

The Current and Trend of Biologicals Used in Agriculture

Presentation to CAC

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Agenda

- Introduction to S&P Global
- Biologicals market overview
 - Advantages and challenges to marketing biologicals
 - Market sizing
 - Market development in key geographies
 - Company involvement
- Conclusions about market – what should companies know?





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We engage with market participants and evolve rigorous methodologies to develop assessments and benchmarks that reflect a commodity's true value. Along with news and market commentary, our assessments help you make successful trading decisions and manage risk.

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We partner with you to enhance workflows, increase efficiency and optimize business processes by leveraging AI-driven software and applications, integrated platforms and machine delivery.

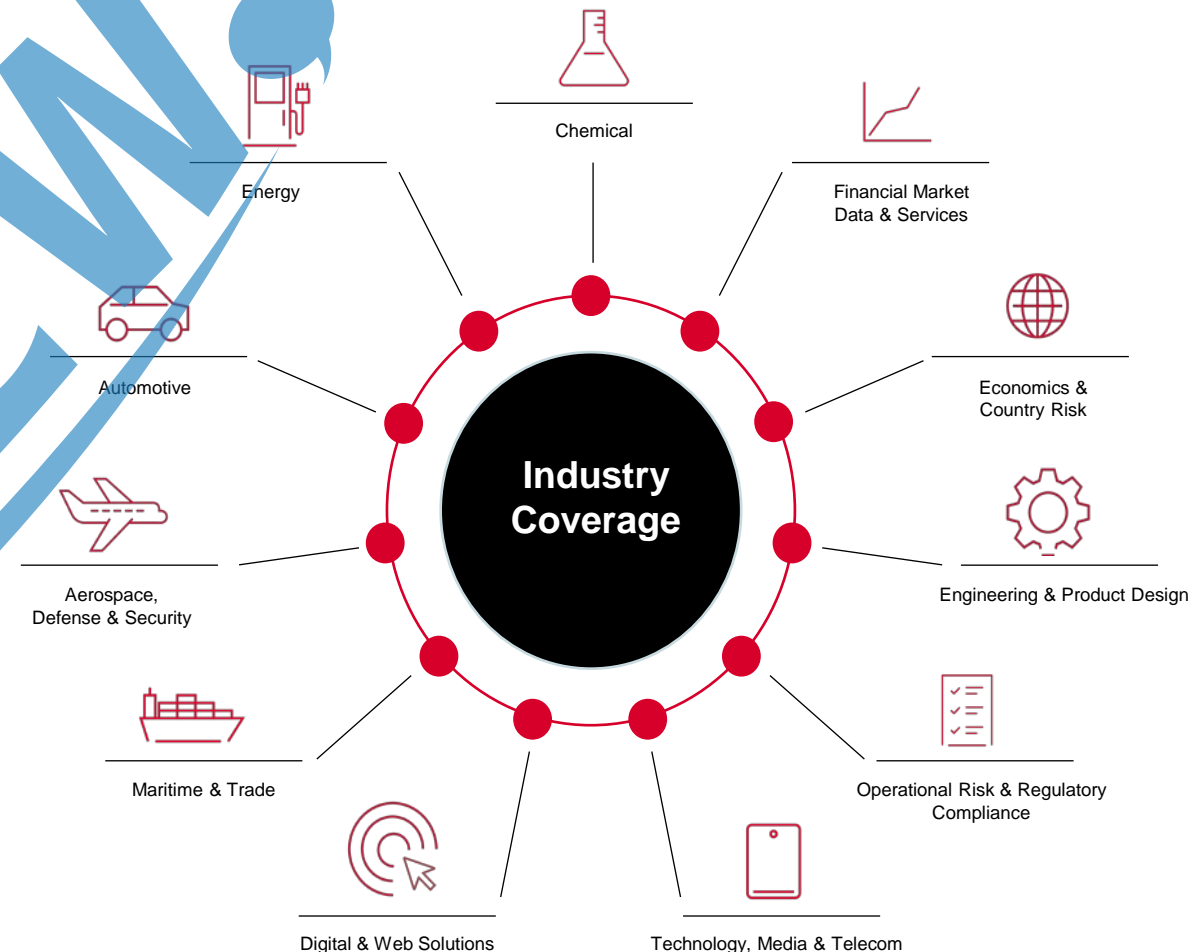
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Our analysts are experts in their respective fields and guide our clients in reducing risk, optimizing investments and better understanding supply, demand and price dynamics. The unique insights we provide empower our clients to make informed strategic decisions to benefit their business today, tomorrow and for years to come.

Fertilizers

Price benchmarks and 10-year forecasts across:

- Ammonia
- Nitrates
- Urea
- Potash
- Phosphate
- Phosphate raw materials
- Sulphur
- Sulphuric Acid

Crop Science

- Pesticides: conventional & biological – fungicides, insecticides, herbicides, PGRs and nematicides
- Seed / GM Crops: input & output traits, and seed treatments
- Digital farming and precision agriculture
- Commercial deals and more

Food and Agricultural Commodities

- **Crops:** Soybean, corn and feed grains, wheat, rice, oilseeds and more
- **Softs:** Sugar, sweeteners, molasses, cocoa and coffee
- **Proteins:** livestock, beef, pork, poultry, eggs and dairy
- **Foods:** Fruit & vegetables, dried fruit & nuts, frozen foods, beverages and more

Biofuels

- Ethanol and biodiesel price reports
- Feedstocks, acreages, weather and crop reports
- Monthly balances and global trade, including import and export data
- Production, processing and consumption
- Commercial factories, capacity, acquisitions and joint ventures

Animal Health

- Parasiticides, vaccines, pharmaceuticals, generics, diagnostics and tech
- Nutrition, feed and additives
- Investment and M&A developments
- Policy and regulation
- Major disease outbreaks

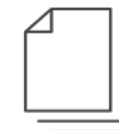
Policy

European and US analysis:

- Agriculture: Trade and farm policy, energy, environment and policy
- Food: Food and health policy, advertising and labelling, food safety and standards, traceability and supply chains

Use Cases

- **Procurement** - Help develop sourcing strategies and confidently negotiate cost-effective contracts
- **Trading** - Help increase revenue, informed by accurate forecast of price trends and demand drivers
- **Finance** - Help develop economic models, understand the industry landscape and evaluate investments
- **Business Management** - Help identify and implement growth opportunities to achieve revenue targets
- **Research and Development** - Help ensure products are competitively positioned and meet market needs
- **Regulation and Policy** - Help understand how changing regulation impacts an organization while mitigating risk



Subscription Packages Available

One-Time Contracts

Current
Market
Reporting

Short to
Mid-Term
Market
Forecasting

Long-Term
Market
Outlooks

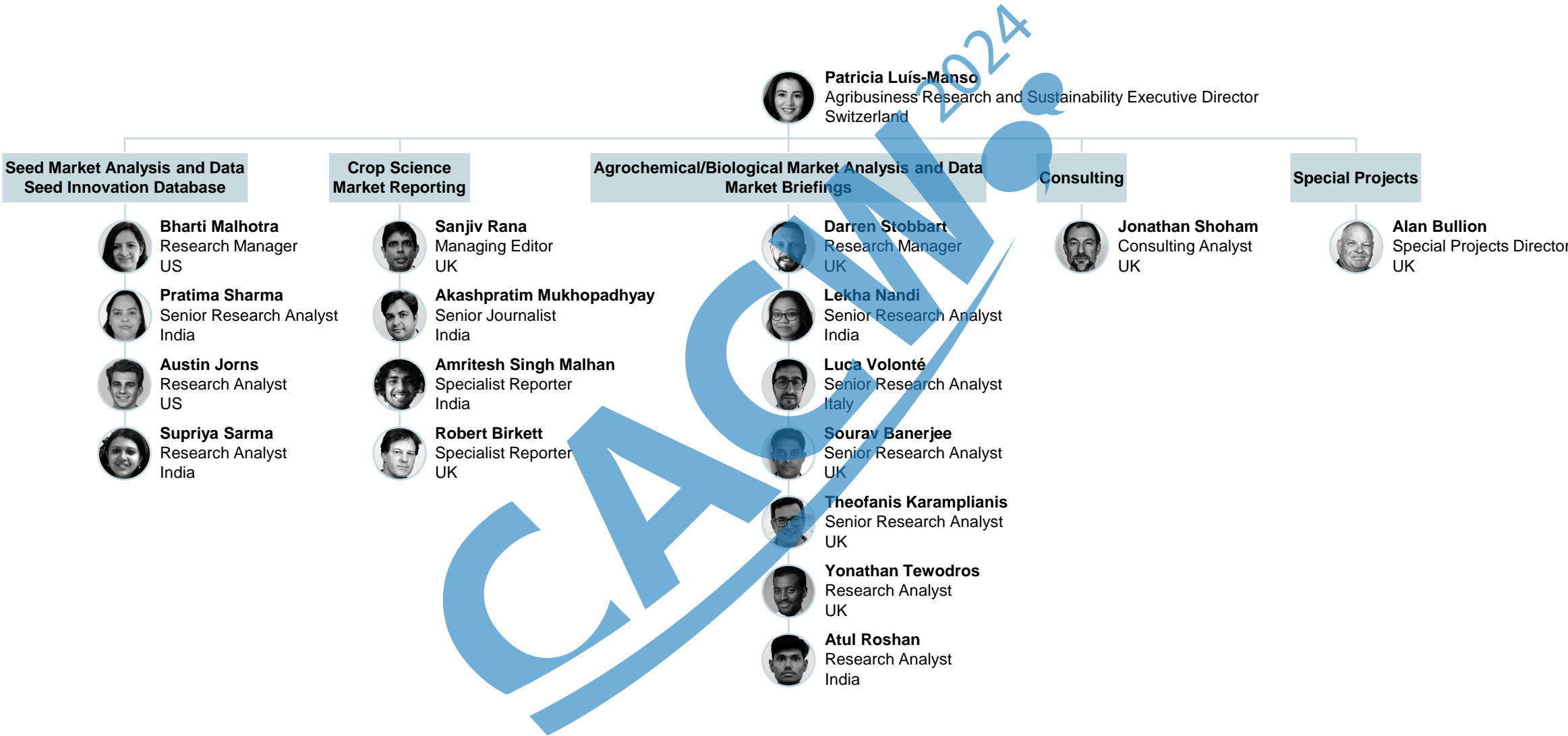
Multi-Client
Studies

Special
Reports

Databases, API and Data Feeds

Bespoke Advisory and Consulting

Crop Science: Team structure and expertise



As of November 2023.
Source: S&P Global Commodity Insights.

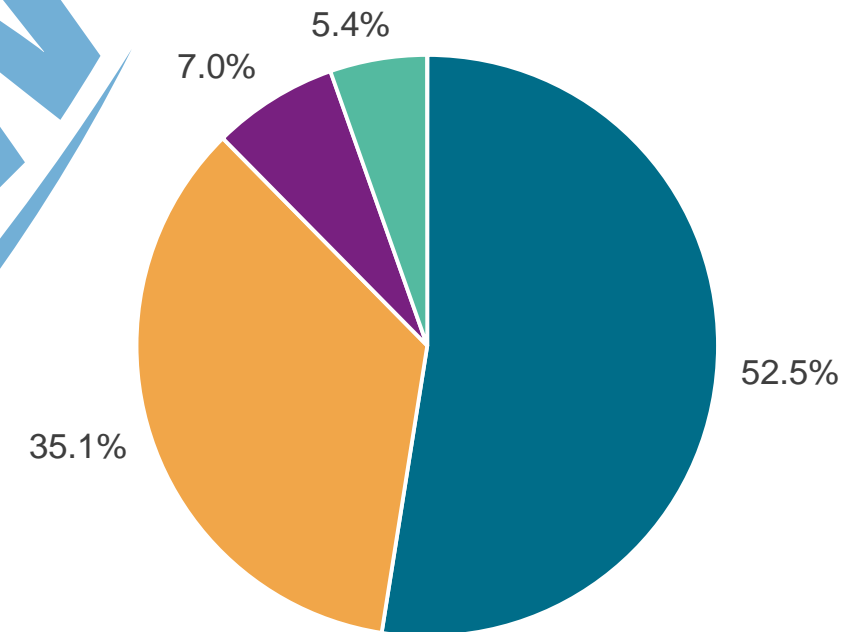
Crop Science industry overview

S&P Global estimates the Crop Science sector at ~\$145 billion:

- **Crop protection, including BCAs/Biostimulants/Biofertilizers, totals approximately \$83 billion.**
- Total seed market, GM + conventional, valued at approximately \$50 billion.
- Digital agriculture market valued between \$10-15 billion.

Crop science market split by segment 2022

■ Agrochemicals ■ Seeds ■ Digital Agriculture ■ Biologicals



Data compiled Nov. 2023.

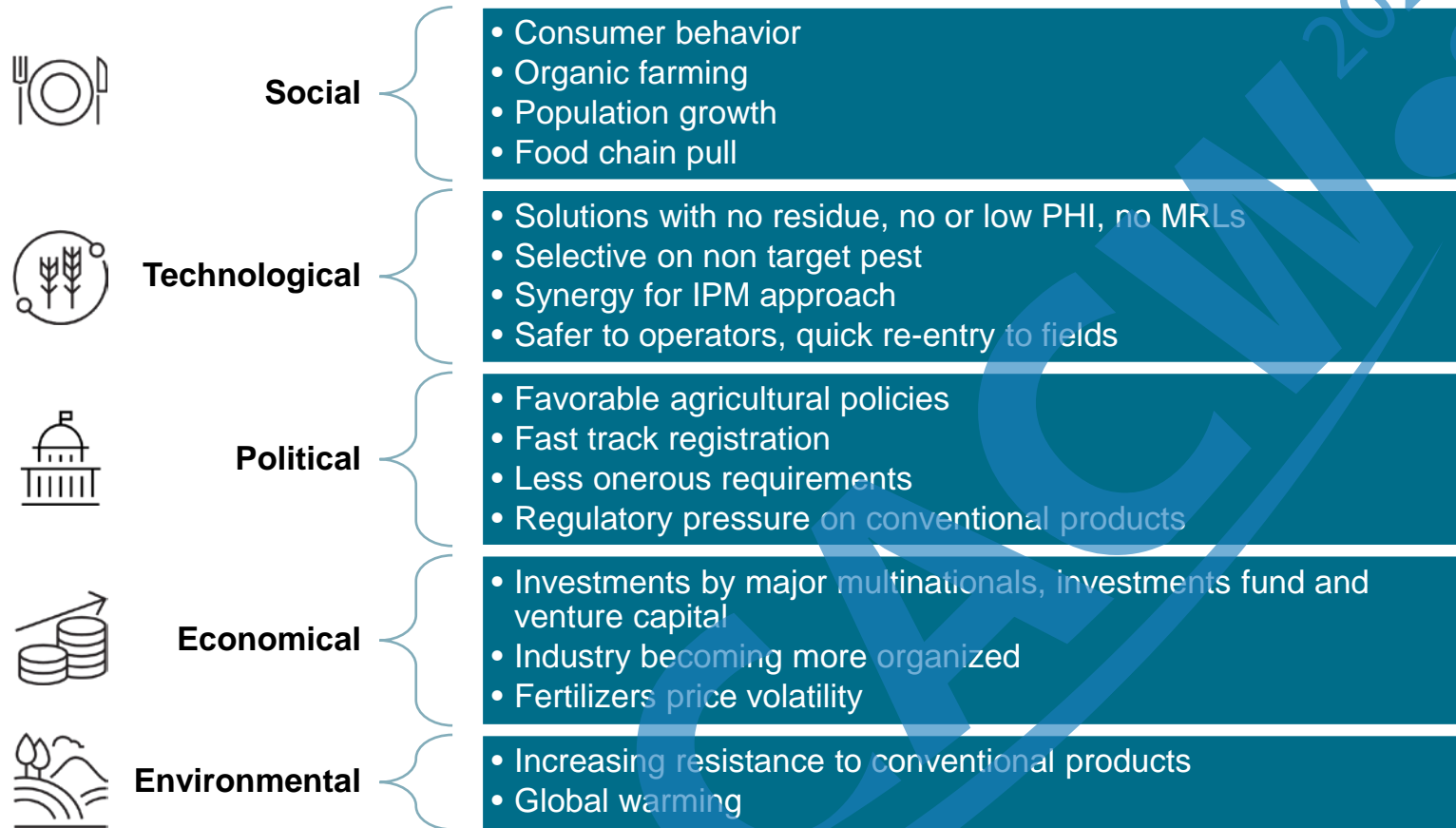
Source: S&P Global Commodity Insights.

Biological market overview



Drivers benefiting market

Summary



Even if products have been around for many years, we are experiencing a significant growth of the biologicals market from 2000's onwards.

There are many different drivers positively influencing the growth and can be grouped in 5 different categories:

- Social
- Technological
- Political
- Economical
- Environmental

Market resistors – hurdles for biological to cross

- Even though the biologicals market is expected to grow in the coming years, some factors are limiting potential.
- The market is impacted in some cases by poor reputation and the fact that sometimes convincing evidence is lacking — “snake oil”/”bath-tub brew”.
- Many growers and advisors do not yet possess deep expertise with such products, particularly those that are considered more complex compared to a crop protection product or a mineral fertilizer.
- The results obtained are not always clear and easy to read, and can be influenced by multiple factors such as application method, timing of the application, pest pressure, soil condition, agro-environmental condition

1 – Poor reputation

2 – Low versatility vs. synthetics

3 – Lower efficacy

4 – High number of treatments needed to get the result

5 – High cost of production resulting in higher cost/ha

6 – More difficult to use, more stewardship and technical support needed

7 – Storage and logistic challenge

8 – Legislation lacking

Biologicals market overview

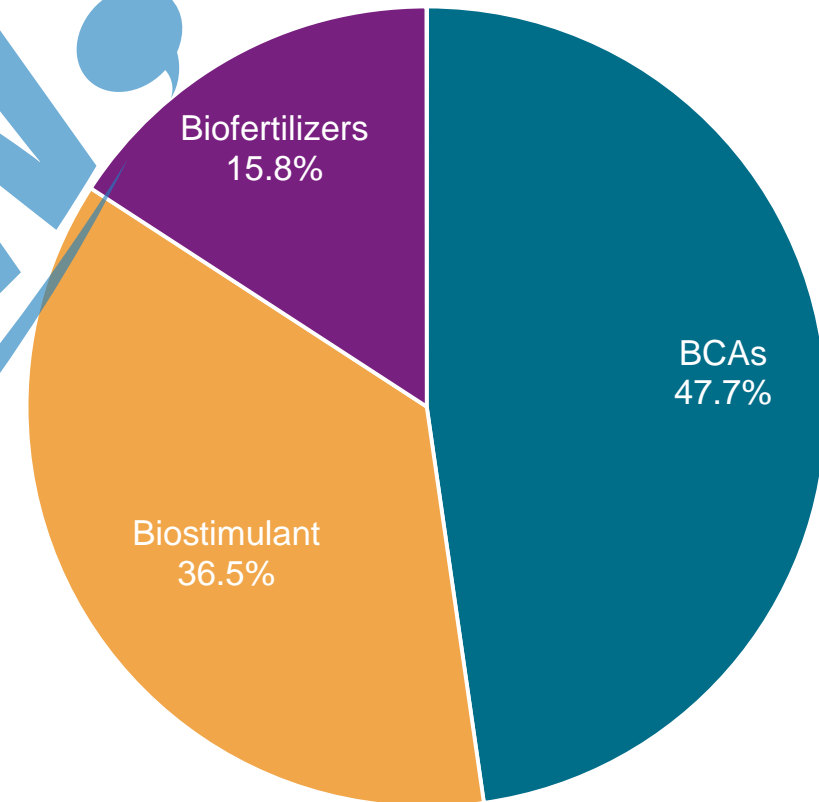
The biologicals market can be split into three macro-categories: BCAs (biopesticides), Biostimulants, and Biofertilizers.

- BCAs worth ca. \$3.7 billion
- Biostimulants ca. \$2.8 billion
- Biofertilizers ca. \$1.2 billion

The growth of the three categories has been similar over the past years, always overperforming the crop protection and fertilizer market, with a positive trend ahead.

The market comprises over 1900 AI's and 7200 brands sold by over 700 companies, as reported in the Biologicals Market Data service from S&P Global. This results in extreme market fragmentation, with more than 70% of the products selling less than \$10 million.

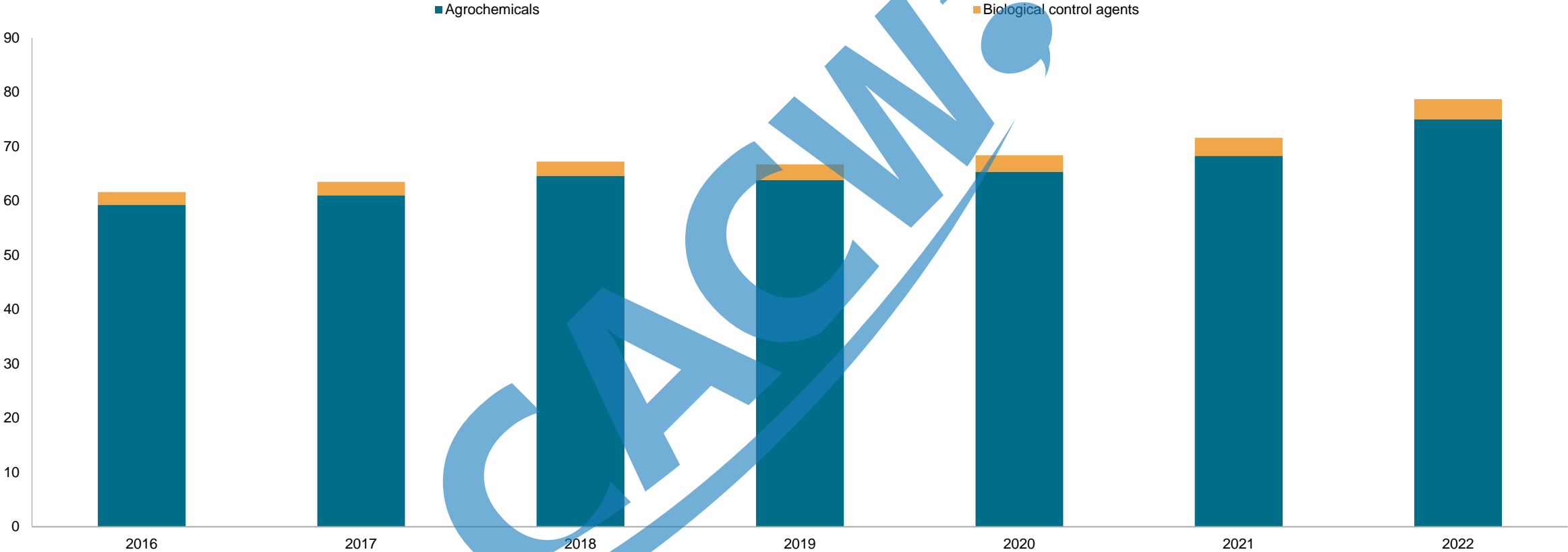
2022 – Biologicals Market split



Data compiled Aug. 01, 2023
Source: S&P Global Commodity Insights.

Biologicals still a niche sector

Crop protection market split by conventional and biological products (USD billion)



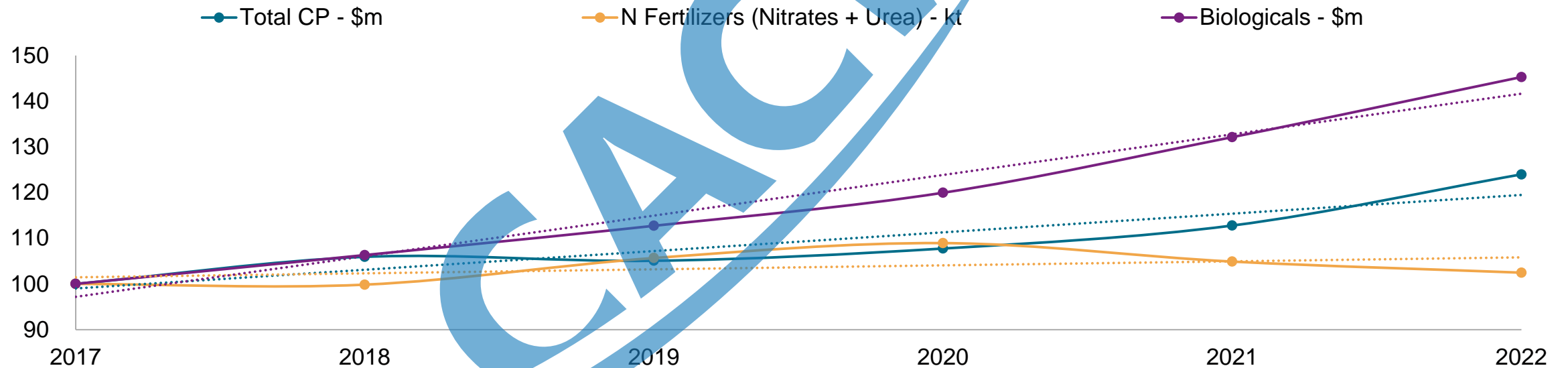
Data compiled Mar. 2024.
Biologicals represent Biological Control Agents (biopesticides). Does not include biostimulants or biofertilisers. Does not include products derived from bacterial fermentation
Source: S&P Global Commodity Insights.

Biologicals market trend

In the graph is presented a comparison of the annual growth rate for crop protection products, including BCAs, biologicals and N fertilizers (nitrates & urea). Due to the lack of data in term of market value the fertilizer market is presented as consumed product in kt.

Annual growth rate comparison for crop protection products, N fertilizers (nitrates & urea) and biologicals

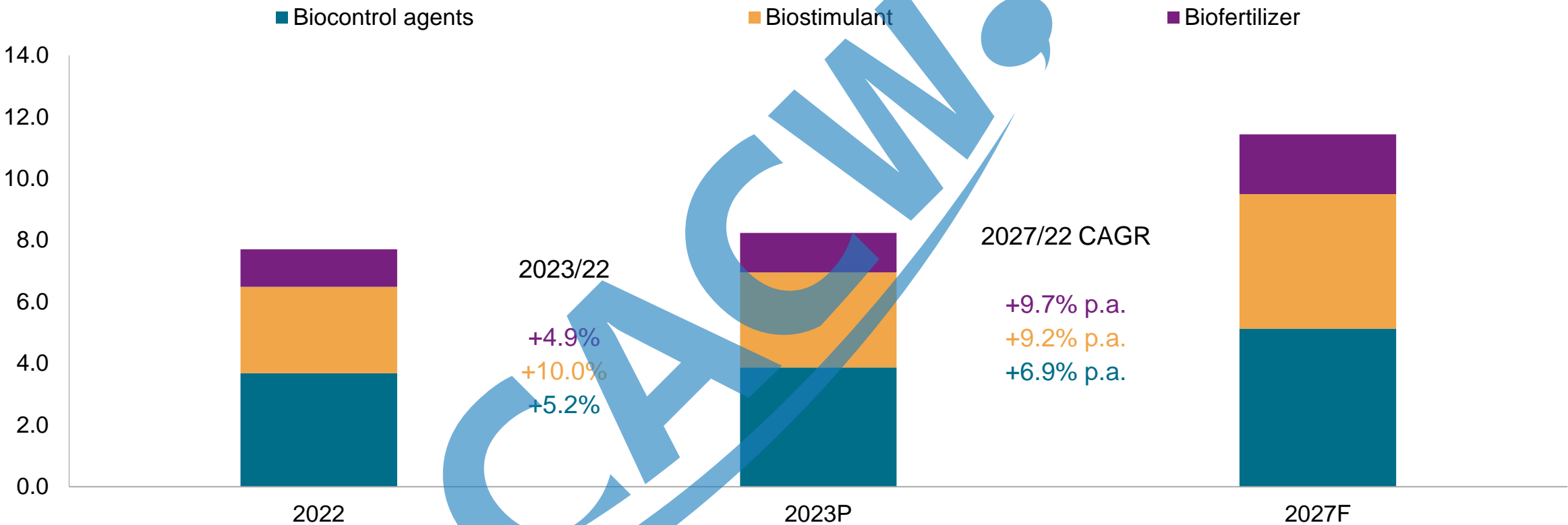
Index: 2017 = 100%



Data compiled Aug 3, 2023.
Source: S&P Global Commodity Insights.

Biological market forecast

Biological segment forecasts (USD billion)



As of Feb. 2024.
P = preliminary, F = forecast.
Source: S&P Global Commodity Insights.

Key geographies

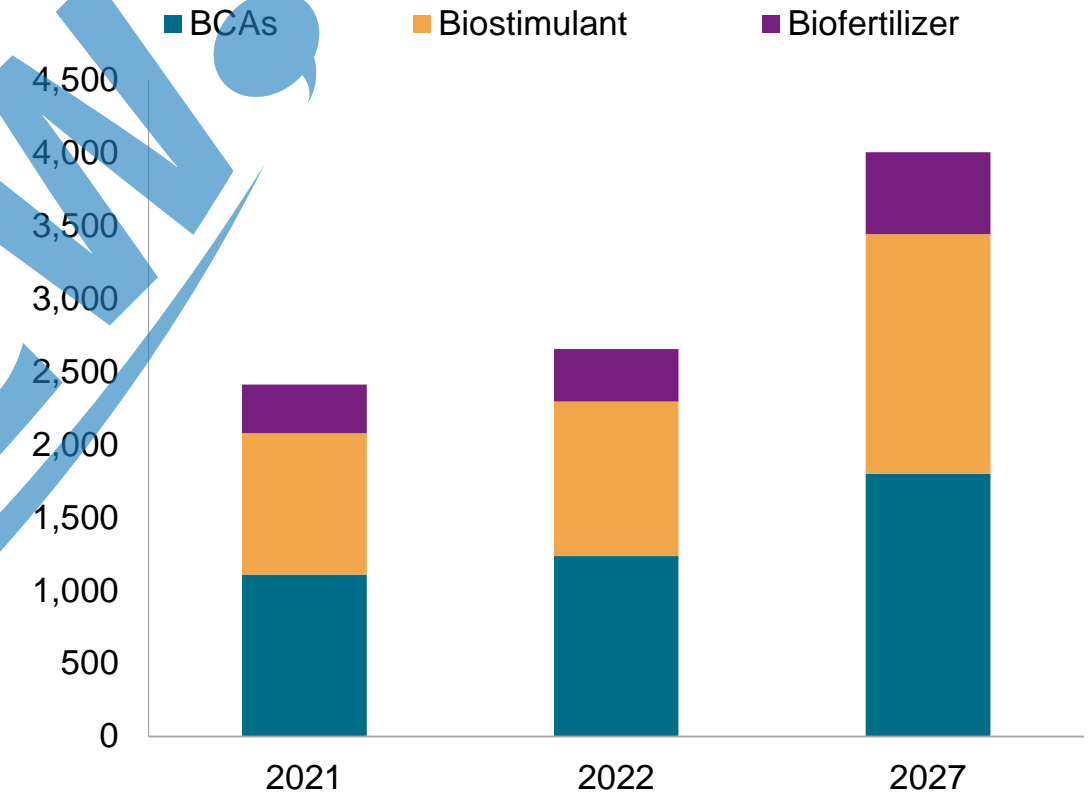


Europe: biologicals market outlook

The European market is expected to grow by 66.1% over the next 5 years to reach \$4,007 million by 2027.

- BCAs are expected to remain the primary market, growing by 62.3% to reach \$1.8 billion. Main drivers of the growth will any moves related to the European sustainability policy supported by the new regulatory infrastructure to speed up and ease the registration for this products.
- Biostimulants are expected to grow by 69.8% between 2022 and 2027, again influenced by European policies as well as by the new common regulatory approach across Europe..
- Biofertilizers will be growing at a similarly fast pace, with a rise of 68.8%. Policies aiming to reduce synthetic fertilizer input, fertilizers price volatility will support the upcoming growth.

Biological market trend 2021-2027 (USD million)



Data compiled: October 2023.

Source: S&P Global Commodity Insights.

Europe: regulatory framework

- BCAs (microbials, semiochemicals and botanicals) are regulated under the general pesticide regulation (Regulation (EC) No 1107/2009).
 - A multiplicity of different authorities is involved at both EU and Member State level which many believe contributes to the increased complexity, cost and perceived inefficiency of the EU system compared to its counterparts elsewhere.
- The EU is a pioneer in biostimulants regulation, its new regulation (EU fertiliser Regulation 2019/1009) was adopted in 2019 and was applied in full as of the 16 July 2022.
- Responsible regulatory body(ies) - European Commission, European Food Safety Authority (EFSA), National Regulatory Authorities
- Registration fees - **Around 285 k EUR**
- Time from submission to approval - **2.5 to 3.5 years**
- Recent abandonment of SUR in EU expected to support conventional market, at detriment to biologicals.
 - The Commission is leaving open a potential new proposal with “much more matured content and with the stakeholders together”.

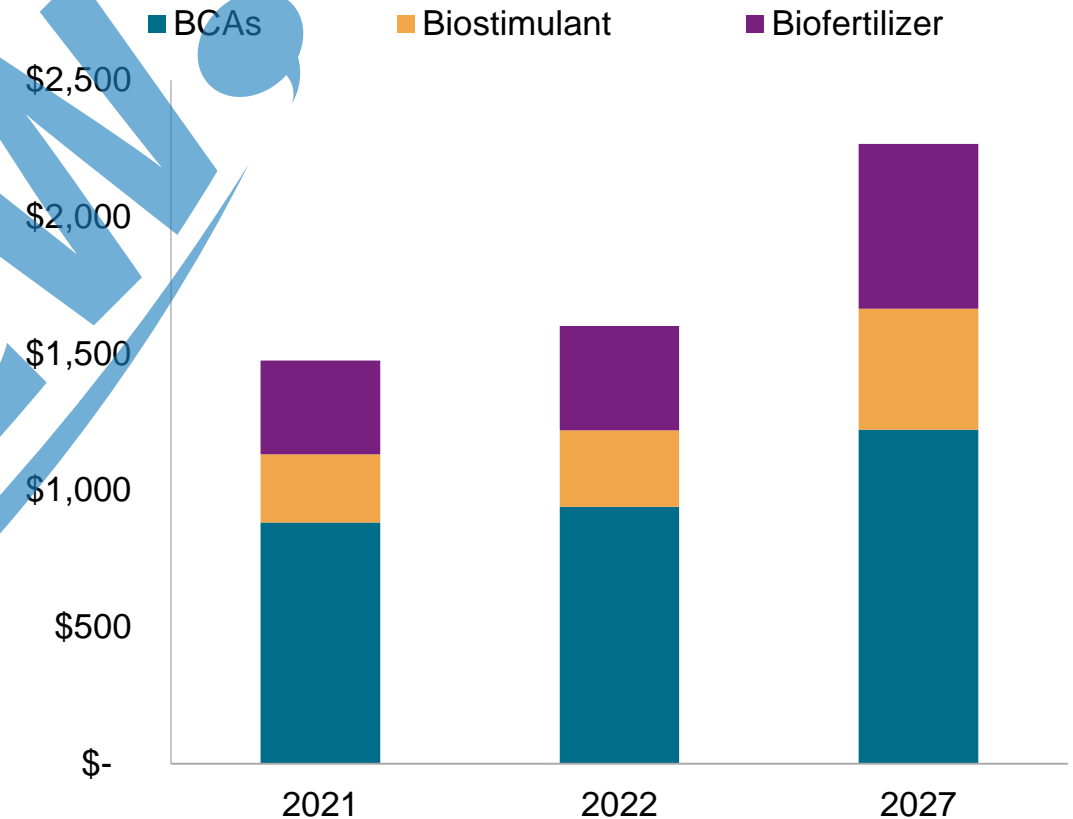
Data compiled: October 2023.
Source: S&P Global Commodity Insights.

USA: biologicals market outlook

The US market is expected to grow by 41.6% over the next 5 years to reach \$2,267 million by 2027.

- BCAs are expected to remain the primary market accounting for 53.9% with a CAGR of 5.4%. Main drivers of the growth will be the very favorable regulatory environment as well as the adoption in row crops.
- Biostimulant and Biofertilizers will be growing at a faster pace, with a similar CAGR of nearly 10% respectively thanks to new regulatory harmonized approach across all the states for biostimulants, increasing awareness about fertilizers run-off, new fertilizer regulations becoming more stringent as well as increasing organic farming surfaces.

Biologicals market trend 2021/2027 (USD million)



Data compiled: October 2023.
Source: S&P Global Commodity Insights.

USA: regulatory framework

- The main biopesticide product categories recognized are biochemicals (including semiochemicals), microbials and Plant-Incorporated Protectants. Registration for macrobials is not required unless they are non-native in which case their import and release is regulated at state and federal levels. Current and emerging regulatory challenges include policy and assessment of plant biostimulants and new biotechnology innovations in biotechnology such as RNA interference, CRISPR and genetically engineered insects.
- Biocontrol agents regulated under Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
- No regulation at the federal level yet, at the state level, some states regulate marketing of biostimulants. Some biostimulants are registered under FIFRA as plant regulators.
- Responsible regulatory body(ies) – US EPA Biopesticides and Pollution Prevention Division (BPPD)
- Registration fees – **From USD \$1,833 to USD \$13,069 (PRIA fees FY 23/24)**
- Time from submission to approval - **From 6 months to 15 months**

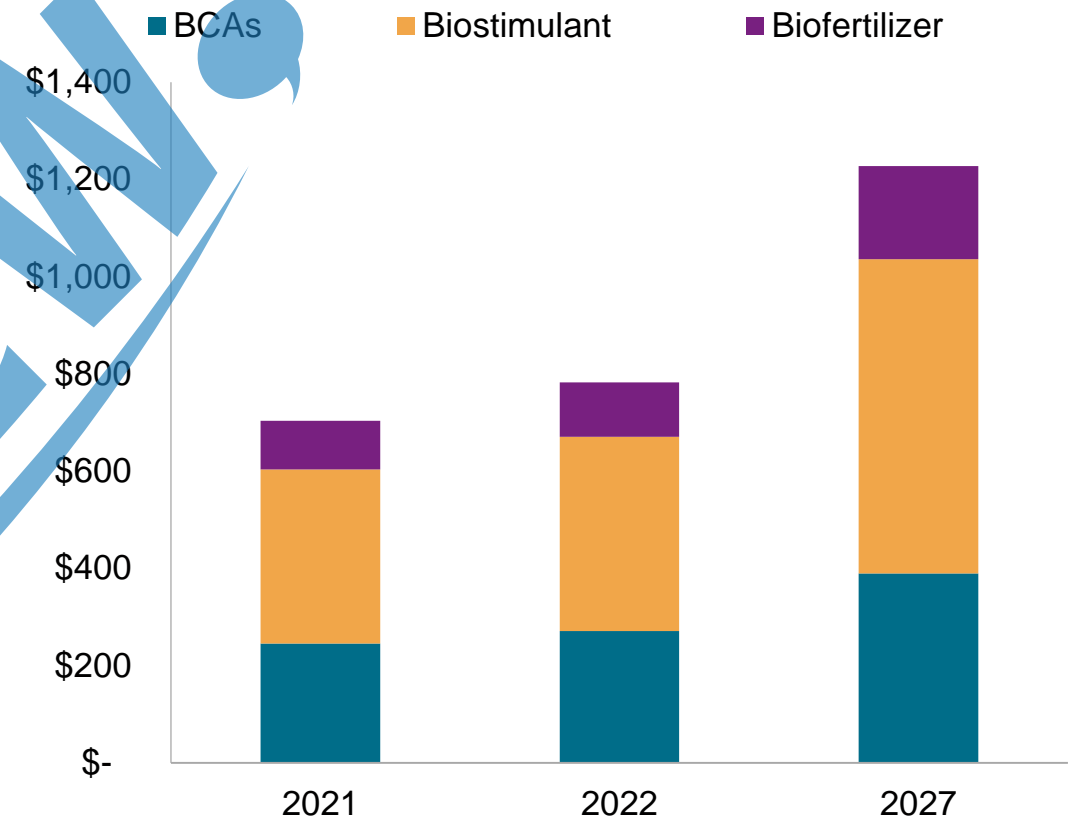
Data compiled: October 2023.
Source: S&P Global Commodity Insights.

Brazil: biologicals market outlook

The Brazilian market is expected to grow by 56.7% over the next 5 years to reach \$1,227 million by 2027.

- Biostimulants are expected to remain the primary market accounting for 52.6% with a CAGR of 10.1%. Main drivers of the growth will be the very favorable regulatory environment as well as further adoption in row crops and increasing acreage of soybean.
- Biofertilizers will be growing at a faster pace, with a CAGR of 11.3% thanks to the investment that association are making to increase awareness around the segment sharing research results and benefits.
- BCAs are expected to grow by 43.7% to reach \$390 million thanks to new technology coming that will extend and increase adoption in row crops such as pheromones and seed treatments solutions.

Biologicals market trend 2021-2027 (USD million)



Data compiled: October 2023.
Source: S&P Global Commodity Insights.

Brazil: regulatory framework

- In 2020, Brazil launched the National Bioinputs Program, coordinated by the Ministry of Agriculture, Livestock and Supply. The goal of the program is to expand and strengthen the use of bioinputs in the country to benefit the agricultural sector as well as to update the rules and regulation regarding this category.
- Biocontrol agents regulated under Law No. 14785/2023 which also includes conventional products – NEW in 2023 and replaced Law. 7802.
- No specific definition for Biostimulants which are often classified as plant growth regulators or inoculants and covered under Fertilizers regulation (Lei 6.894/1980).
- Brazilian Senate's environment select committee has approved a draft bill (3668/2021) seeking to regulate biological agricultural inputs such as biopesticides, supporting further easing of regulatory hurdles. Outcome to be confirmed.
- Responsible regulatory body(ies) – MAPA, ANVISA, IBAMA.
- Registration fees - **from USD \$11k to USD \$31k**
- Time from submission to approval - **8 months on average, up to 2 years maximum**

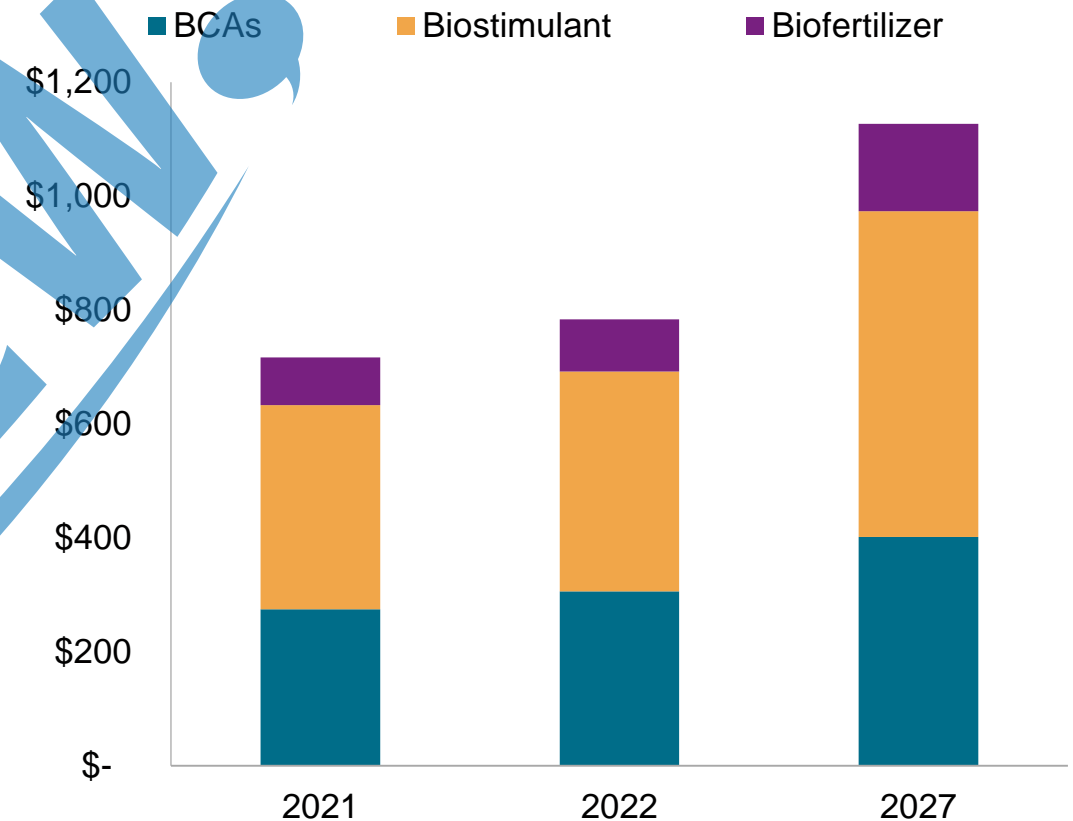
Data compiled: October 2023.
Source: S&P Global Commodity Insights.

China: biologicals market outlook

The Chinese market is expected to grow by 43.8% over the next 5 years to reach \$1,127 million by 2027.

- Biostimulants are expected to remain the primary market accounting for 50.7% share with a CAGR of 8.2%. Main drivers of the growth will be the concern around the inefficient use of fertilizers, problem of polluted soil and the activities that government has in place to promote this solutions.
- BCAs are expected to grow by 31.2% share to reach \$402 million thanks to strong demand for sustainable food and national environmental policies to reduce synthetic crop protection products.
- Biofertilizers will be growing at a faster pace, with a CAGR of 10.8%, they will remain a niche sector accounting for 13.6% of total sales.

Biologicals market trend 2021-2027 (USD million)



Data compiled: October 2023.
Source: S&P Global Commodity Insights.

China: regulatory framework

- The country has developed its own biopesticide classification system based on categories developed by the UN FAO and the U.S. EPA. The scope is much broader than in many other countries and includes microbials, botanicals, biochemicals, natural enemies, genetically modified organisms as well as agricultural antibiotics.
- China has developed a specific process and requirements for biopesticide registration under which data requirements are partially waived and much reduced compared to conventional crop protection chemicals. The Chinese registration process for biopesticides has typically been much faster than many of its global counterparts and a product can be approved in two years.
- Biocontrol agents regulated under Pesticide Management Regulation Decree Number 677 of the State Council of China of April 1 2017
- No specific definition for Biostimulants which are classified as fertilizers.
- Responsible regulatory body(ies) – Ministry of Agriculture (MoA)/Pesticide Administration Bureau
- Registration fees – **Upwards of 500,000 CNY for microbial products**
- Time from submission to approval - **up to 2 years**

Data compiled: October 2023.
Source: S&P Global Commodity Insights.

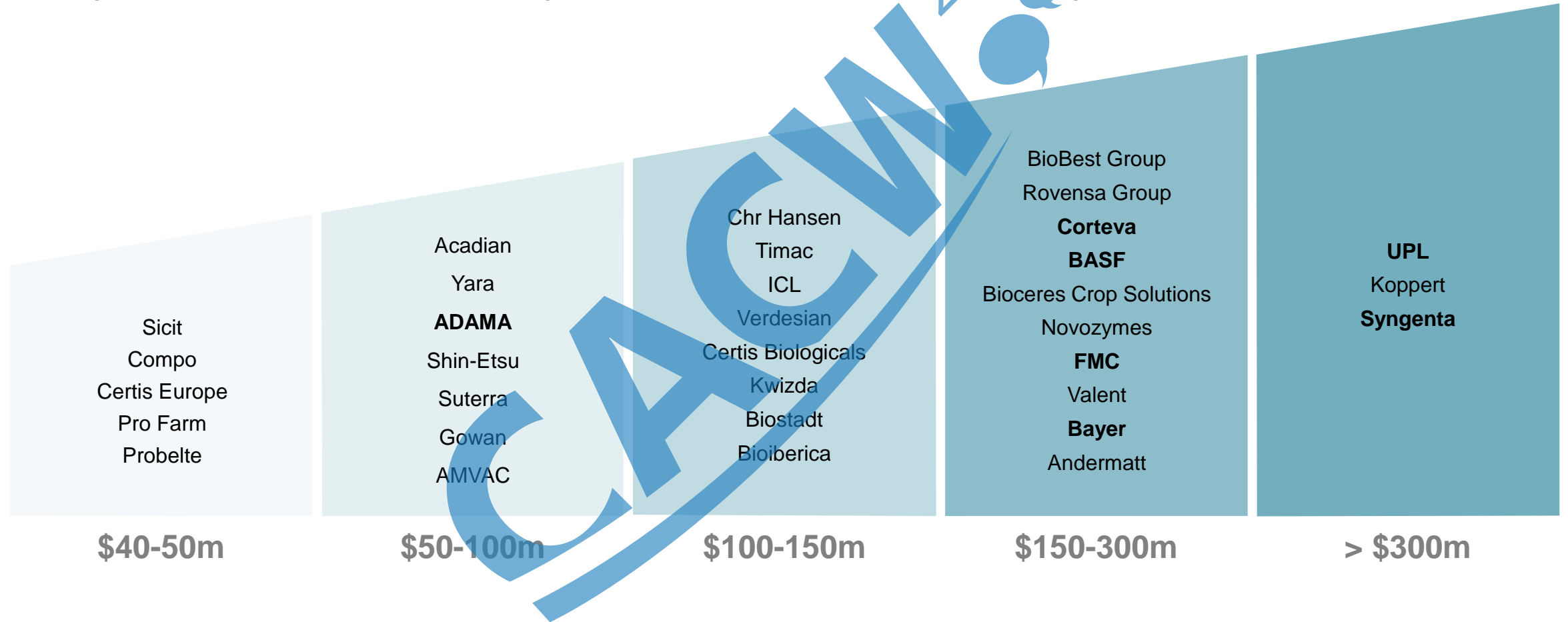
Company involvement



Biologicals industry structure

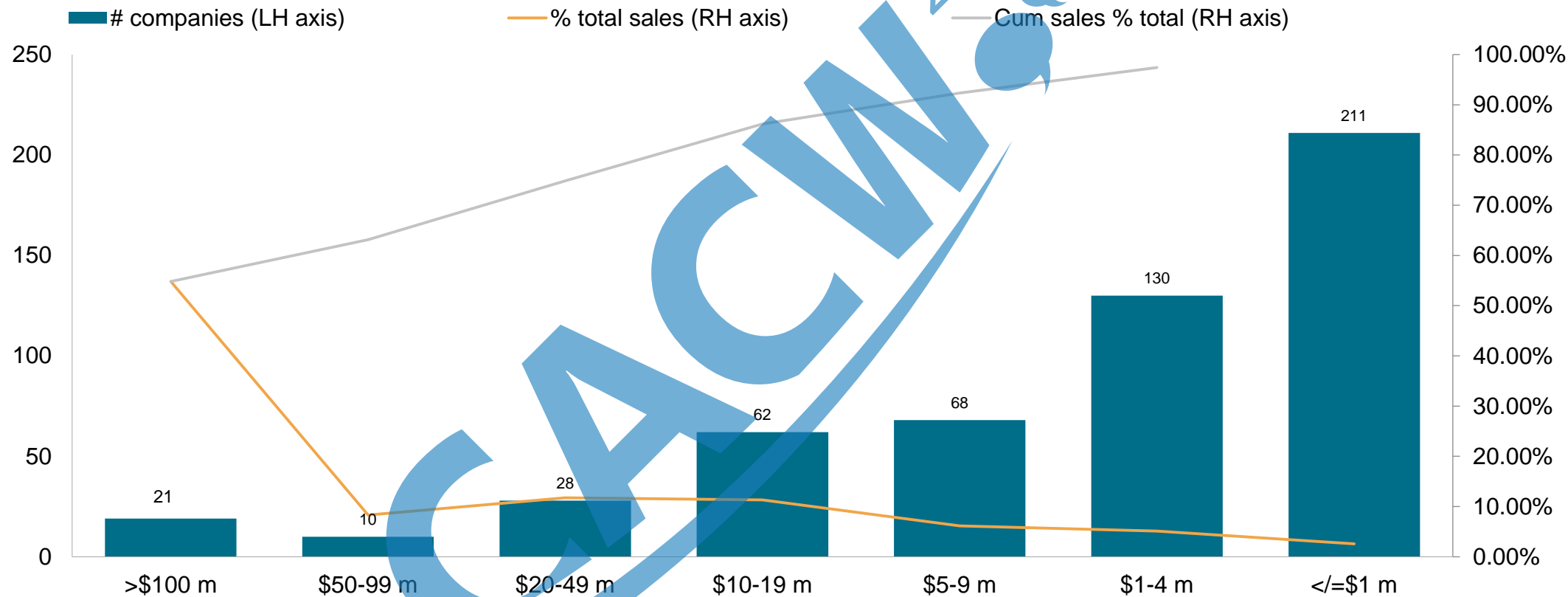
Leading biologicals companies ranked by annual sales

In the graph are presented the major biologicals companies ranked for sales of biologicals in 2022



Biologicals industry structure

Biological companies by sales

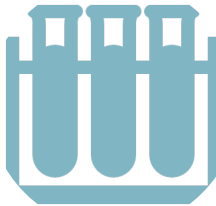


Data compiled Feb. 2024.
Source: S&P Global Commodity Insights.

M&A main drivers



Geographic expansion



Pipeline and new technology



Portfolio and business

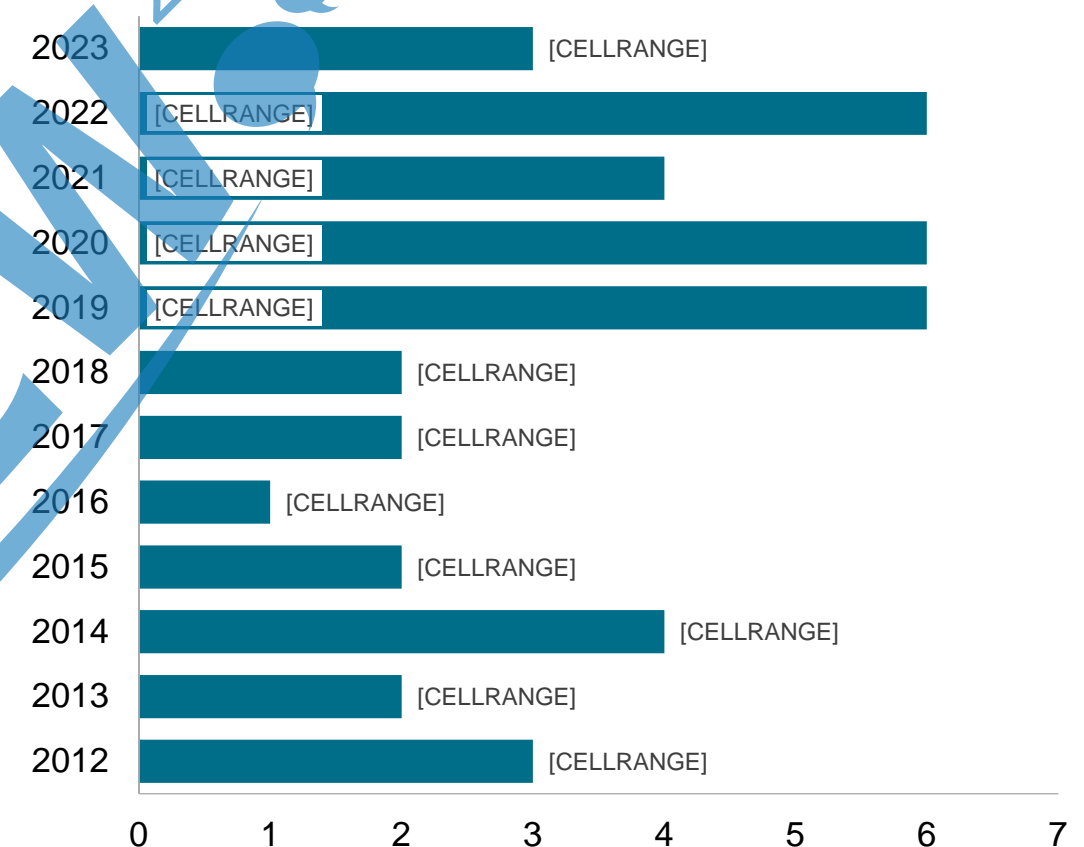
Different drivers can be identified in M&A events and can be grouped into 3 main categories:

- Geographic expansion: gaining access to new geographies where the acquired company has a strong presence. Strategy to improve route to market in case of sub-optimal sales
- Pipeline and new technology: acquisition of R&D knowledge, pipelines, or new technologies developed by the acquired company
- Portfolio and business: acquisition of a product portfolio to broaden the offer and get immediate results in terms of profit

M&A activity

- High level of activity over the last 5 years:
 - More than 100 acquisitions
 - More than 100 R&D collaboration
 - More than 50 venture capital funding
- Recent acquisitions involving major R&D companies such as FMC, Corteva, Syngenta
- Not only BCA's but Digital Ag, Biostimulants, R&D platforms
- Price for most deals not disclosed, but for those which are sales multiples between 0.5x and 8x
 - Actual sales and EBITDA
 - Projected sales
 - R&D and pipeline

Number of significant acquisitions or joint ventures



Source: S&P Global Commodity Insights

Conclusion



Conclusion

- Market growing at a rate that is far outstripping conventional sector and this trend is expected to continue
- More favourable environmental and consumer attributes support growing adoption
- Regulatory frameworks are more suitable for biologicals compared to conventional counterparts
 - Fast track systems in many countries
- Despite growth, biologicals remain a niche sector compared to conventional products
- Issue remains that there is no globally accepted definition of such product subsectors
- Challenges in farmer uptake include efficacy and shelf-life

Conclusion continued

- Consolidation has happened in the agrochemical market, and the market is in a mature phase
- The biologicals market is still in an early phase with high fragmentation, and several startups appear every year, bringing innovation to the market (AI, RNAi, peptides, formulation, etc.)
- New players are entering the market every year (major agchem, generics agchem, fertilizers company, tech companies)
- The sector is still at the beginning of the consolidation phase
- Companies are more careful in their investment due to the number of early stages startups
- Early warning of M&A are VC investments and company third-party agreements
 - **Acquisition and collaboration speak louder than words**

Further discussion



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