

Digital farming and biologicals

Presentation to ABIM

Jonathan Shoham,
Consulting Analyst, Crop Science

October 2023



Agenda

- **S&P Global introduction**
- **Digital farming**
 - History; penetration; taxonomy
- **Biologicals**
 - Linking their intrinsic properties to their strengths and weaknesses
- **How digital farming products and services can address some of the challenges facing biologicals**

S&P Global: Our capabilities

We bring you the Essential Intelligence to make it all happen

Ratings & Benchmarks

We partner closely with market participants to develop ratings and benchmarks that are the market standard sources for measurement, evaluation and comparison, helping people make assessments and manage risk and return.

Data & Analytics

We harness both proprietary and external data with experienced analysts and advanced analytics, providing clients the right forecasts and tools to uncover insights and unlock new opportunities.

Technology Solutions

We partner with customers to enhance workflows, increase efficiency and optimize business processes by leveraging software, platforms and managed services.

Research & Insights

S&P Global is the go-to expert for deeper industry insights and news. We provide opinions and research on current challenges such as ESG compliance and supply chains, and offer education, webinars, and marquee events like CERAWeek.

S&P Global Agribusiness: Six core sectors of expertise

We support organizations in driving success across the global agribusiness value chain



Crop Science

- Pesticides: Conventional and biological — fungicides, insecticides, herbicides, PGRs and nematicides
- Seed / GM Crops: Input and output traits, and seed treatments
- Digital farming and precision agriculture
- Commercial deals and more



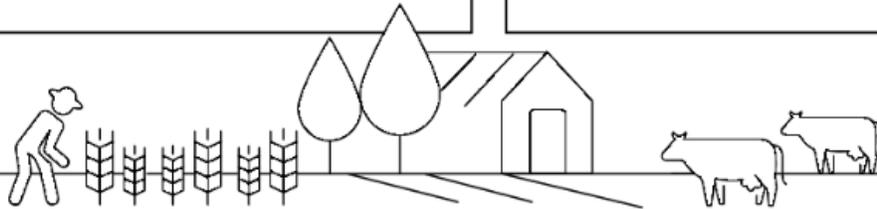
Food and Agricultural Commodities

- 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



Fertilizers

Price benchmarks and 10-year forecasts across:

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



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



Animal Health

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

Crop Science: Agrochemical Market Analysis and Data

Agrochemical Market Analysis

- Analysis of key country, crop and product markets with 5-year trends and 5-year forecasts
- Performance and strategy analysis for leading 50 companies
- Sector outlooks based on proprietary models — 10-year forecasts at the H/I/F level for major countries crop segments

Agrochemical Market Data

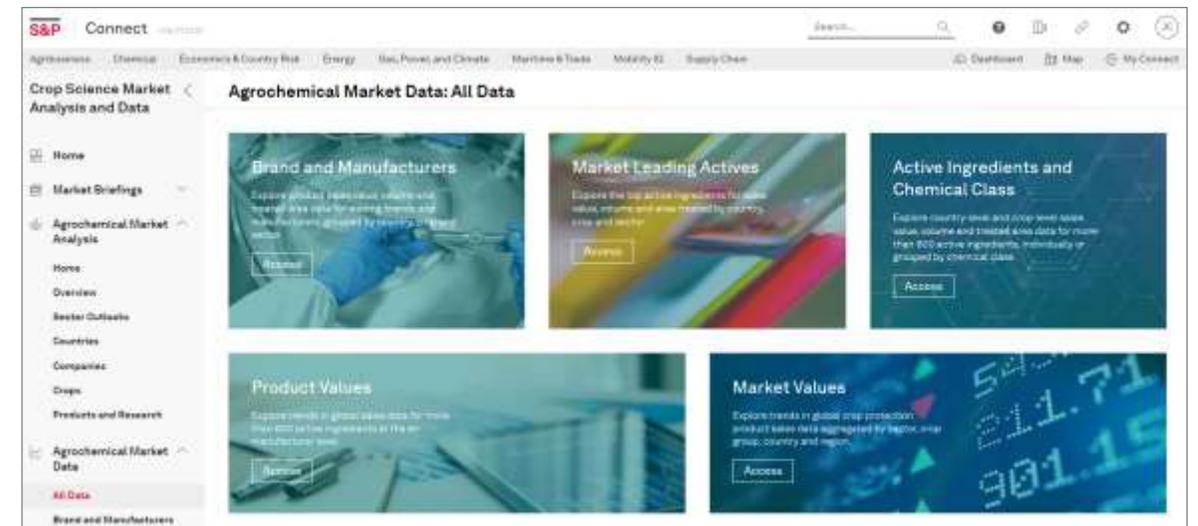
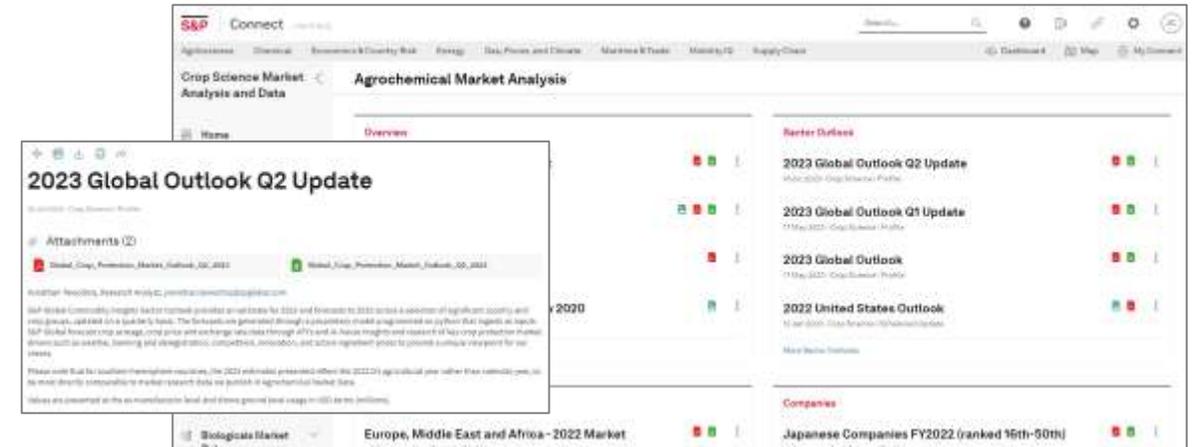
Provides a unique, granular view of the crop protection market with market data for active ingredients and brands:

- market value down to country-crop segment level
- volumes applied
- areas treated
- formulation types used

Generated from an array of reputable data sources — more primary market research (panel) data in recent years.

Modelled and validated against our proprietary historic datasets.

Supported with additional insight from our in-house analysts (with access to the wider Agribusiness Intelligence datasets).



Crop Science: Biologicals

Biologicals Market Data

Database of 750+ companies, 1,800+ active ingredients and 7,000+ brands:

- Biologicals control agents, biostimulants and biofertilizers
- Search by company, product and brand
- Search products by crops, pests, product class (26 classes) and product sector (biofungicides, biostimulants, etc.)
- Search companies by product class and region
- Product sizing down to US\$10m level (aggregated species value)
- Company sales down to US\$1m level
- Core data plus analysis reports for market and product class sizing and forecasts
- Market Trackers for company and regulatory events and R&D pipelines

Biologicals Market Analysis

- Coming soon...

The screenshot displays the S&P Global Connect interface for Biologicals Market Data. The main content area includes several 'Featured Insight' cards, such as 'Biologicals Regulatory Status Tracker September 2023' and 'Biologicals Market Events Tracker September 2023'. A 'Biologicals Brands' window is open, showing a search bar and a list of 407 results. The list includes various active ingredients with checkboxes, such as 0.1% Physcion AS, 0.2% Resveratrol AS, 0.2% Azadirachtin SL, 0.3% Matrine AS, 0.6% Emamectin Benzoate ME, 0.6% Matrine, 0.6% Matrine AS/DL, 1,4 Shig, 1,4 Slight, 1.5% Pyrethrins EW, 1.8% Abamectin EC, 1.9% Emamectin Benzoate ME, 1% Carvacrol AS, and 1% Cnidiladin.

Crop Science: Special reports

Digital Farming

- Published April 2023

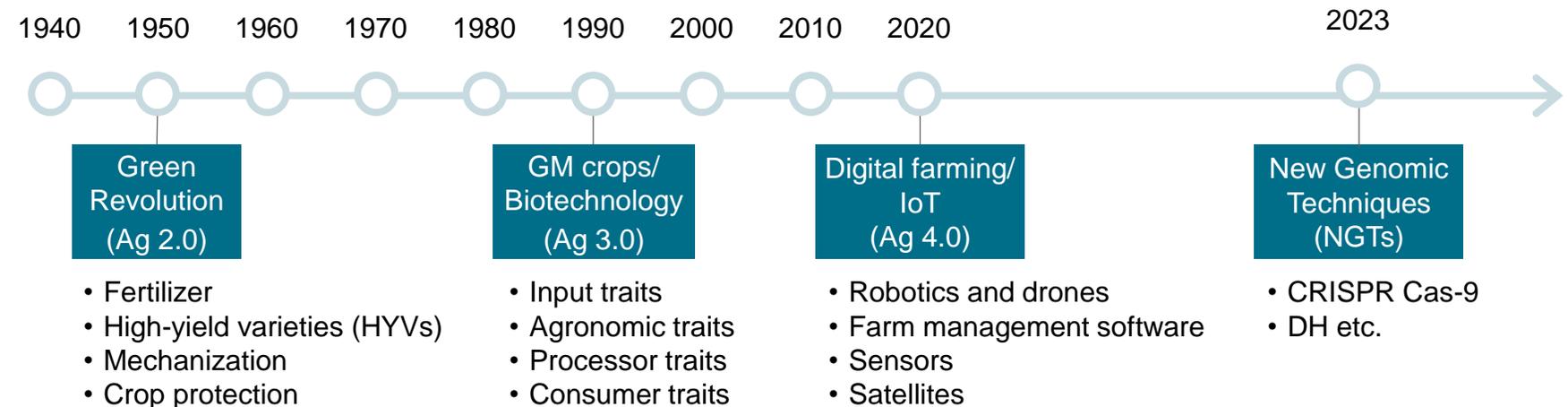


Crop Science: Digital farming

Eras of digital agriculture

Decade	Terminology	Characteristics/comments
1980s	Site-specific management	
1990s	Precision agriculture	Large, expensive machinery; drones used in Japan.
2000s	Big data	Costs start to come down; proliferation of technologies.
2010s	Digital farming	Monsanto acquires Climate Corp. DuPont acquires Granular. John Deere acquires Blue River. Syngenta acquires Farmshots, Strider, Cropio, Perfect Flight.
2020s	Digital farming	Everybody is doing it; increasingly given away for free.

Past and future agricultural revolutions



Source: S&P Global Commodity Insights.
© 2023 S&P Global.

Platts | CERAWEEK | Chemical Week

Crop Science: Digital farming

Market penetration

Company	Sector	Home country	Million acres	Million farmers
John Deere	Machinery	US	329	NA
Syngenta	CP/Seeds	China	208	NA
Bayer	CP/Seeds	Germany	>200	NA
Telus	Telecoms	US	170	NA
Semios/AgWorld	FMS	US	100	NA
DJI	Drones	China	80	NA
Agrosmart	FMS	US	48	0.10
Yara	Fertilizers	Norway	37	NA
Farmers Edge	FMS	US	10	NA
ProsperaTechnologies	FMS	US	5	NA
Decisive Farming	FMS	US	5	NA
Origin Digital	FMS	US	1.7	0.04
Crop Metrics	Irrigation	US	0.5	NA
Bloomfield Robotics	FMS	US	NA	NA
XAG	Drones	China	>100	9.00
e-Choupal	FMS	India	NA	4.00
IFFCO Kissan	Telecoms	India	NA	4.00
mKrishi	FMS	India	NA	0.40
Dacom	FMS	NA	NA	0.03
Proagrica	FMS	NA	NA	0.02
Agrible	FMS	NA	NA	0.02

Data compiled April 2023.

NA = Not available; CP = Crop protection; FMS = Farm management software.

Source: S&P Global Commodity Insights.

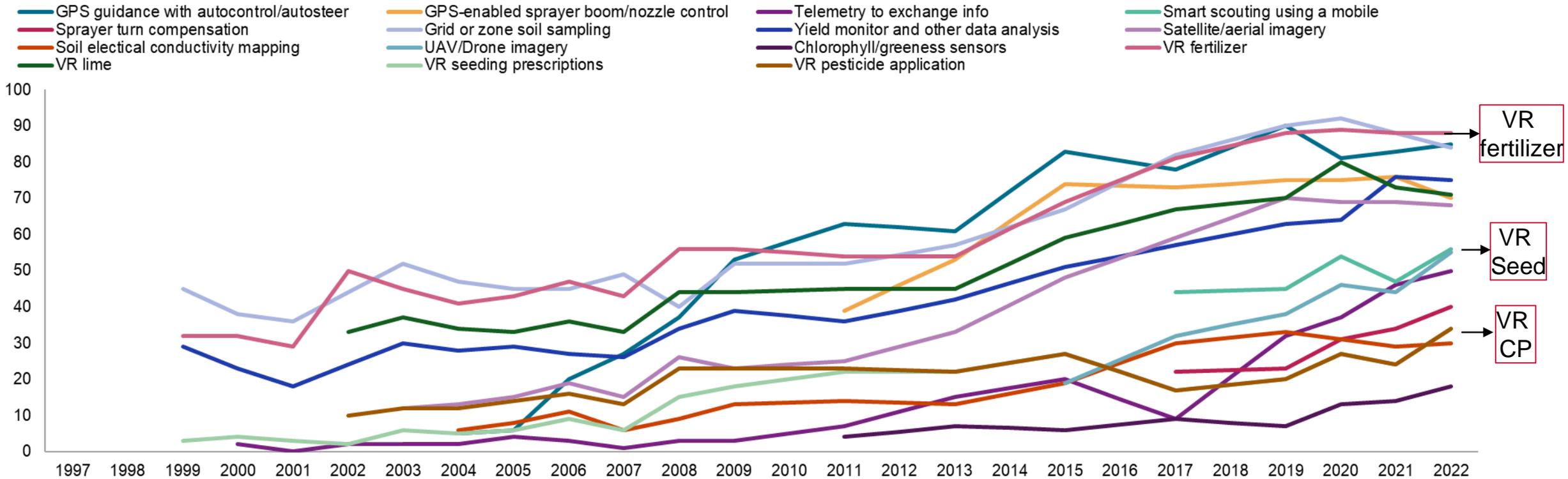
© 2023 S&P Global.

Platts | CERWeek | Chemical Week

Crop Science: Digital farming

Digital farming adoption by US Midwest dealers

% US Midwest dealers providing various digital farming services

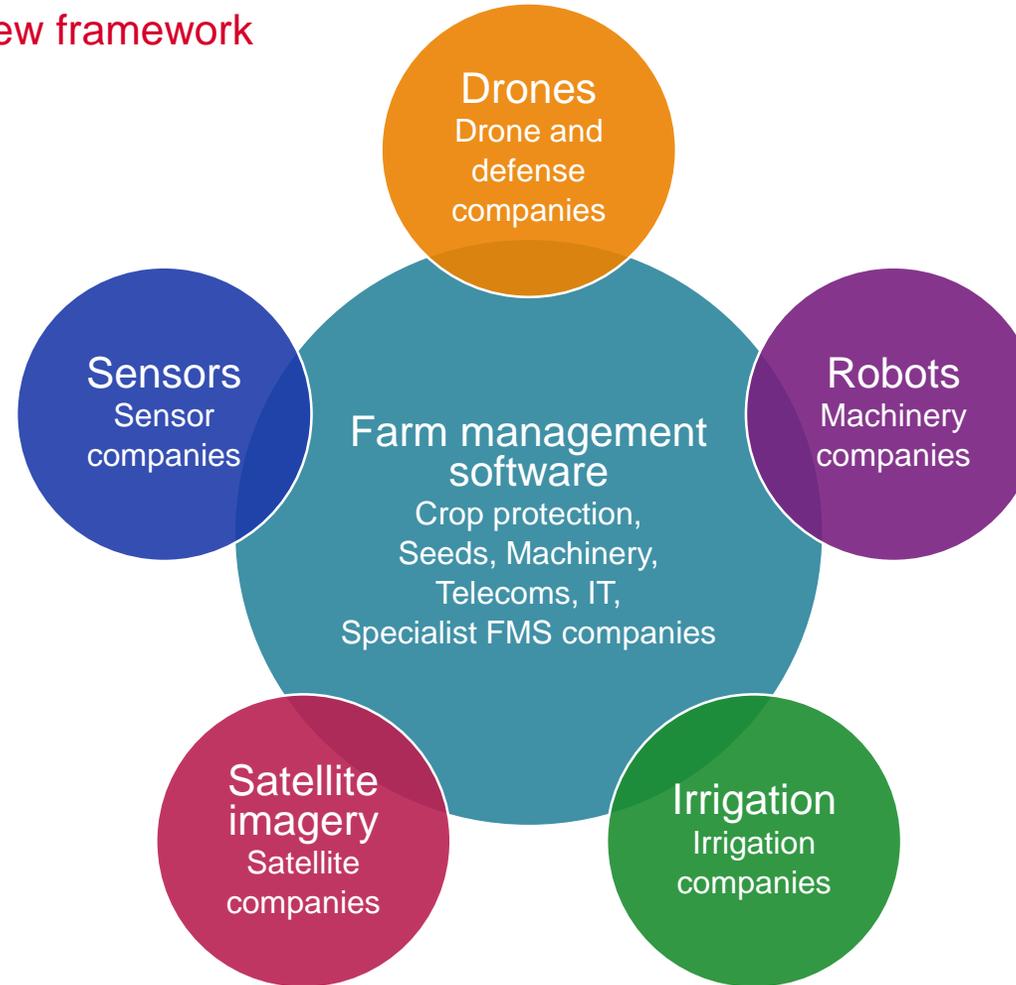


Data compiled April 2023.
 NA = Not available; CP = Crop protection; FMS = Farm management software.
 Source: S&P Global Commodity Insights; Erickson, 2022.
 © 2023 S&P Global.

Crop Science: Digital farming

Digital farming subsectors — a new framework

Sub-sectors and companies involved



Source: S&P Global Commodity Insights.
© 2023 S&P Global.

Platts | CERAWEEK | Chemical Week

Crop Science: Special reports

Biological Control Agents 2022

- Biopesticides and related BCAs
- Published October 2022



Biologicals: Properties and implications

Positives and negatives

BCA property	Positive	Negative
Intrinsically safer	Safer to operators; Quick re-entry to fields	
Different mode of action from conventional products	Good for combatting resistance; Can lead to synergy with conventional CP products, reducing the rates required	
Complex, living molecules		Can be expensive; Formulation challenges; Limited shelf life; Limited to high value crops e.g., F&V
Contact action	<u>No residues</u> ; Used up to and beyond harvest; No MRLs; No/low PHIs	Lack of systemic action can limit efficacy; <u>Good application critical</u>
Narrow spectra of activity	No impact on non-target species	Lack of efficacy; Must be used in combination with conventional CP products and in <u>IPM programs</u>
Synergy with conventional CP products	Reduction in amount of conventional chemical product needed	<u>Greater complexity of use</u>

Data compiled October 2023.

MRL = xxxxxxx; CP = Crop protection; PHI = xxxxxxx; IPM = Integrated pest management; F&V = Fruit and vegetables.

Source: S&P Global Commodity Insights.

© 2023 S&P Global.

Platts | CERAWEEK | Chemical Week

Biologicals: Challenges and digital farming solution

BCA property	Challenge	Relevant digital sector	Specific digital technology
Contact action	Need good application	Robotics; Drones	See & Spray etc.
Narrow spectra of activity	Pest identification especially important	FMS; Sensors	Pest identification apps.
	Use in IPM programmes	FMS	Education and training
	Use in combination with conventional CP products	FMS	Education and training
Low/zero residues	Traceability	FMS	End-to-end tracking; QR codes
>1000 AIs	Complex product choice decisions	FMS	Education and training

Data compiled October 2023.

CP = Crop protection; FMS = Farm management software; IPM = Integrated pest management.

Source: S&P Global Commodity Insights.

© 2023 S&P Global.

Platts | CERAWEEK | Chemical Week

Conclusions

- **CP in general more challenging for digital than some other areas:**
 - This reflects the complexity of CP
- **Biologicals have additional complexities which digital farming services can address:**
 - Need for education, training and stewardship (FMS)
- **Biologicals use can be more complex:**
 - Part of IPM programs (FMS)
 - Use in combination with conventional CP products (FMS)
 - Pest identification even more critical (FMS, sensors)
 - Need for precise application (drones, robotics)
- **Reaping the rewards from their use**
- **Record-keeping and traceability (FMS):**
 - The R&D majors have an advantage in applying digital farming to biologicals as they are already well-established in the former

Thank you. Any questions?



Having obtained a PhD in Environmental Economics, Jonathan worked for Syngenta and legacy companies in a variety of technical and commercial roles for 32 years, latterly as Head of Business Intelligence. For the last 12 years Jonathan has worked as a consultant for clients in the public, private, academic and NGO sectors on a range of projects spanning the agricultural supply chain. During this time, he has authored over 20 published papers and reports, most recently on the 'hot topics' of biologicals and digital farming. In his current role as Consulting Analyst for S&P Global, Jonathan has returned to his crop protection and seeds roots.

Jonathan Shoham

Consulting Analyst, Crop Science

Jonathan.Shoham@spglobal.com

CONTACT US

Americas	+1 800 597 1344
Asia Pacific	+60 4 296 1125
Europe, Middle East, Africa	+44 (0) 203 367 0681

www.spglobal.com/en/enterprise/about/contact-us.html

www.spglobal.com/commodityinsights



© 2023 by S&P Global Inc. All rights reserved.

S&P Global, the S&P Global logo, S&P Global Commodity Insights, and Platts are trademarks of S&P Global Inc. Permission for any commercial use of these trademarks must be obtained in writing from S&P Global Inc.

You may view or otherwise use the information, prices, indices, assessments and other related information, graphs, tables and images (“Data”) in this publication only for your personal use or, if you or your company has a license for the Data from S&P Global Commodity Insights and you are an authorized user, for your company’s internal business use only. You may not publish, reproduce, extract, distribute, retransmit, resell, create any derivative work from and/or otherwise provide access to the Data or any portion thereof to any person (either within or outside your company, including as part of or via any internal electronic system or intranet), firm or entity, including any subsidiary, parent, or other entity that is affiliated with your company, without S&P Global Commodity Insights’ prior written consent or as otherwise authorized under license from S&P Global Commodity Insights. Any use or distribution of the Data beyond the express uses authorized in this paragraph above is subject to the payment of additional fees to S&P Global Commodity Insights.

S&P Global Commodity Insights, its affiliates and all of their third-party licensors disclaim any and all warranties, express or implied, including, but not limited to, any warranties of merchantability or fitness for a particular purpose or use as to the Data, or the results obtained by its use or as to the performance thereof. Data in this publication includes independent and verifiable data collected from actual market participants. Any user of the Data should not rely on any information and/or assessment contained therein in making any investment, trading, risk management or other decision. S&P Global Commodity Insights, its affiliates and their third-party licensors do not guarantee the adequacy, accuracy, timeliness and/or completeness of the Data or any component thereof or any communications (whether written, oral, electronic or in other format), and shall not be subject to any damages or liability, including but not limited to any indirect, special, incidental, punitive or consequential damages (including but not limited to, loss of profits, trading losses and loss of goodwill).

ICE index data and NYMEX futures data used herein are provided under S&P Global Commodity Insights’ commercial licensing agreements with ICE and with NYMEX. You acknowledge that the ICE index data and NYMEX futures data herein are confidential and are proprietary trade secrets and data of ICE and NYMEX or its licensors/suppliers, and you shall use best efforts to prevent the unauthorized publication, disclosure or copying of the ICE index data and/or NYMEX futures data.

Permission is granted for those registered with the Copyright Clearance Center (CCC) to copy material herein for internal reference or personal use only, provided that appropriate payment is made to the CCC, 222 Rosewood Drive, Danvers, MA 01923, phone +1-978-750-8400. Reproduction in any other form, or for any other purpose, is forbidden without the express prior permission of S&P Global Inc. For article reprints contact: The YGS Group, phone +1-717-505-9701 x105 (800-501-9571 from the U.S.).

For all other queries or requests pursuant to this notice, please contact S&P Global Inc. via email at ci.support@spglobal.com.