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Recent Developments and Future Drivers in the Crop Protection Market

Presented by:

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Global Crop Protection Market Performance

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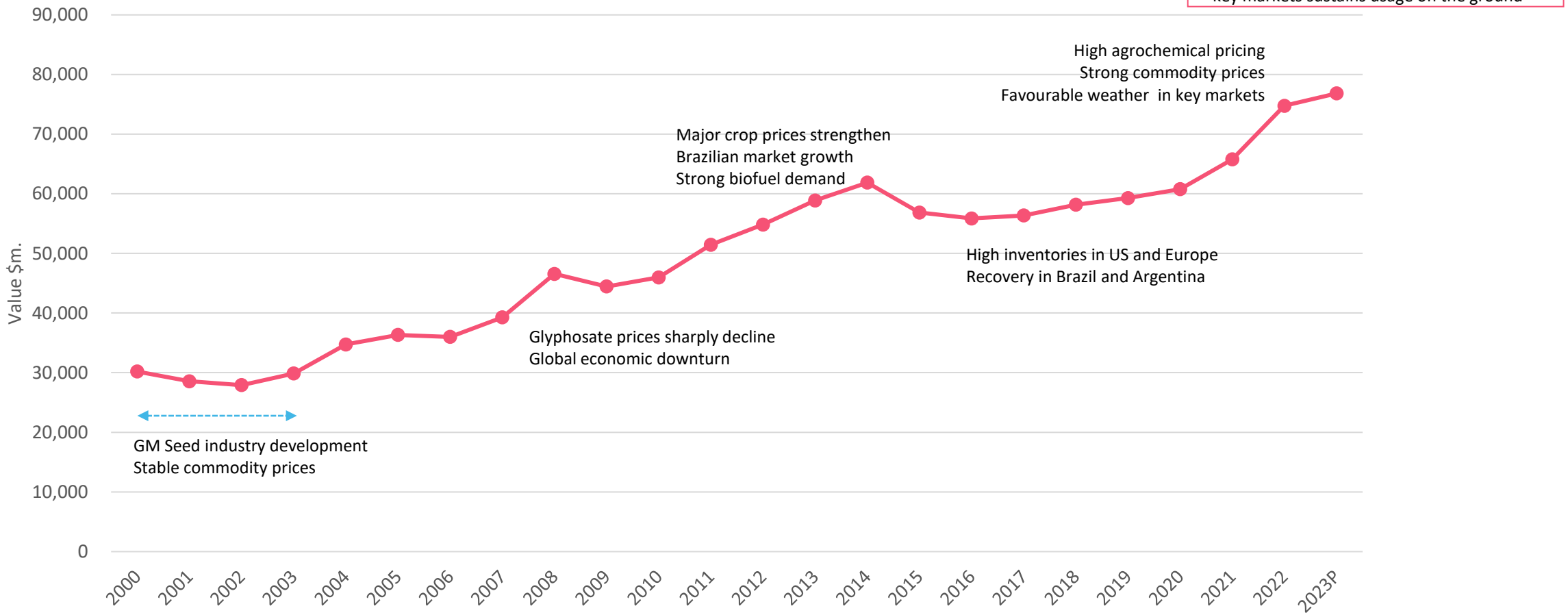
Crop Protection Market Development

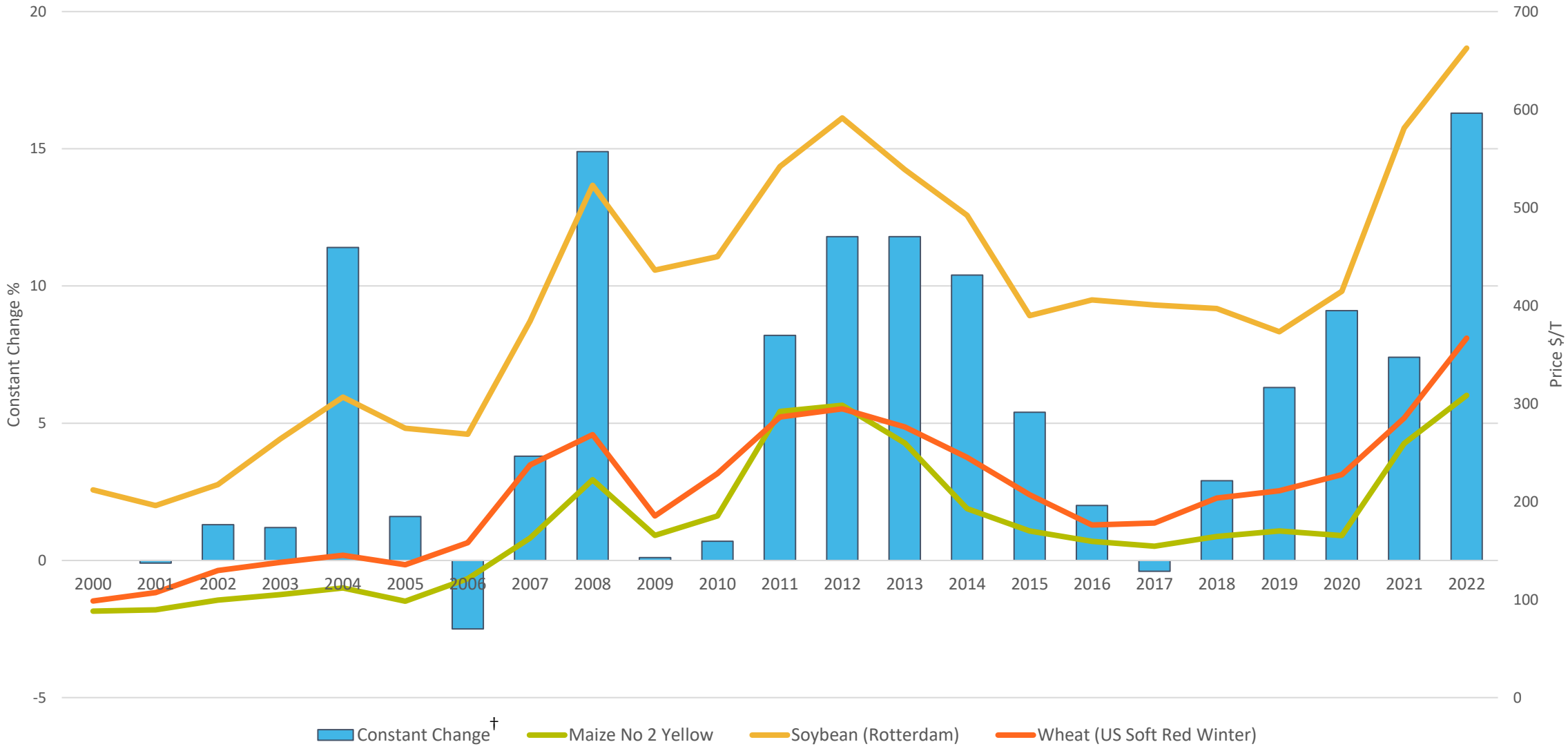
All values: Ex-manufacturer level – average exchange rates – Nominal US$

- Declining agrochemical pricing
- High inventories
- High pest pressure and favourable weather in key markets sustains usage on the ground



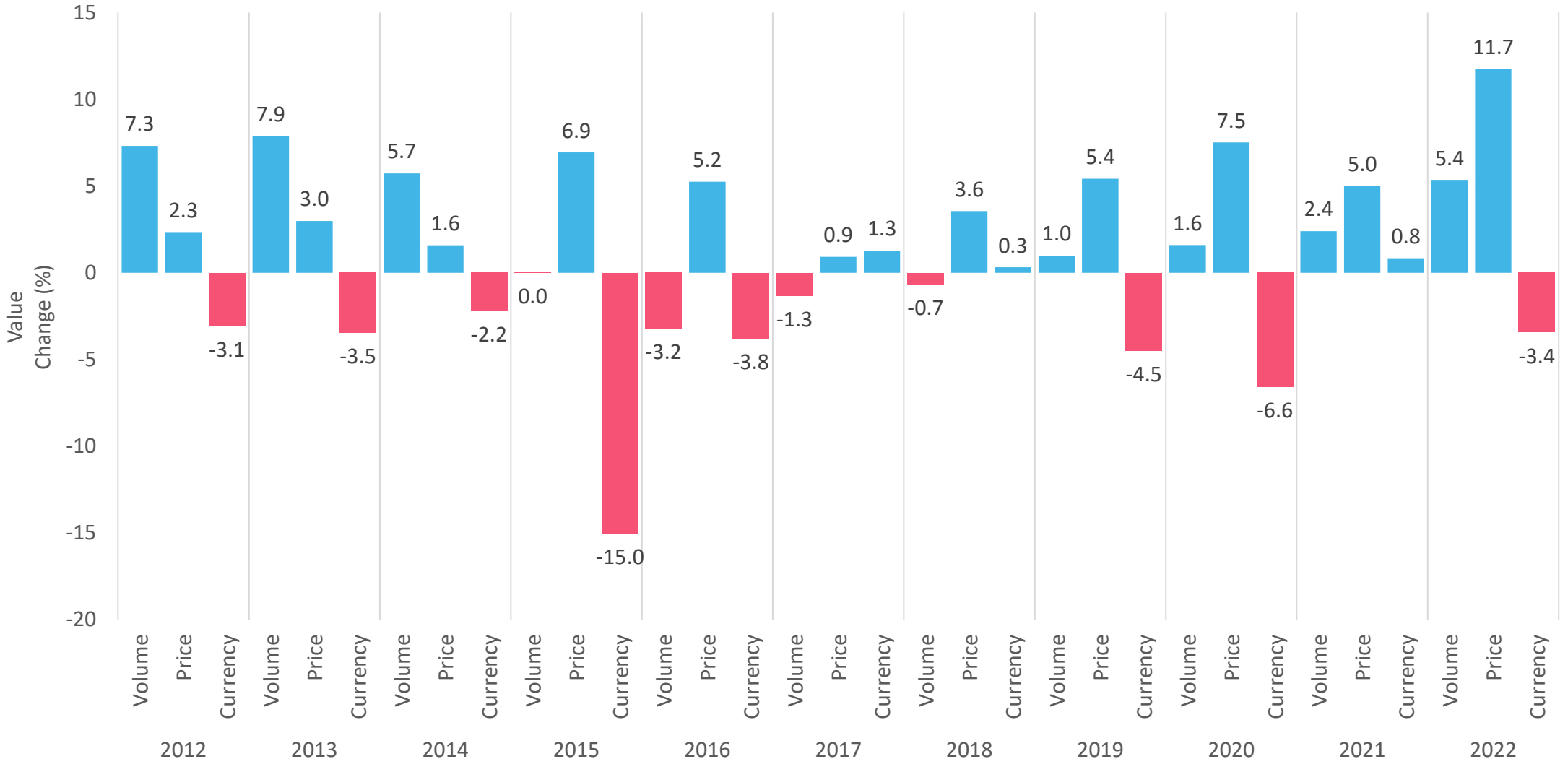
Source: AgbioCrop

Crop Protection Market: Commodity Price v Market Development



Source: FAO / AgbioCrop

Crop Protection Market: Volume/Price/Currency Effects



Source: AgbioCrop

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Future Market Drivers

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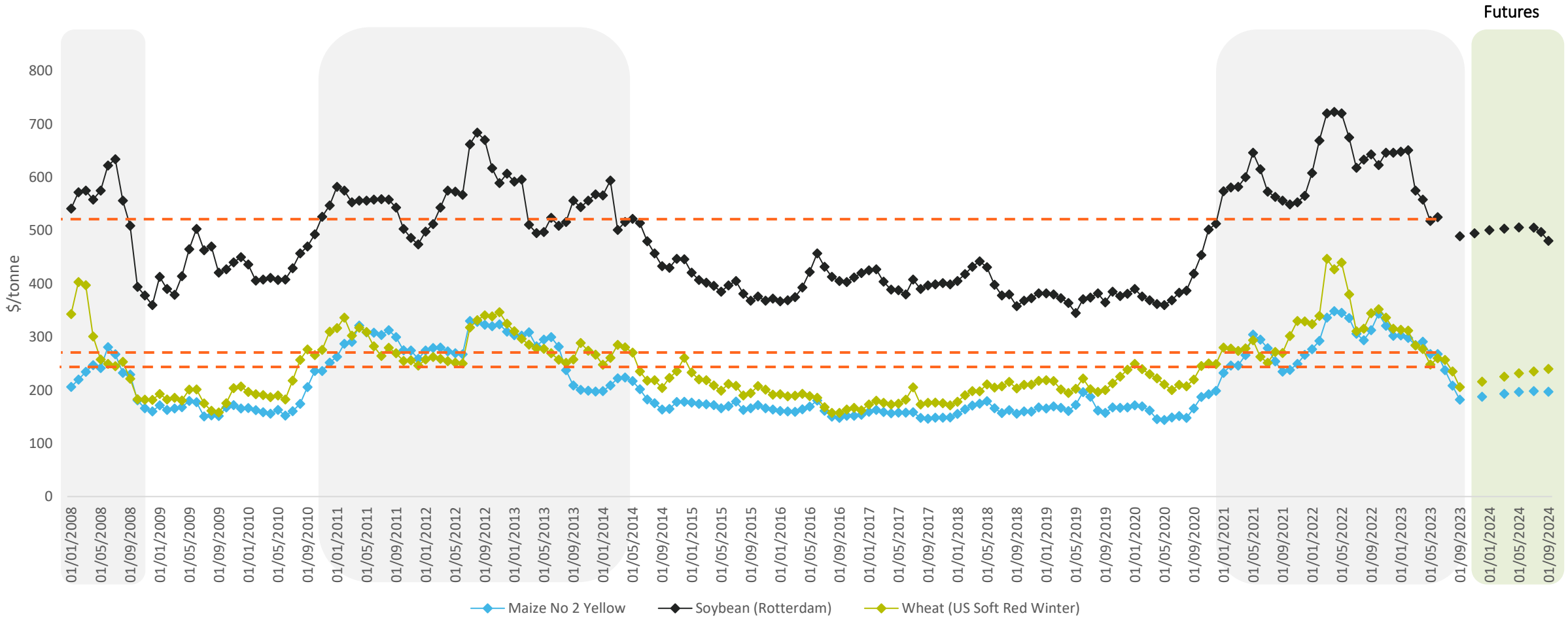
Future Market Drivers: Commodity Prices

- Crop commodity prices peaked during mid-2022
- Prices remain high by historical standards
- Covid, Ukraine and poor weather conditions initially drove strong gains

- Prices have softened as concerns over global grain supply have eased
- Winter wheat futures trading up, future Australian production a concern
- High corn pricing and low stocks stimulated a switch to increased planted areas in N. America



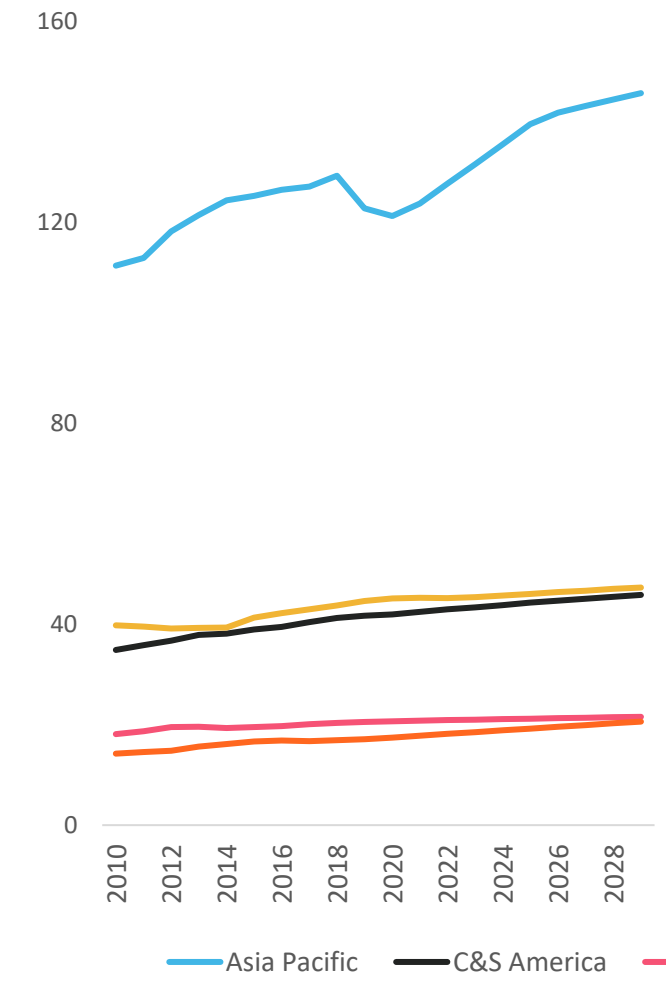
Source: FAO / CBOT

Future Market Drivers: Changing Dietary Habits

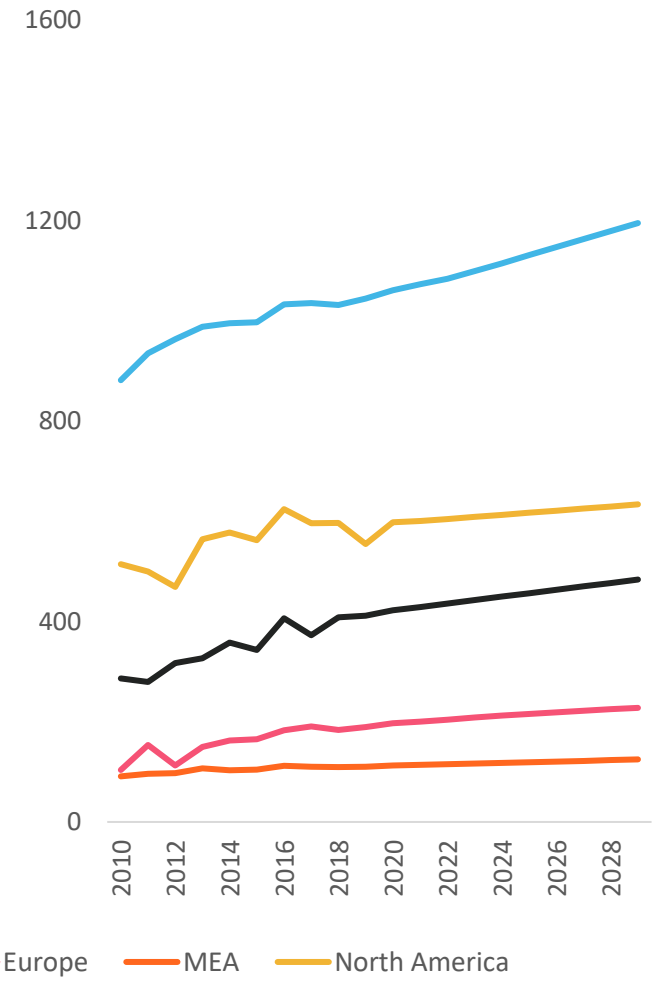
Changing dietary habits have potential to alter crop protection demand

- Vegetarian, veganism drives demand for feed crops and shifts demand to pulses and vegetables
    - Focus on Europe & North America
- Meat consumption forecast to rise primarily in APAC region:
    - Expanding middle classes in markets such as China and India
    - Demand for crop exports from C&S America and North America

Meat Consumption (T m.) [1,2]



Field Crop Production (T m.) [1,2]



Asia Pacific | C&S America | Europe | MEA | North America

[1] Beef, pig, poultry, sheep in key countries
[2] Maize, rice, soybean, wheat in key countries

Source: OECD

Future Market Drivers: Biopesticide Crop Protection Market

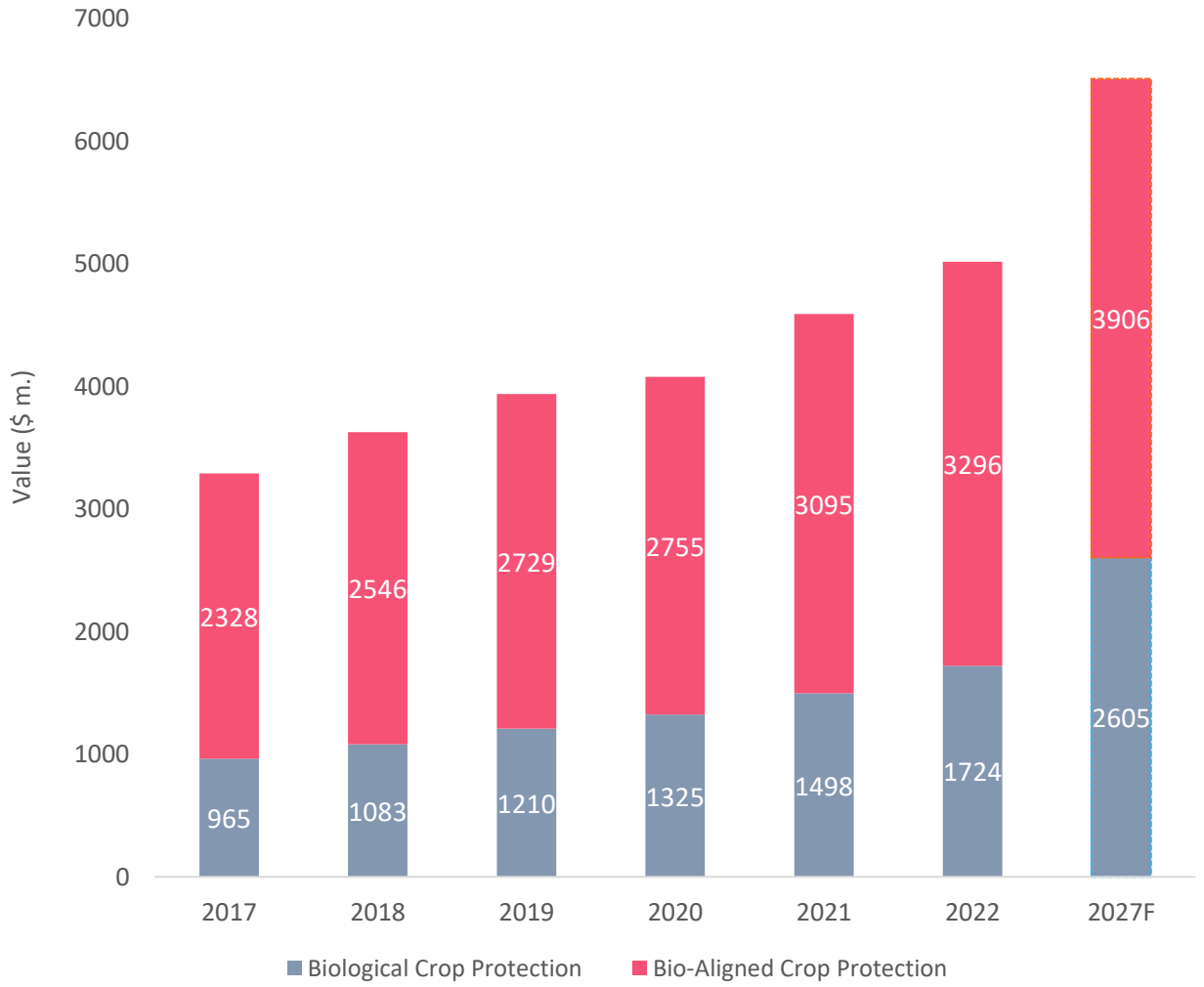
Value at ex-manufacturer level.

The Biopesticide Market Remains a Small Proportion of the Overall CP Market

- Market remains dominated by Bio-aligned products
  - (e.g. copper, sulphur, spinosad)
- Biopesticide (e.g. plant extracts, microbials) market +15% in 2022
- **Biopesticide Market expected to continue to out-grow conventional CP**

Key Drivers

- Organic production
- 'Green' legislation
- Efficacious new technology
- Increased market reach
- Novel mode of action
- 'Bridge' hybrid products
- Regulation



Source: AgBiological

Future Market Drivers: Political Controls

Political Control Now Centres on Environmental Controls

Targets range between 2030 – 2050

Generally, the key themes behind legislation focus on:

- Substantially increasing agricultural production
- Reduce pesticide volume use
- Reduce nutrient losses
- Reduce fertiliser use
- Substantially increasing organic farming areas

Recent Political Initiatives

The European Green Deal

- Farm to Fork
- EU Biodiversity Strategy

United Kingdom

- Brexit
- National Action Plan for the Sustainable Use of Pesticides (NAP)

Japan's Green Food System Strategy

USA's Agriculture Innovation Agenda (AIA)

China's 14th Five-Year Plan

- National Agriculture Green Development Plan (2021–2025)
- National Pesticide Industry Development Plan (2021–2025

Canada's Healthy Environment and Healthy Economy Plan

Australia's National Agriculture Innovation Agenda

Brazil's ABC+ Plan

Source: AgbioInvestor's Sustainability Policies & Agriculture Report

Political Controls: EU Farm to Fork Strategy

Published in May 2020 and voted in during October 2021 as a major component of the European Green Deal.
Post-Brexit, UK no longer acquired to adhere to F2F targets, although intends to adopt similar steps to halt biodiversity loss and protect the environment.

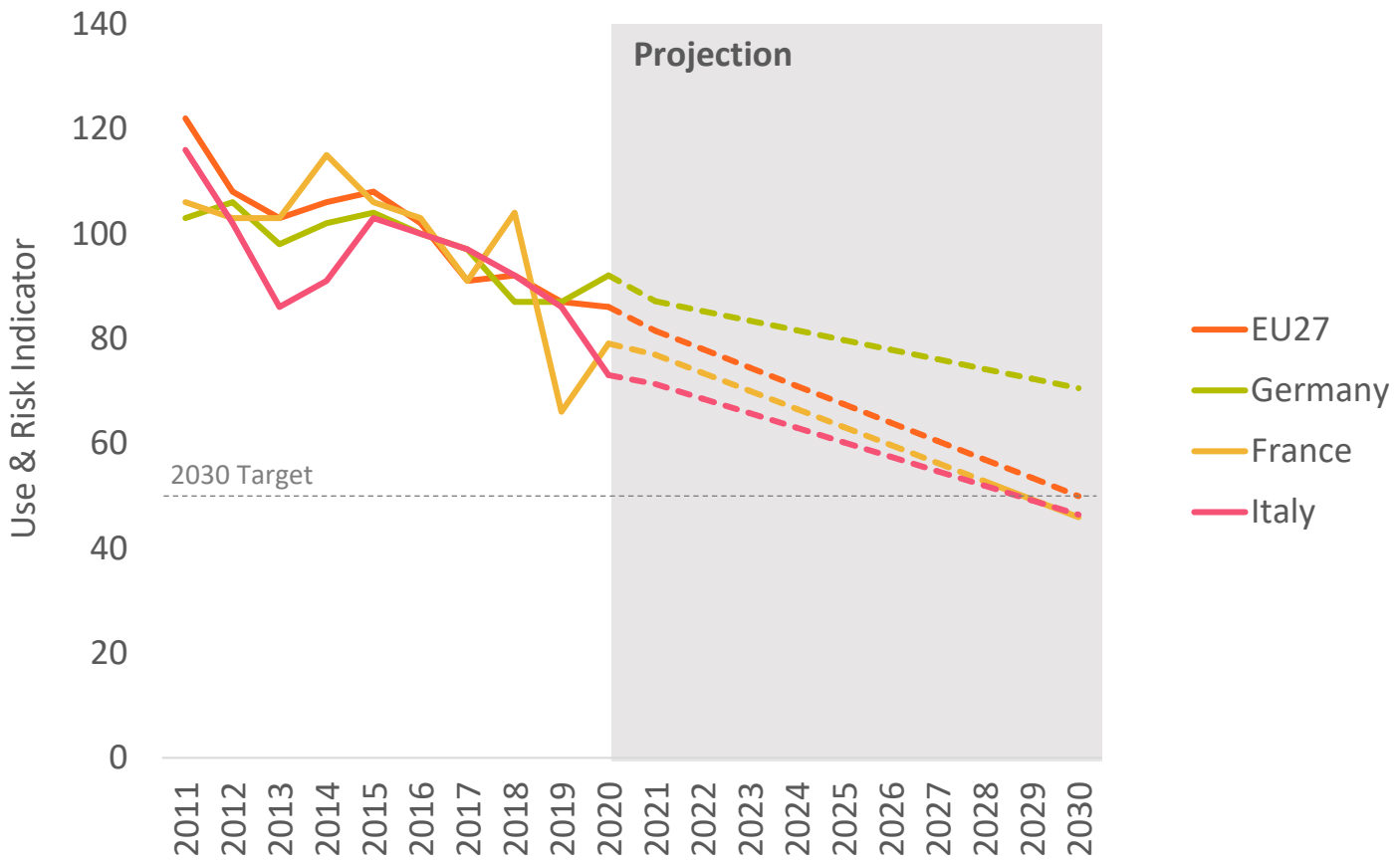
Aims

- Accelerate transition to a sustainable food system
- Preserve food security and affordability of food
- Generate fairer economic returns

Factor	Risks	Opportunities
Reduce Pesticide Risk/Use 50%	Toxic pesticides High volume pesticides	Biopesticides Env. safe + Low tox. products
Reduce Nutrient Loss 50%	Chemical fertilisers Organic fertilisers	Nitrification inhibitors Biostimulants
Organic Farming to 25% Area	Chemical pesticides Chemical fertilisers	Biopesticides/Biofertilisers 'Organic' inputs
Reduce chemical fertiliser use by 20%	Chemical fertilisers	Biofertilisers Biostimulants

Political Controls: EU Farm2Fork Progress

- EU aims to reduce use/risk of pesticides to 50% of 2015, 2016 and 2017 baseline by 2030
    - Composite measure based on AI volumes and AI hazard properties
- Risk/Hazard has been in decline
- Chart shows extrapolation of 2011-2020 data:
    - If continue at same rate, EU would meet target
    - Germany would miss target, Italy, France would hit target
- Key high volume hazardous AIs lost registration in recent years, should aid meeting target:
    - Mancozeb, Chlorpyrifos, Other Organophosphates



Source: Adapted from https://food.ec.europa.eu/plants/pesticides/sustainable-use-pesticides/farm-fork-targets-progress/member-states-trends_en and https://food.ec.europa.eu/plants/pesticides/sustainable-use-pesticides/farm-fork-targets-progress/eu-trends_en

Future Market Drivers: Political Controls - UK

Revised National Action Plan (NAP) Post-Brexit

Calls for:

1. **Ensuring continued robust regulation to protect human health and the environment**
2. **Supporting the development and uptake of IPM**
3. **Ensuring the safe and sustainable use of pesticides**
4. **Supporting the reduction of the risks associated with pesticides by setting clear targets by the end of 2022 and improving metrics and indicators**
5. **Ensuring that the government works effectively with others to deliver the NAP goals**

Also aims to further expand and improve the Biopesticides Scheme.

UK taking more pragmatic view on use of gene-edited crops to help achieve targets?

Source: AgbioInvestor's Sustainability Policies & Agriculture Report

Regulation – Herbicide Products at Risk in EU

chlorotoluron

Potential alternatives:

metobromuron

Negatives

Initially benefited as replacement for isoproturon due to concerns over groundwater contamination.

Component in a range of mixture products.

diflufenican

Potential alternatives:

halauxifen-methyl

Negatives

Important pre-emergent residual broadleaf weed control in cereals, including in a wide range of mixture products.

Could promote a shift from pre-emergent weed control program to post-emergent control, particularly for ALS resistant weeds.

metazachlor

Potential alternatives:

quinmerac

dimethenamid-P

Negatives

Leading oilseed rape herbicide in Europe. Significant product for pre- and early post-emergence of grass weeds.

Also a component in Clearfield Vantiga with quinmerac and imazamox for use on Clearfield oilseed rape in Germany.

Loss of carbetamide restricts alternatives

phenmedipham

Potential alternatives:

metamitron

Negatives

Significant herbicide for broadleaf weed control in sugar beet.

Removal of desmedipham restricts options, particularly in sugar beet.

Regulation – Fungicide Products at Risk in EU

Copper

Potential alternatives:

acibenzolar (bacterial diseases)

Trichoderma harzianum (organic)

sulphur

Negatives

alteration in agronomic practices leading to reduction in fungicide sprays

development of varietal disease resistance (particularly vines, potatoes, tomatoes).

Biocontrol methods generally supplementary, cannot replace efficacy of copper

In vine, several alternatives result in hardening of skin, making wine production more difficult

Triazoles

Potential alternatives:

mefentrifluconazole

fenpicoxamid

Negatives

Removal of important tool in resistance management (often paired with SDHIs to mitigate against resistance development)

Key wheat fungicides in EU in particular

Wide range of crop applications, including as seed treatments

Fludioxonil

Potential alternatives:

proquinazid would be the only available signal transduction inhibitor left in the EU market, good preventative option against mould in particular

Negatives

Important tool in resistance management

Common component in seed treatments, often with insecticides

Multi-sites

(mancozeb, chlorothalonil)

Potential alternatives:

folpet (particularly Ramularia control in barley)

Combination products (azole / SDHI combinations)

Negatives

resistance management and spectrum of disease control at significantly higher cost than when using multi-sites

Loss of fungicide sprays, with greater focus being placed on reducing crop stress through higher use of nutrients

Future Market Drivers: Digital Agriculture

Digital Agriculture Uptake Driven by Consumer Demand

- Demand for low residue produce from consumers and food groups
    - E.g. PAN-UK surveys supermarkets and ranks related to their action on pesticides
- Expected to aid increase demand for biopesticides:
    - Particularly large farms with direct links to retail
- Traceability may be a key issue for regulators to enforce standards:
    - Enabled by **digital agriculture**

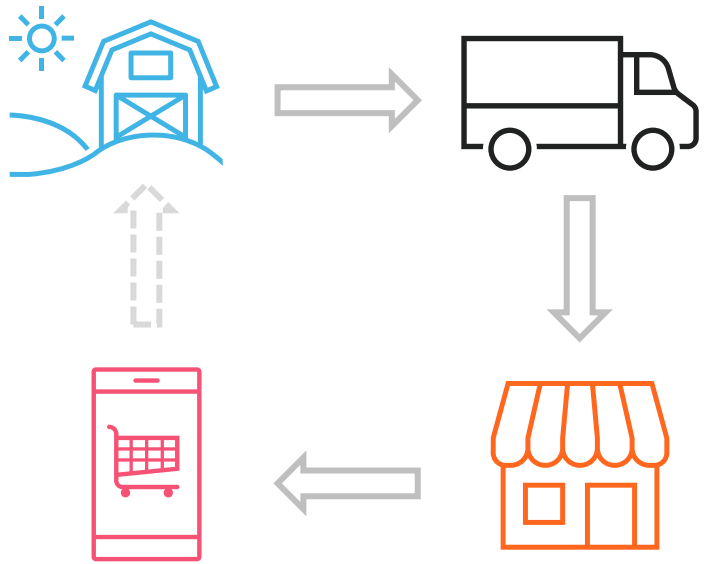
Regulatory and consumer demand influences grower, manufacturer and retailer behaviour

Digital Systems for Food Traceability

Enable tracking of history, distribution, location and application of food products. Helps ensure reliability of sustainability claims and enhances transparency.

Growers
Document source, methods and standards.

Manufacturers / Distributors
Digitise data on secure systems.



Consumers
Scan products for information on food production process.

Retailers
Monitor produce, communicate with consumers & reduce food waste.

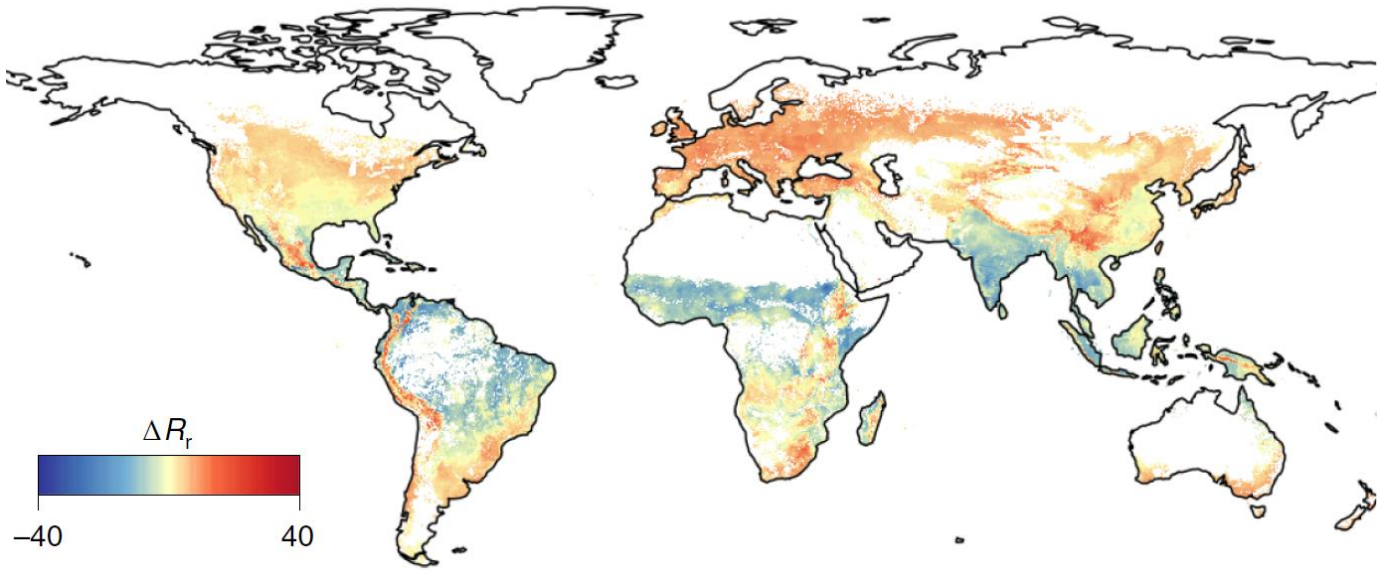
Source: Adapted from eitfood

Future Market Drivers: Climate Change

Climatic change expected to alter pest distribution

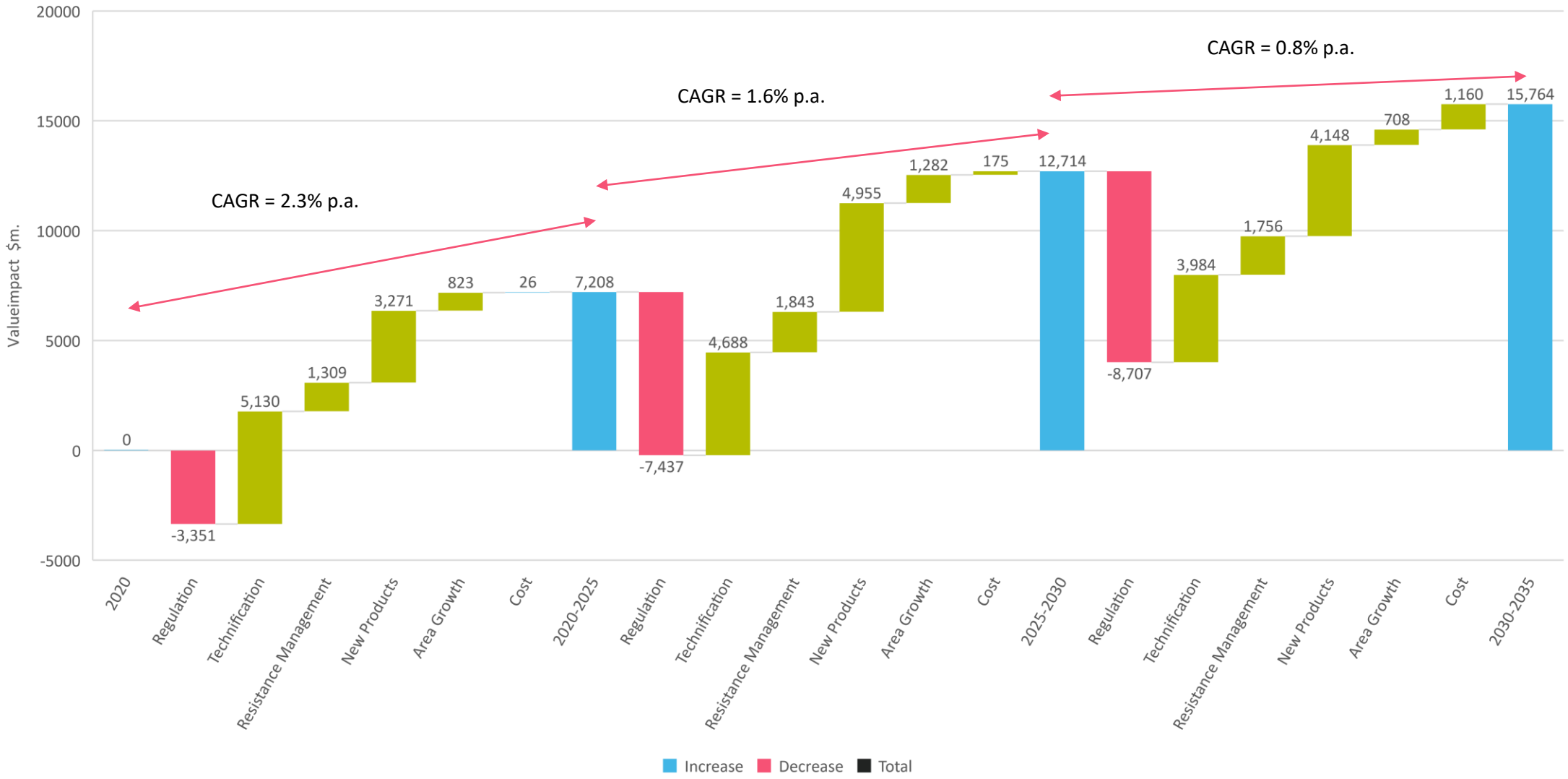
- Impacts are crop, pest and microclimate dependant:
  - More species at higher latitudes
  - Fewer species closer to equator
- Potential to increase pressure in USA and Canada, Europe, China, Andean S America, Southern Africa
- Potential for fewer species of concern in Brazil & Northern S America, Sub-Saharan Africa, India and SE Asia
- Number of species not necessarily indicative of pressure on crop plants.

Average change in number of crop disease species (ΔR_r) at end of 21st century under high emissions scenario (RCP 6.0).
Model based on temperature response for >80 row crop pest species.



Source: Adapted from: Chaloner, T.M., Gurr, S.J. & Bebber, D.P. Plant pathogen infection risk tracks global crop yields under climate change. *Nat. Clim. Chang.* 11, 710–715 (2021).

Crop Protection Market Forecast 2025-2030-2035



Note

2020 baseline predates recent significant price increases
Forecasts in Real terms (i.e. constant price + currency)

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Thank you!

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