

Agrochemicals - Where are we heading?

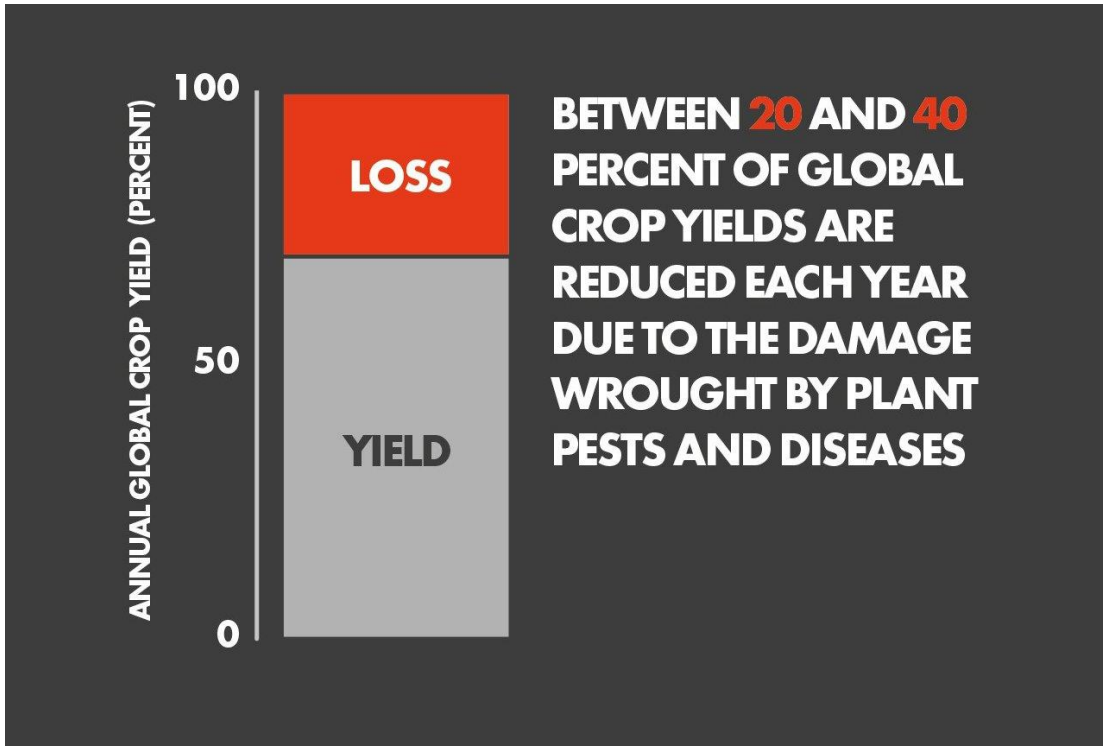
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August 2026

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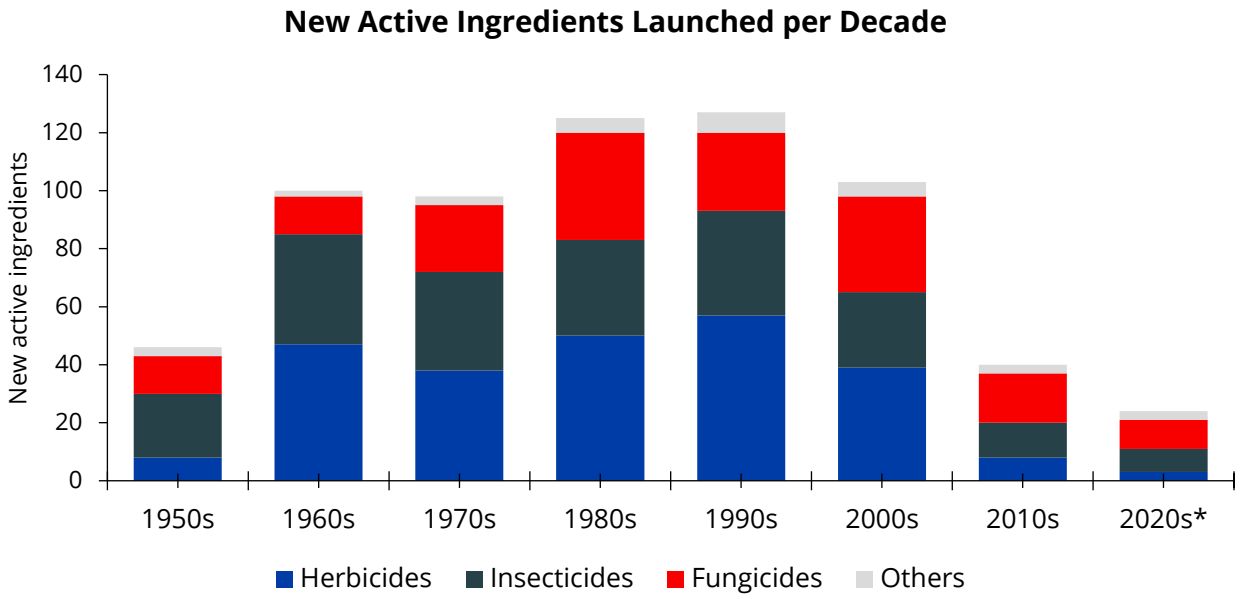
Setting the Stage – Why Crop Protection Matters

- By 2050, the global population is projected to exceed 9.7 billion.
- Today over 295 million people across 53 countries experienced acute hunger,
- Agricultural production must increase by approximately 60% to meet future food demand.
- The crop protection industry stands at a crossroads: balancing sustainability, technology, and consumer trust.
- Approximately 1.05 billion tons of food waste globally in 2022 at the retail, food service, and household levels. This is in addition to the 13% of food lost earlier in the supply chain between harvest and retail.



The State of Crop Protection Today

- **Chemical pesticides still dominate**, representing 80% of market value.
- Market value by category (2024, approx.): herbicides ~$35B, insecticides ~$21B, fungicides ~$21B, biologicals ~$8B, adjuvants ~$4B, and PGRs ~$3B – roughly $80B in total
- 1960's – 15 groups, today over 40 groups **(MoA's)**
- The **biological segment—** biopesticides, microbial and natural extracts—is growing rapidly. (10-15% CAGR)
- **Increasing regulation** on chemical residues, such as the EU Farm-to-Fork strategy, is reshaping the market.
- **Rising R&D costs** and shrinking portfolios of new active ingredients challenge innovation.



*Source: Phillips McDougall, Figure 2 (new active ingredients by class). *2020s covers 2020–2026 only – a partial decade; bar is indicative and not comparable to full ten-year totals.*

What changed since: Bringing a new active ingredient to market now costs ~$286M and ~11 years of R&D, up roughly 55% since 2000. As the cost and time per molecule climb, R&D budgets are shifting away from conventional chemistry toward GM traits and biologicals.

Crop Protection Actives off patent and due off patent till 2028

2023	Category
Bixafen (Bayer Crop Science)	Fungicide
Isopyrazam (Syngenta AG)	Fungicide
Mandipropamid (Syngenta AG)	Fungicide
2024	
Chlorantraniliprole (Corteva/FMC)	Insecticide
Flubendiamide (Bayer Crop Science)	Insecticide
Fluopicolide (Bayer Crop Science)	Fungicide
Fluopyram (Bayer Crop Science)	Fungicide / Nematicide
Penflufen (Bayer Crop Science)	Fungicide
Penthiopyrad (Corteva Agriscience)	Fungicide
Pyriofenone (Ishihara)	Fungicide
Pyroxsulam (Corteva Agriscience)	Herbicide
Saflufenacil (BASF)	Herbicide
Sedaxane (Syngenta AG)	Fungicide
Thiencarbazone-methyl (Bayer Crop Science)	Herbicide
Valifenalate (Ishihara)	Fungicide
2026	
Cyantraniliprole (Corteva/FMC/Syngenta)	Insecticide
Pinoxaden (Syngenta AG)	Herbicide
2027	
Sulfoxaflor (Corteva Agriscience)	Insecticide
2028	
Benzovindiflupyr (Syngenta AG)	Fungicide

Growth opportunities persist:

- Continuous expansion of off-patent crop protection market share as blockbuster compounds lose exclusivity;
- Rapid growth of excellent multinational generic crop protection companies
- Interplay among different product categories driven by transgenic seed and biologicals
- Government prohibition or restriction policies



Patented Pipelines of the Crop Protection Majors (Next 5 Years)

Company	Pipeline focus (2025–2030)	Flagship new / recently launched patented actives (mode of action)	Expected launch
Bayer	New-MoA herbicides, next-gen fungicides & insecticides	Icafolin-methyl (new-MoA herbicide); Isoflucypram – Iblon (SDHI fungicide)	2024–2028
Syngenta	Novel insecticide & fungicide MoAs, seedcare nematicides	Isocycloseram – Plinazolin (isoxazoline insecticide); Cyclobutrifluram – Tymirium (nematicide/fungicide)	2023–2027
BASF	New insecticide & herbicide MoAs for resistance management	Dimpropyridaz – Axalion (novel insecticide); Trifludimoxazin – Tirexor (PPO herbicide)	2024–2028
Corteva	Bio-based & novel fungicides, nematicides, herbicides	Florylpicoxamid – Adavelt (picolinamide fungicide); Fluazaindolizine – Reklemel (nematicide)	2024–2027
FMC	New herbicide MoA (rice), next-gen diamides & fungicides	Tetflupyrolimet – Dodhylex (first new-MoA rice herbicide in decades); Fluindapyr (SDHI fungicide)	2025–2028
Sumitomo Chemical	Novel PPO herbicide, SDHI fungicide, insecticides	Epyrifenacil – Rapidicil (PPO herbicide); Inpyrfluxam – Indiflin (SDHI fungicide)	2024–2027

Indicative pipeline based on public company disclosures; launch timing varies by crop and geography.



Forces Shaping the Industry's Future

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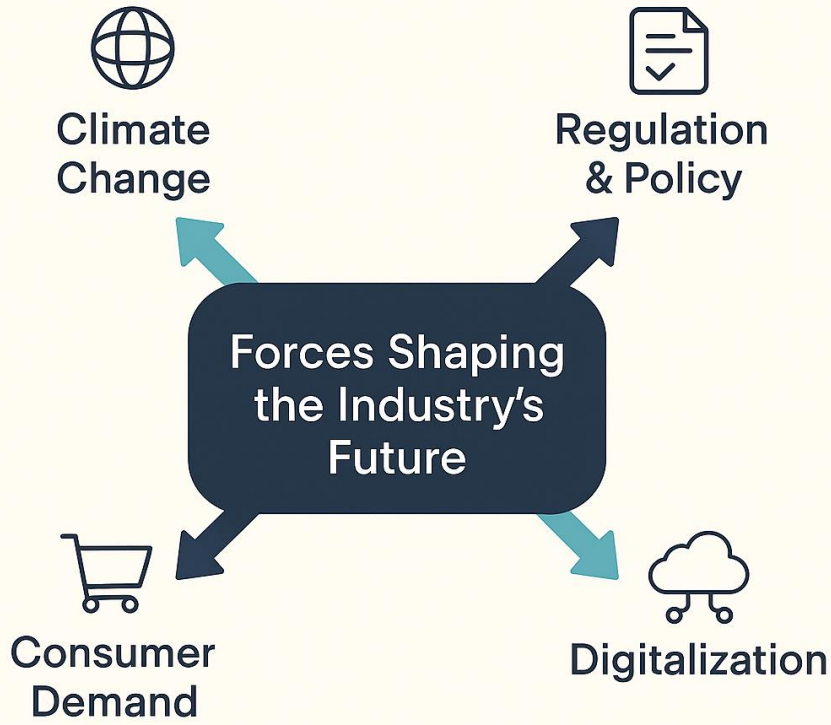
Forces Shaping the Industry's Future

Climate Change: Alters pest pressure, disease distribution, and requires new strategies and crop choices.

Regulation & Policy: Push for reduced pesticide use, eco-labeling, and integrated pest management (IPM).

Consumer Demand: Growing preference for sustainable, residue-free products.

Digitalization: Precision agriculture, AI, and sensor-driven decision support are transforming farming.




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Climate Variability, Climate Change, Climate Smart Agriculture

South Africa is expected to experience:

- Increase in mean, maximum and minimum **temperatures**.
- Increase in **very hot days – above 35 °C** and the frequency of heat wave events.
- **Drier conditions** in the future, with regional variation.
- Slight **increases in rainfall** towards the north-eastern region.
- A strong **drying signal** over the **southwestern region**, which could result in reductions in rainfall of more than 40 mm per year.
- Increase in the **frequency of extreme rainfall** events (20 mm of rain falling within 24 hours) over eastern parts during the summer months.
- **Sea level rise** and an increase in the frequency and intensity of **sea storms**, accompanied by increases in wave heights
- Increase in the **number of high fire danger** days over north-eastern region and along the Cape south coast and the south-western Cape.



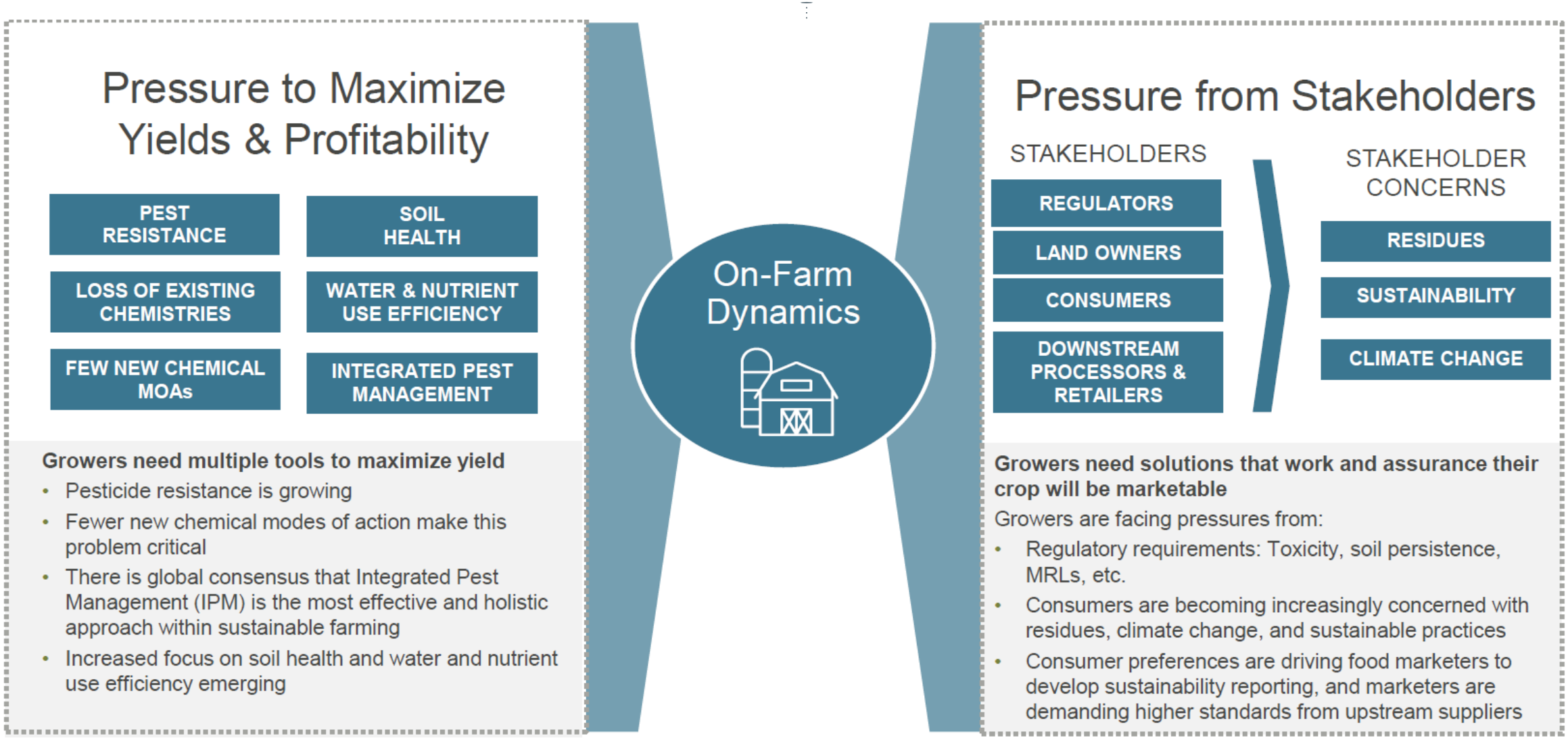


Consumer demand

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As growers face increased pressure to maximize yields and profitability, they also face increasing pressure from a variety of stakeholders



Innovation and technological advances that will change the ag-industry. (some examples)

RNA Interference (RNAi): Enables targeted pest control at the genetic level.

Biologicals: Microbial solutions, pheromones, and plant extracts offer new modes of action.

CRISPR & Gene Editing: Developing pest-resistant crop varieties for future resilience.

Digital Platforms: AI-driven pest prediction, autonomous spraying, and drone monitoring are becoming mainstream.



AI-Driven Discovery of New Crop Protection Chemistry

Scaffold building & hopping: AI assembles and swaps core molecular scaffolds to find novel, patent-free active structures.

Generative de novo design: Models propose entirely new candidate molecules optimised for a target mode of action.

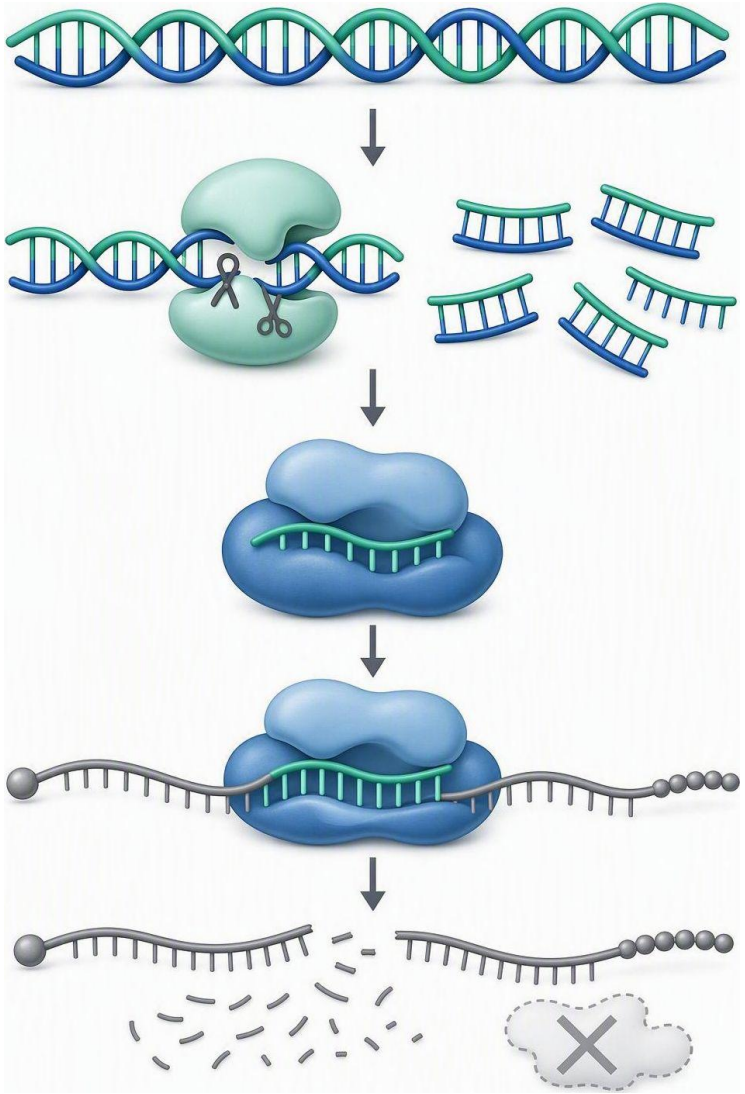
Predictive screening: Machine learning ranks millions of virtual compounds for efficacy, selectivity and toxicity before synthesis.

Retrosynthesis planning: AI maps synthesis routes and flags manufacturability, shortening the path to scale-up.

Faster, cheaper pipelines: Compressing discovery cycles and cutting the cost of bringing new chemistry to market.



What is RNAi Technology and why is this exciting?



dsRNA → Dicer → siRNA → RISC → binds mRNA → mRNA degraded

Mechanism: RNAi relies on double-stranded RNA (dsRNA) molecules that match a sequence in a target pest's or pathogen's gene. This dsRNA triggers the cell's machinery to degrade the corresponding messenger RNA (mRNA), preventing the production of essential proteins for survival, development, or function.

Specificity & Safety: It is highly sequence-specific, meaning it can be designed to target a gene unique to the pest, leading to minimal impact on beneficial insects, non-target organisms, and the environment compared to broad-spectrum chemical pesticides.

See Calantha: https://www.greenlightbiosciences.com/

Peptide Technology: A New Class of Biological Crop Protection

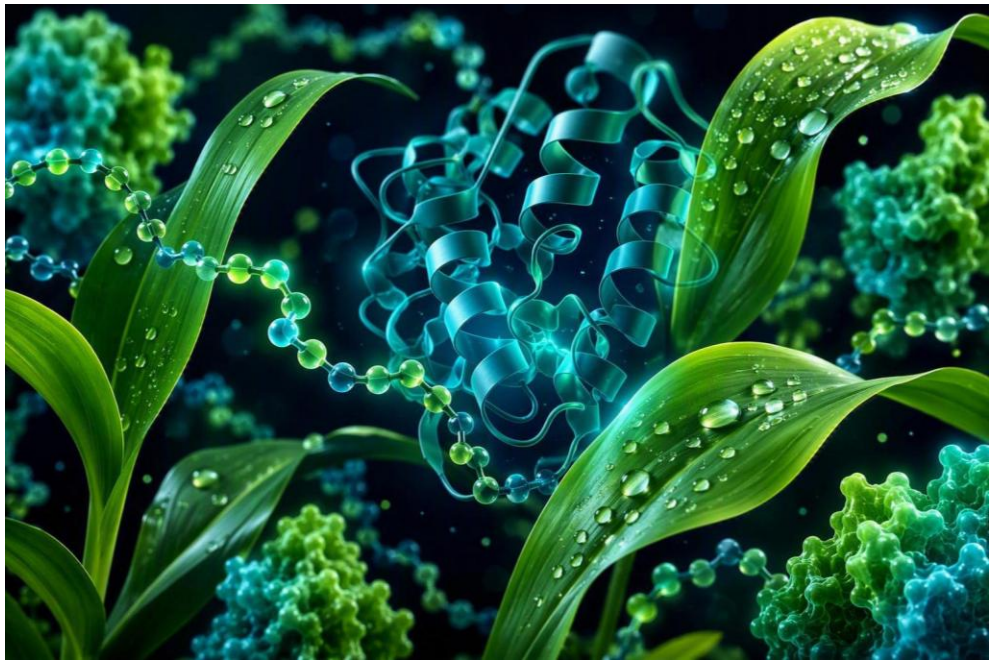
What it is: Short amino-acid chains that act as targeted bio-pesticides – novel modes of action, fast knockdown, and strong safety for pollinators and applicators.

BLAD – ProBlad (CEV): Polypeptide from germinated sweet lupine; multi-site biofungicide controlling Botrytis and powdery mildew (FRAC BM01).

Spear (Vestaron): Spider-venom peptide with a new IRAC Group 32 mode of action against caterpillars and thrips; 0-day harvest interval, MRL-exempt.

Bt (related): *Bacillus thuringiensis* Cry/Vip insecticidal proteins – sprayed or expressed in Bt crops; protein-based rather than short peptides, but the same protein-as-pesticide principle.

Why it matters: Resistance-breaking chemistry, residue-friendly, and pollinator-safe – a fast-growing biological category.





Regulation & Policy

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Changes affecting availability of agricultural remedies

- Expect further impact of recent and future regulatory changes on the availability of agricultural remedies.
- These will change the way we need to approach crop protection in future.
- Some local legislative and regulatory changes
  - 2023 Regulation relating to agricultural remedies – e.g., phase-out of CMRs, handling of HHPs (including restricted remedies) on farms.
  - Future changes already in process: Implementation of Global Chemicals Framework in SA (e.g., HHP phase-out), revision of Act 36 of 1947, and more.
  - General trend: Greater public participation in regulatory decisions in future.
- Some possible international regulatory changes: EU Omnibus, UK-EU SPS agreement (UK-EU re-alignment), EU member countries setting own regulatory requirements.
- Non-legislative: changing retailer requirements have additional impacts.




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Navigating the Digital Harvest: Current Realities & Future Frontiers in Agriculture

	NOW: Precision & Optimization (Current Focus)	FUTURE: Autonomy & Integration (Emerging Trends)
Core Theme	Data-Driven Efficiency	Integrated Agri-Ecosystems
Key Technologies	IoT Sensors, GPS, Basic Automation, Mobile Apps	AI & Machine Learning, Robotics, Advanced Automation, Blockchain, Drones/UAVs
Application Areas	Precision Farming: Variable Rate Application (VRA), Real-time monitoring, Resource optimization (water, fertilizer, pesticides).	Autonomous Systems: Self-driving tractors, Robotic harvesting, Autonomous pest control. Predictive Analytics: Hyper-local forecasting, Proactive disease management.
Data Usage	Local & On-Farm Data: Primarily for decision support on single farms/fields.	Global & Integrated Data: Aggregating diverse datasets (weather, market, supply chain, environmental) for systemic insights.
Impact & Value	Increased Yields & Reduced Costs: Focusing on operational efficiency and resource conservation.	Enhanced Sustainability & Resilience: Focusing on environmental performance, supply chain transparency, climate change adaptation, and risk management.
Business Model Shifts	Productivity Tools: Selling software and sensor hardware.	Platform & Service Economy: Selling "farming-as-a-service" and integrated data platforms.





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