories; and FMC has been quite disciplined by pulling back sales but trying to hold up pricing. The company also noted it is making inroads in expanding its market intelligence through formal and informal sources. The key hurdle to expanding visibility is that it has to be done on a country-by-country basis and distributor-specific, which is particularly challenging in some countries like Brazil.

Looking ahead, Mr. Sandifer highlighted that four Ais should deliver $2bn in sales by 2023. These include the Isoflex cereal herbicide, the Fluindapyr fungicide for soybean rust, and the Dodylex rice herbicide that should be launched in 2026. The company is also excited about its pheromone product suite that should be more environmentally-friendly as its mechanism of action is to prevent mating. On diamides, Mr. Sandifer noted that branded sales were down 7% in 2023, while total diamide sales were down 15%; this means even non-branded diamides outperformed the rest of FMC's portfolio. The company is currently litigating against four companies in India although the legal process is moving quite slow. In Brazil there was one generics company that tried to "cut the line" but lost a legal case and now has to wait a couple more years to enter the market.

Green Plains

We hosted Green Plains CEO, Todd Becker for a fireside discussion. Near-term, ethanol margins have been under pressure as production has remained at high levels and demand has been seasonally soft. However, demand could improve from Mid-March as the driving season commences. Meanwhile, Mr. Becker noted that production at such elevated levels is unlikely to be maintained for a long period based on historical data. Additionally, ethanol prices are now a full dollar/gallon below US gasoline prices, close to historical record discounts, and even at a discount to Brazilian ethanol prices – boding well for ethanol's competitiveness and arbitrage opportunities in 2024.

Regarding GPRE's transformation into higher-value products, 2023 high-pro volumes were lower than initially expected in part due to production setbacks in 1H23, including the Wood River outage and extended turnarounds in other mills. However, Mr. Becker was optimistic about the 2024 production outlook. Mr. Becker was even more excited about the dextrose business, which should ship its first product in April. While the Shenandoah, IA plant conversion is almost mechanically complete, the dextrose ramp will be slow and operating rates won't reach 100% till next year. Demand looks to be strong with GPRE receiving a lot of calls from potential buyers for 2025-26 volumes, while dextrose margins at wet mills have remained strong/resilient despite degradation elsewhere. As GPRE enters this market, it expects to be able to gain market share largely due to its significantly lower carbon footprint vs the traditional wet mill process (~40% reduction). Shifting to carbon capture, we discussed Mr. Becker's expectation that the company can generate $100mn in income from CC&S, including the significant benefits from the 45Z credit. Note that a 120mn gallon/year plant with a 20 CI score could generate $72mn in annual 45Z credits. The York, NE plant, however, is more likely to request the 45Q credit instead as its CI score shouldn't be materially below 50.

Lastly, regarding the strategic review, GPRE noted that a company sale is one of the options being considered, along with other alternatives such as an asset combination. Mr. Becker noted that neither he nor the activist investor want to sell the company at a low price, especially with a replacement value pegged at $35/share and additional upside from carbon sequestration.

ICL

We hosted ICL's Chief Innovation and Technology Officer, Anantha Desikan. He outlined five key innovation platforms at ICL: nutrient use efficiency; biostimulants; battery materials (including LFP); functional ingredients; and digital agriculture. In LFP, ICL has signed its first offtake contract with an energy storage customer, covering around a third of the 30kt capacity of its first US plant (currently under construction), and management suggested they are close to signing another contract. On the broader business, ICL suggested Industrial Products (bromine) remains soft but there are small signs of green shoots.

Linde

Linde described that volumes are trending flat globally (ex-healthcare and food/bev), with Europe slightly softer recently and no signs of a post-New Year pick-up in China. Nevertheless, the company was confident that it would still deliver strong earnings growth in 2024 (as guided) helped by a 2% start-up/ramp-up contribution, a 2% contribution from share buybacks, continued positive pricing (likely similar to global inflation, which they see at 3-4% for the year) and productivity. The latter two factors will help to drive the margin upwards, even if this progression will occur at a more moderate pace vs the large improvements delivered in recent years. On energy transition projects, Linde noted positive recent comments from Dow (although a final contract has not yet been signed) and was also upbeat about the OCI project. By contrast, the company described green hydrogen as neither economic nor reliable – and therefore likely to be largely constrained to the merchant market (rather than on-site) for now in their view.

Mosaic

We hosted Mosaic's recently-appointed CEO Bruce Bodine and Jenny Wang, EVP, Commercial. Mr. Bodine has been working for MOS and its predecessors since 1994, and has experience in running both potash and phosphate operations. His key priorities are driving improved operating performance, de-commoditizing the company's product portfolio, and reducing G&A spending.

Mr. Bodine highlighted that phosphate (P) S/D fundamentals are very positive. Demand remains strong despite weakness in corn and soybean prices, as these two crops comprise ~30% of applications. P demand grew nicely in 2023, and 2024 should be another year of growth. Meanwhile supply remains challenged by China's export restrictions. Bodine noted that the 5-7mn export quota for 2024 set by China just last week was below the company's expectations. Stripping margins are currently quite strong, and the company will focus its efforts on bringing phosphate production back to 8mn tonnes. A majority of the 2022-23 production setbacks were due to turnaround delays stemming from COVID and inclement weather, but now MOS' phosphate assets, including its sulfuric acid plants, should be in a much better position. Additionally, the company is adding Microessentials capacity. Its next-gen product, Mircoessentials Pro, is undergoing field trials in Brazil where it has shown a ~3% increase in soybean yield vs the prior generation product and 8% vs conventional phosphate applications. The new product suite should also extend MOS' patents through 2038.

The outlook for potash is more mixed. Shipments in 2023 reflected a meaningful recovery in North and South America, India, and China. Malaysia and Indonesia have been lagging, but in 4Q23 the company began to see a stronger demand recovery from Southeast Asia, likely reflecting the yield impact of potash underapplications. However, MOS doesn't see the potash market as likely to tighten given a strong export recovery by Russia and Belarus in 2H23.

Mosaic's Fertilizantes business in Brazil has 9mn tonnes of distribution capacity at a $30-40/mt margin, with volumes expected to increase in 2024 and 2025. This business also generates around $100mn in annual EBITDA by selling co-products such as gypsum.

Nippon Sanso

We hosted Alan Draper (CFO of Nippon Sanso) and Raghu Menon (Global Head of HYCO), focusing on the status of the company's various projects. The majority of Nippon's sales come from its Gas business (largest delivery method is Bulk/Merchant), but they also have a sizable Equipment and Installation business (22% of FY23 Sales) and sell Thermos branded products (3% of sales) which has seen significant margin growth over the last year. The HYCO business focuses on driving volume growth through footprint establishment into countries selected by presence, compatibility, and growth potential. The company seems to favor blue hydrogen over green hydrogen which can often not actually be fully green from a power standpoint or economically sustainable. Menon described in detail HYCO's plant design and engineering, procurement, and construction (EPC) protocols, which are developed in-house. The EPC protocols are catered to geography as well as Nippon's Process/Plant Specifications, targeting best-in-class lifecycle operations and well-characterized maintenance.

Nippon Sanso projects underway or in the pipeline, include 1) a [285tpd] Hydrogen plant in India (onstream in 2H25), expected to be the largest over-the-fence supply in Asia, 2) a hydrogen or syngas facility in Alabama (targeted on stream in1H25), built with a long-term supply agreement for a 75k bpd refinery for renewable diesel (RD) production and potentially sustainable aviation fuel (SAF), 3) a hydrogen and nitrogen plant in Peru (in early operations), built with a long-term supply agreement with Peru national oil company, 4) a liquid hydrogen plant in Pennsylvania for local customers derived from a small reformer that replaced an electrolyzer, resulting in a lower carbon footprint, and 5) a direct air capture plant in Texas (on-stream mid 2025).

Draper indicated that their Electronics business (15-20% of sales) has recently experienced weaker specialty gases sales, although equipment sales were up and the company expects positive momentum in CY24. As for helium, Nippon only has 5-10% sales exposure, and has not seen any major issues in this business.

Novonesis

A month after the Chr Hansen deal closed, our key takeaway was that integration seems to be very smooth so far. This has been helped by the geographical proximity and strong familiarity between the businesses, as well as lots of work done through the clean room before deal close. For example, all sales data is already flowing into a single system, and new employee reporting structures are largely in place too. Synergies will take time, but work has started on both cost (e.g. discussing procurement savings with suppliers) and sales (e.g. probiotics teams already cross-selling each other's products). Beyond the merger, investors focussed on Bioenergy (& pricing), particularly given lower spot ethanol margins. Novonesis reiterated they expect the business will keep growing, via 3 key drivers: (1) further penetration of recent innovations which help customers monetise by-products, possibly also driving market share gains; (2) growth in Brazilian corn ethanol volumes; and (3) 2nd generation ethanol. In the medium term, the company (and customers at the conference) were bullish about potential extra ethanol demand from sustainable aviation fuel.

Nutrien

We hosted Nutrien's Chief Commercial Officer Mark Thompson and Jeff Tarsi, EVP of Retail. Like other fertilizer market participants, the company was more optimistic on nitrogen. Mr. Thompson noted that the US Gulf nitrogen market is very tight at the moment, mainly for urea, and less so for ammonia. The reasons for tightness include reduced imports and constraints in Trinidad supply, higher exports, and production issues from a January cold snap. Additionally, weather has allowed for earlier-than-normal fieldwork which could bring demand forward. The company's own normalized nitrogen production is 11.5-12mtpa, higher than the 10.9mn level guided for 2024, primarily as its Trinidad production recovers.

On potash, NTR noted that its strategy is to have a consistent 19-21% market share. Its share was higher in 2022 as Belarus and Russia were forced to pull back from the market but is now back within this range. Demand has increased since then, with a more broad-based recovery observed in 2H23. NTR expects 2024 potash demand to grow by 2mn tons, which is expected to be satisfied by increased supply from Laos and a recovery in Belarus/Russia exports. Increased potash production by Nutrien would require a stronger recovery in demand.

NTR's Retail channel is currently sufficiently stocked on fertilizers, in line with historical averages. However, that doesn't mean its competitors (~75% of the market) are as well supplied. NTR's Retail business typically has a steady stream of fertilizer procurement and good storage capabilities. Regarding growth, NTR believes there is more room to grow its US footprint through bolt-on acquisitions, which should be very synergistic especially as the company rolls out its proprietary private label products. Its Brazil business has been more volatile vs the US and Australia and more challenged recently. After 10 acquisitions, NTR is taking a pause on further acquisitions in Brazil to focus on integration.

Pilbara

We hosted Dale Henderson, CEO of Pilbara Minerals, to discuss the company's project expansion pipeline, low operating cost, and mid-stream opportunities. Pilbara owns one of the largest hardrock assets globally (7% of global lithium supply in 2023), the Pilgangoora Project, a mature asset (6 years old) in Western Australia. The company has a low operating cost, which allows them to continue expansion even through this less favorable pricing environment, and is expected to increase capacity by 47% (680ktpa to 1Mtpa) by the end of 2025.

Pilbara sees a meaningful opportunity to solve certain inefficiencies in the upstream to downstream lithium process, by creating a mid-stream process, which would involve bringing the front-end of the chemical conversion plant to the mine site and concentrating the spodumene ore (typically ~1.5% LCE) to a lithium salt (potentially Lithium Phosphate to ~30% LCE), thus, reducing the amount of non-lithium material that gets shipped to downstream customers. These convertor customers would likely convert the lithium salt to battery grade lithium and sell to battery makers. This mid-stream process is not yet commercial, and thus Pilbara is building a demonstration plant, to determine an incentive price for the compound and to eventually license out the technology to the industry.

Pilbara also has growth opportunities in South Korea, a battery materials hub, through its JV with POSCO to build a lithium hydroxide chemical facility. Further, Pilbara's acquisition of Altura Mining in the last downcycle, provides further upside to the capacity and life of mine for the Pilgangoora Project. Henderson believes that we may be near the bottom of lithium pricing, but notes that the supply may get tight in the next few years due to the slowdown in operations, reduced pace of expansions, and the growing lithium demand, but IRA incentives and EV manufacturer commitments will drive increased lithium supply.

PPG

We hosted Tim Knavish, CEO of PPG Industries, to discuss the strategic review of the architectural business along with some product-mix growth opportunities. Last Monday (2/26) PPG announced the planned strategic review of their US & Canada architectural business (10% of company revenue) for a potential sale, spin off, or JV (although Knavish gave no indication of the likelihood these transactions or a transaction even occurring). PPG stated that the business delivered flat sales volumes in 2023 and an EBIT margin well below the Performance Coatings segment average, which we viewed as surprisingly low given the 1) the industry's ability to push price and 2) PPG's ongoing investment in the HD collaboration which seemed to be gaining traction. PPG is not reviewing its architectural businesses in Mexico or Europe, both regions having already built significant scale.

Knavish emphasized that higher growth rates can be achieved from more technically demanding coatings solutions (i.e. autos, aerospace, protective & marine) whereas architectural coatings are not technology-driven but rather brand-driven which may, in our view, be providing roadblocks to volume growth and margin. Some examples of technology-driven share growth for PPG include additional coatings opportunities in EV battery packs, PPG's Link and Moonwalk (color matching and automatic mixing technology) which has caused continued share gain in Refinish, and electrocoating and heat/chemical protection to drive share growth further in Aerospace and Protective & Marine.

Westlake

We hosted Jeff Holy, Westlake's Treasurer, who was constructive on the outlook for PVC demand and prices. He noted that PVC export prices have been moving higher at the start of the year, leading contract prices higher. PVC has a 6cpp price hike on the table for February, which included a 3cpp increase for January that trade publications didn't recognize. Mr. Holly noted that domestic PVC netbacks are well-below published benchmarks, resulting in the premium for US to export pricing to be below historical averages. As such, any export price increases should directly flow through to the domestic market. In caustic there are also indications we are at the bottom. Longer-term, WLK believes both chlor-alkali and PVC supply growth will be limited, particularly in China as that country is already self-sufficient. For PVC specifically, Mr. Holly highlighted the complex supply chain including several intermediate products, plus the need for ethylene, as a big hurdle to supply.

On building products, WLK noted that it has decent visibility into the supply chain near-term, with inventories appearing low currently. The company's performance surprised to the upside in 2023, in part due to very resilient pricing. This is largely due to WLK's focus on premium solutions (the company noted it should be the largest provider of premium building product solutions in North America), focus on consolidating end-markets, and good relationships with homebuilders that likely allowed it to gain market share. Key growth areas currently include pipes and fittings, mainly for infrastructure projects, and PVC siding and trim. Looking ahead, M&A remains a focus for Westlake, as the building products market remains fragmented and there are many small players and first/second generation owners that could be looking to sell.

Stocks mentioned

Prices and ratings for stocks mentioned in this report

BofA Ticker	Bloomberg ticker	Company name	Price	Rating
CF	CF US	CF Industries	US$ 82.5	B-1-7
CTVA	CTVA US	Corteva	US$ 53.66	B-2-7
DOW	DOW US	Dow	US$ 55.77	B-1-7
ESI	ESI US	Element Solutions	US$ 23.63	B-1-7
FMC	FMC US	FMC	US$ 57.31	B-3-7
GPRE	GPRE US	Green Plains	US$ 21.26	C-1-9
HUN	HUN US	Huntsman Corp	US$ 25.25	B-1-7
LIN	LIN US	Linde	US$ 449.21	B-1-7
LINGY	LIN GY	Linde	EUR 413.85	A-1-7
LYB	LYB US	LyondellBasell	US$ 99.45	B-2-7
NTR	NTR US	Nutrien	US$ 52.24	B-1-7
PPG	PPG US	PPG Industries Inc.	US$ 139.52	B-1-7
SGML	SGML US	Sigma Lithium	US$ 15.93	C-1-9
MOS	MOS US	The Mosaic Company	US$ 31.63	C-1-7
WLK	WLK US	Westlake Corp	US$ 137.38	B-3-7

Source: BofA Global Research

Price objective basis & risk

CF Industries (CF)

Our $96 PO for CF is based on 8x our 2024 EBITDA estimate, including a $50mn contribution for post-2024 EBITDA from the Waggaman acquisition and $4/sh for the NPV of the blue ammonia project starting in2025. The 8x multiple is at the middle of the company's historical average over the last seven years (6-11x). We use this multiple as we think earnings next year will move to a more sustainable long-term level. We also see organic growth coming from an increasing blue/green ammonia opportunity.

Downside risks to our PO are higher US natural gas prices, lower nitrogen prices, a decline in grain prices, a near-term resolution to the Russia/Ukraine conflict, significantly lower than expected demand, and increased use of bacteria-sourced ammonia.

Upside risk to our PO is further supply cuts in nitrogen leading to lower grain production.

Corteva (CTVA)

Our PO of $57 is based on 11x our 2024 EBITDA estimate and includes a roughly $2bn adjustment for legal liabilities ($1.5bn for a potential chlorpyrifos liability and roughly $500mn for a potential PFAS liability). We view 11x, around the 5-year average of specialty chemical companies, as appropriate given continued strength of Ag fundamentals balanced by rising risks.

Downside risks are aggressive soybean seed pricing, higher raw material costs, weather disruption, and litigation risks.

Upside risks are price/mix gains in seeds, lower raw material costs, improving LatAm FX rates, and better than expected new product growth

Dow Inc (DOW)

Our PO of $60 is based on a 8.5x 2024E EV/EBITDA multiple. The multiple is a premium to the 7x average forward EBITDA multiple realized by DOW and its closest peer over the last five years, reflecting our view of a strong earnings recovery ahead.

Upside risks to our price objective are improvement in the plastics outlook, new product growth, additional productivity gains, higher oil prices, and a weaker USD.

Element Solutions Inc. (ESI)

Our $28 PO is based on a 15.5x multiple, as applied to our 2024E EBITDA estimate. This multiple is in line with the average for the broader specialty chemical universe, which we see as fair considering the defensive growth and robust free cash flow generation that ESI has been able to exhibit.

Risks to our PO are a stronger dollar, decline in electronics demand, and reduced OEM automotive production.

FMC Corporation (FMC)

Our $54 PO is derived applying a 10x multiple on our 2024E EBITDA estimate. We opt for a multiple of 10x, on the low end of the historical 5-year range of 9-14x, given increased risks to both the crop chemical market and FMC's own diamides franchise.

Upside risks are higher application rates and pricing for crop protection chemicals as supported by macro and weather-related issues, a weaker dollar, a rally in grain prices.

Downside risks are a shift to generic crop chemicals and concerns about litigation risks.

Green Plains (GPRE)

Our $30 PO is based on a discounted cash flow (DCF) analysis using a 9.5% weighted-average cost of capital (WACC) and 1% terminal growth rate and includes probability-weighed earnings for carbon sequestration and incremental clear sugar capacity. Our DCF assumes continued uplift from the MSC technology beyond 2025 as the company sells higher protein products, extracts more corn oil, and could generate licensing revenues.

Downside risks to our PO are that ethanol margins could deteriorate due to demand pressure from EVs and reduced gasoline consumption more broadly, MSC conversions could take longer than expected and fail to deliver the expected financial results, corn prices could rise more, and adverse policies for carbon sequestration and RFS mandates are possible.

Huntsman Corp (HUN)

Our $30 PO is based on an 11x EV to 2024E EBITDA methodology. This multiple is on the high end of the historic range for HUN, which we believe is appropriate given our expectations of significant earnings growth beyond 2024.

Downside (upside) risks to our price objective come from volatility in underlying commodity markets, corporate actions, and a slowdown to (expansion in) the broader economic backdrop.

Linde (LIN / LINGY)

Our $475 PO (EUR441/ADR) is based on the average of a 3 stage DCF analysis and the average 24-month forward P/E multiple over the last ten years as applied to a CY2024 EPS estimate. The 3-stage DCF is predicated on a 7.5% WACC and a 4% terminal growth rate, and the P/E component applies a 26x average P/E against our calendar 2024 estimate. The average multiple over the last ten years reflects a cycle average, while also considers the current low interest rate regime has had on multiples.

Upside risks to our PO are increased share repurchases, synergy realization faster than anticipated, a depreciating dollar, higher steel operating rates, a rebound in oil, acceleration in global industrial production and increased gains from productivity initiatives.

Downside risks to our PO are a strengthening dollar, slower global growth, and declining US industrial production.

LyondellBasell Industries (LYB)
Our $101 PO is based on a 8.0x multiple to our 2024E EBITDA ex-Refining, plus the cumulative EBITDA generated by Refining through 2024 year-end. The multiple is a slight premium to historic average levels, reflecting below-normal profitability in 2024.

Upside risks to our price objective are an increase in global polyethylene demand, higher oil prices, and lower US NGL prices.

Downside risks to our price objective are lower oil prices, higher natural gas and feedstock costs and slower global economic growth leading to a slowdown in demand for polyethylene.

Nutrien (NTR)
Our $73 price objective is based on SoTP analysis using a 9x 2024E EBITDA multiple for Retail, 7.5x for Potash, 7.5x for Phosphates, and 8x for Nitrogen. The 7.5x multiple for potash and phosphates is at the midpoint of the company's historical trading range of 6-9x. We use slightly higher multiples of 8x for nitrogen due to the clean energy growth potential, and 9x for Retail for its defensiveness and pricing power.

Upside risks are stronger than expected demand and pricing in key fertilizer markets, supported by potential for lower grains stocks-to-use ratios, rising demand for protein in developing markets, and increases in farm income.

Downside risks are price deflation in Retail from new entrants, lower than expected demand and pricing in key fertilizer markets, higher production costs, reduced farm income, a near-term resolution to the Russia/Ukraine conflict, significantly lower than expected demand, and increased use of bacteria-sourced ammonia.

PPG Industries Inc. (PPG)
Our $161 price objective is based on an average of a 3-stage DCF analysis (WACC of 8.3% and terminal growth rate of 3.0%) and a P/E multiple of 17.5x as applied to our 2024 EPS estimate.

Upside risks to our PO are an inflection in price momentum, an acceleration in global auto production, increase in miles driven and collision rates aiding PPG's refinish business, a pickup in broader industrial activity and strength in the US housing end-market.

Downside risks to our PO are a stronger USD, a downturn in US/global auto production, a slowdown in the US housing market and/or market share losses in the US architectural channel and a downturn in industrial activity.

Sigma Lithium (SGML)
Our $27 PO is derived from our comprehensive net asset value (NAV) model, which is predicated on a three-stage buildout and a 9.8% WACC with no terminal value.

Downside risks to our forecast are lower lithium prices, higher operating costs, and failure to successfully commission the new assets.

Upside risks are further resource discovery, faster speed to commissioning new assets, higher lithium prices, and lower operating costs

The Mosaic Company (MOS)
Our $49 price objective is based on a sum-of-the-parts valuation, where we apply a 7.5x multiple on 2024E EBITDA, These multiples are on the lower-end of MOS's 6-11x five year range given earnings remain elevated.

Downside risks to our PO are declines in fertilizer prices from increased supply, potential declines in grain prices from larger than expected crop production, a stronger US dollar, acceleration in global fertilizer production capacities, a shift to less fertilizer intensive crops, environmental concerns over phosphate mining, and a near-term resolution to the Russia/Ukraine conflict.

Upside risks to our PO are increases in fertilizer prices from decreased supply, increases in crop prices, a weaker US dollar, and a slowdown in global fertilizer production capacities.

Westlake Corp (WLK)
Our $127 PO is based on a 8x 2024E EV/EBITDA multiple. This multiple is somewhat above the five year average of roughly 7.5x balancing trough 2024 earnings with concerns about further declines in caustic/PVC prices.

Downside risks to our PO are the absence of a material upturn in PVC/chlor-alkali prices and margins from current levels, faster than expected capacity expansions in chlor-alkali/PVC (versus our expectations for virtual no capacity growth), a deeper trough in polyethylene margins and broader macroeconomic risks, particularly in emerging markets, that would impair the demand outlook for these commodities.

Upside risks to our PO are an inflection in chlor-alkali or polyethylene pricing and margins, an improving economic outlook, and increasing capacity expansion in chlor-alkali and/or polyethylene.

Analyst Certification

We, Steve Byrne, CFA, Isabella Simonato and Salvator Tiano, CFA, hereby certify that the views each of us has expressed in this research report accurately reflect each of our respective personal views about the subject securities and issuers. We also certify that no part of our respective compensation was, is, or will be, directly or indirectly, related to the specific recommendations or view expressed in this research report.

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US - Chemicals Coverage Cluster

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
BUY				
	Air Products	APD	APD US	Steve Byrne, CFA
	Axalta Coating Systems	AXTA	AXTA US	Steve Byrne, CFA
	Bunge Limited	BG	BG US	Salvator Tiano, CFA
	CF Industries	CF	CF US	Steve Byrne, CFA
	Dow Inc	DOW	DOW US	Steve Byrne, CFA
	Eastman Chemical Co	EMN	EMN US	Salvator Tiano, CFA
	Element Solutions Inc.	ESI	ESI US	Steve Byrne, CFA
	Green Plains	GPRE	GPRE US	Salvator Tiano, CFA
	Huntsman Corp	HUN	HUN US	Salvator Tiano, CFA
	Linde	LIN	LIN US	Steve Byrne, CFA
	Linde	LINGY	LIN GY	Steve Byrne, CFA
	Nutrien	NTR	NTR US	Steve Byrne, CFA
	Olin Corp	OLN	OLN US	Steve Byrne, CFA
	PPG Industries Inc.	PPG	PPG US	Steve Byrne, CFA
	Sigma Lithium	SGML	SGML US	Steve Byrne, CFA
	The Mosaic Company	MOS	MOS US	Steve Byrne, CFA
NEUTRAL				
	Albemarle	ALB	ALB US	Steve Byrne, CFA
	Archer-Daniels-Midland Company	ADM	ADM US	Salvator Tiano, CFA
	Corteva	CTVA	CTVA US	Steve Byrne, CFA
	Ecolab Inc	ECL	ECL US	Steve Byrne, CFA
	International Flavors & Fragrances	IFF	IFF US	Salvator Tiano, CFA
	LyondellBasell Industries	LYB	LYB US	Steve Byrne, CFA
	Origin Materials	ORGN	ORGN US	Steve Byrne, CFA
UNDERPERFORM				
	Celanese Corporation	CE	CE US	Salvator Tiano, CFA
	DuPont	DD	DD US	Steve Byrne, CFA
	FMC Corporation	FMC	FMC US	Steve Byrne, CFA
	RPM International Inc	RPM	RPM US	Steve Byrne, CFA
	Sherwin-Williams Company	SHW	SHW US	Steve Byrne, CFA
	Westlake Chemical Partners, LP	WLKP	WLKP US	Steve Byrne, CFA
	Westlake Corp	WLK	WLK US	Steve Byrne, CFA

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Important Disclosures

Equity Investment Rating Distribution: Chemicals Group (as of 31 Dec 2023)

Coverage Universe	Count	Percent	Inv. Banking Relationships [R1]	Count	Percent
Buy	66	47.83%	Buy	33	50.00%
Hold	33	23.91%	Hold	16	48.48%
Sell	39	28.26%	Sell	20	51.28%

Equity Investment Rating Distribution: Non-Ferrous Metals/Mining & Minerals Group (as of 31 Dec 2023)

Coverage Universe	Count	Percent	Inv. Banking Relationships [R1]	Count	Percent
Buy	58	53.70%	Buy	26	44.83%
Hold	24	22.22%	Hold	10	41.67%
Sell	26	24.07%	Sell	13	50.00%

Equity Investment Rating Distribution: Global Group (as of 31 Dec 2023)

Coverage Universe	Count	Percent	Inv. Banking Relationships [R1]	Count	Percent
Buy	1895	53.62%	Buy	1083	57.15%
Hold	832	23.54%	Hold	454	54.57%
Sell	807	22.84%	Sell	383	47.46%

[R1] Issuers that were investment banking clients of BofA Securities or one of its affiliates within the past 12 months. For purposes of this Investment Rating Distribution, the coverage universe includes only stocks. A stock rated Neutral is included as a Hold, and a stock rated Underperform is included as a Sell.

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Investment rating	Total return expectation (within 12-month period of date of initial rating)	Ratings dispersion guidelines for coverage cluster[R2]
Buy	≥ 10%	≤ 70%
Neutral	≥ 0%	≤ 30%
Underperform	N/A	≥ 20%

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