



Global Biocontrol Market Overview, Trends & Drivers

Introduction

DunhamTrimmer LLC
Bio Products Defined
Biocontrol Defined



DunhamTrimmer LLC

*“The Premier Biological Industries Strategic Business Consulting &
Market Research Firm”*

Industries

Biocontrol, Biostimulants, Biofertilizers

Services

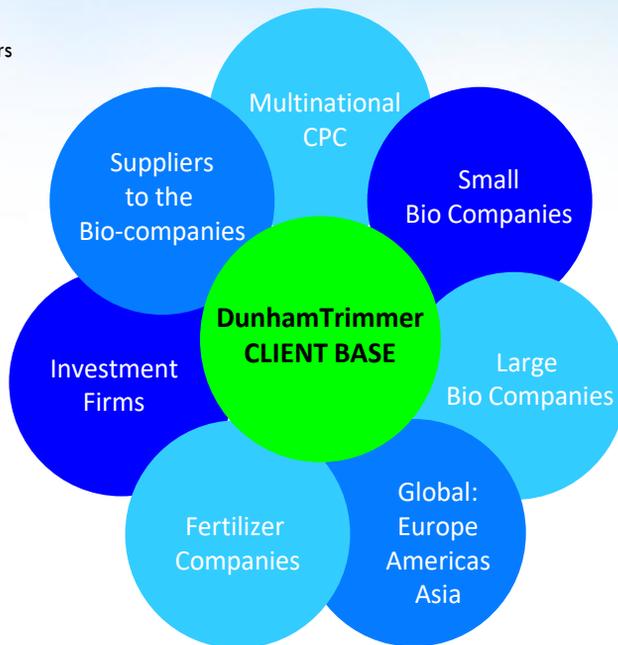
Strategic Marketing
Bio Market Data
Technology Evaluation
Market Evaluations
Investment Due Diligence

Products

Single-Client Custom Projects
Multi-Client Reports
Retainer Support

Size of Organization

Headcount: 3
Global Network of Professionals



Bill Dunham

42 Years – Crop Protection & Seeds
Global & Regional Strategic
Marketing Teams
Subsidiary Managing Director

Mark Trimmer, Ph.D.

30 Years – Crop Protection
Global R&D
Global Technology Acquisition
& Licensing

Manel Cervera

15 Years – Biostimulants &
Specialty Fertilizers
Regional/Global Marketing &
Sales

2BMonthly

Global Biocontrol & Biostimulants
E-Newsletter
Organize Annual Biocontrol LatAm,
Asia and Africa Conference

Market Access Needs Drives Industry Consolidation

Business consolidation will increase gap among companies in terms of market access, product differentiation capacity, and financial muscle to fund R&D.

The entry of global companies into this business will definitely impact the business model structure for other players

M&A/JVs/Investments

2018 – 35 Major Agreements

2017 – 29 Major Agreements

2016 – 24 Major Agreements

2015 – 23 Major Agreements

2014 – 24 Major Agreements

2013 – 16 Major Agreements

Distribution – Mkt Access

2018 – 24 Major Agreements

2017 – 35 Major Agreements

2016 – 13 Major Agreements

2015 – 04 Major Agreements

2014 – 22 Major Agreements

2013 – 14 Major Agreements

R&D/Manufacturing

2018 – 08 Major Agreements

2017 – 14 Major Agreements

2016 – 08 Major Agreements

2015 – 12 Major Agreements

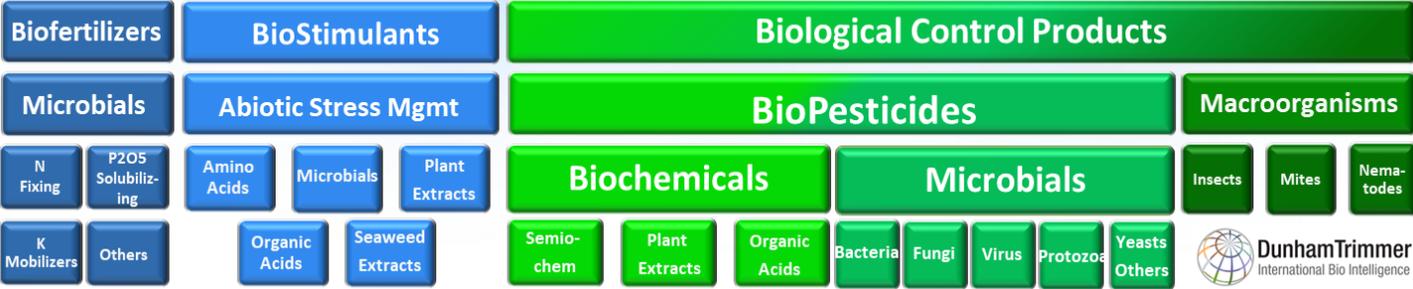
2014 – 16 Major Agreements

2013 – 09 Major Agreements

Biological Products Defined

Biological Products

Source: DunhamTrimmer LLC



Biofertilizers

- Microbials used to enhance plant nutrient uptake from soil
- Nitrogen fixing bacteria make up largest group
- Others include mobilizers of specific nutrients (zinc, sulfur) and mycorrhizal fungi
- Biofertilizers regulated under country/state fertilizer regulations

Biostimulants

- Seaweed Extracts make up the largest segment in this group
- Microbials, primarily bacteria, often used as seed or soil treatment to aid in nutrient assimilation
- Organic acids are humic and fulvic acids used as soil amendments, formed by the microbial degradation of plant matter.
- Definition and regulation of biostimulants is still under development in most parts of the world

BioPesticides

- Biopesticides are derived from natural materials, such as plants, bacteria and certain minerals. Biopesticides target specific pests and are inherently less toxic than synthetic pesticides.

Biochemicals

- Plant Extracts; Semiochemicals; Organic Acids
- Plant Extracts make up the largest segment in this group
- Semiochemicals (pheromones) has the largest actual number of products
- Largest challenge for Plant Extracts is manufacturing and consistent quality in the active ingredient(s)

Microbials

- Bacteria; Fungi; Virus; Protozoan; Yeasts
- Bacteria, followed by Fungi make up the largest groups commercially (>90%)
- Microbials are the largest market of biopesticides.
- Biggest challenges for microbials are formulation related: 1) Shelf-life; 2) Stability; 3) Performance enhancement

Macroorganisms

- Insects; Mites; Nematodes
- Insects followed by mites make up the largest groups
- Unique in that the live organism in the form of eggs, larvae, pupae or adult is used.
- Most important challenge for Macros is logistics—shipping live organisms that have to have special care to survive
- Normally not classified as a Biopesticide—only as Biological Control Products

Biocontrol Products Defined

Biological Control Products Source: DunhamTrimmer LLC

BioPesticides

Macroorganisms

Biochemicals

Microbials

Insects

Mites

Nematodes

Semiochem

Plant Extracts

Organic Acids

Bacteria

Fungi

Virus

Protozoa

Yeasts
Others



DunhamTrimmer
International Bio Intelligence

BioPesticides

- Biopesticides are derived from natural ingredients e.g. plants, bacteria, & other bio materials.
- Biopesticides target specific pests and are inherently less toxic than synthetic pesticides.
- Biopesticides go through a registration process similar to traditional pesticides.

Macroorganisms

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Global Biocontrol Market Overview

Forecasting: Everything All the Time?

Research Methodology

Global Landscape

Accelerating Growth

Global Regional Performance

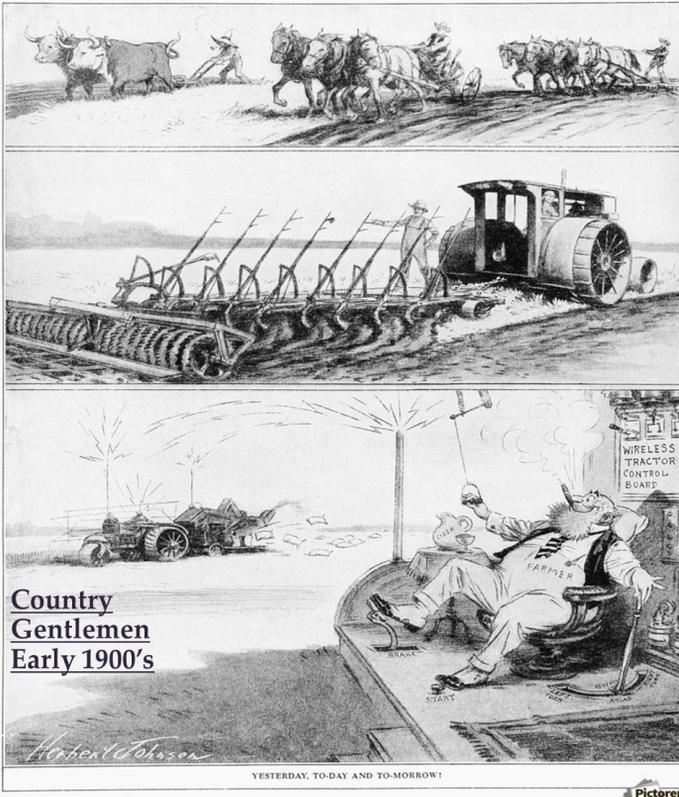
Global Product Line Segments

Global Product Use Segments

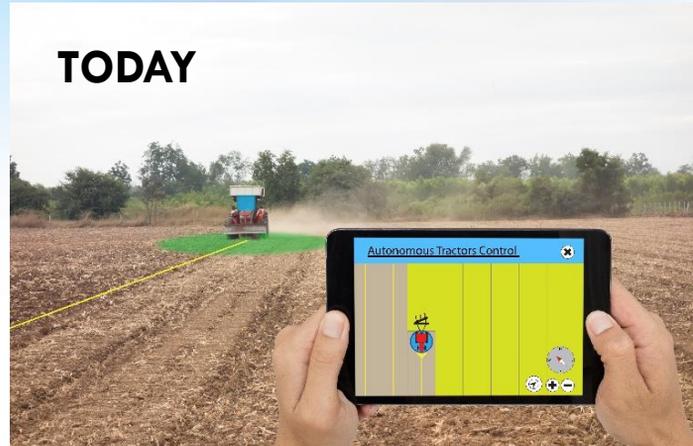
Top 10 Countries by Use Segments



Forecasting: Everything All the Time?



TODAY



Forecasting

- Easy to get most of it right;
- but difficult to get it all right!!

Research Methodology

Multiple Data Collection

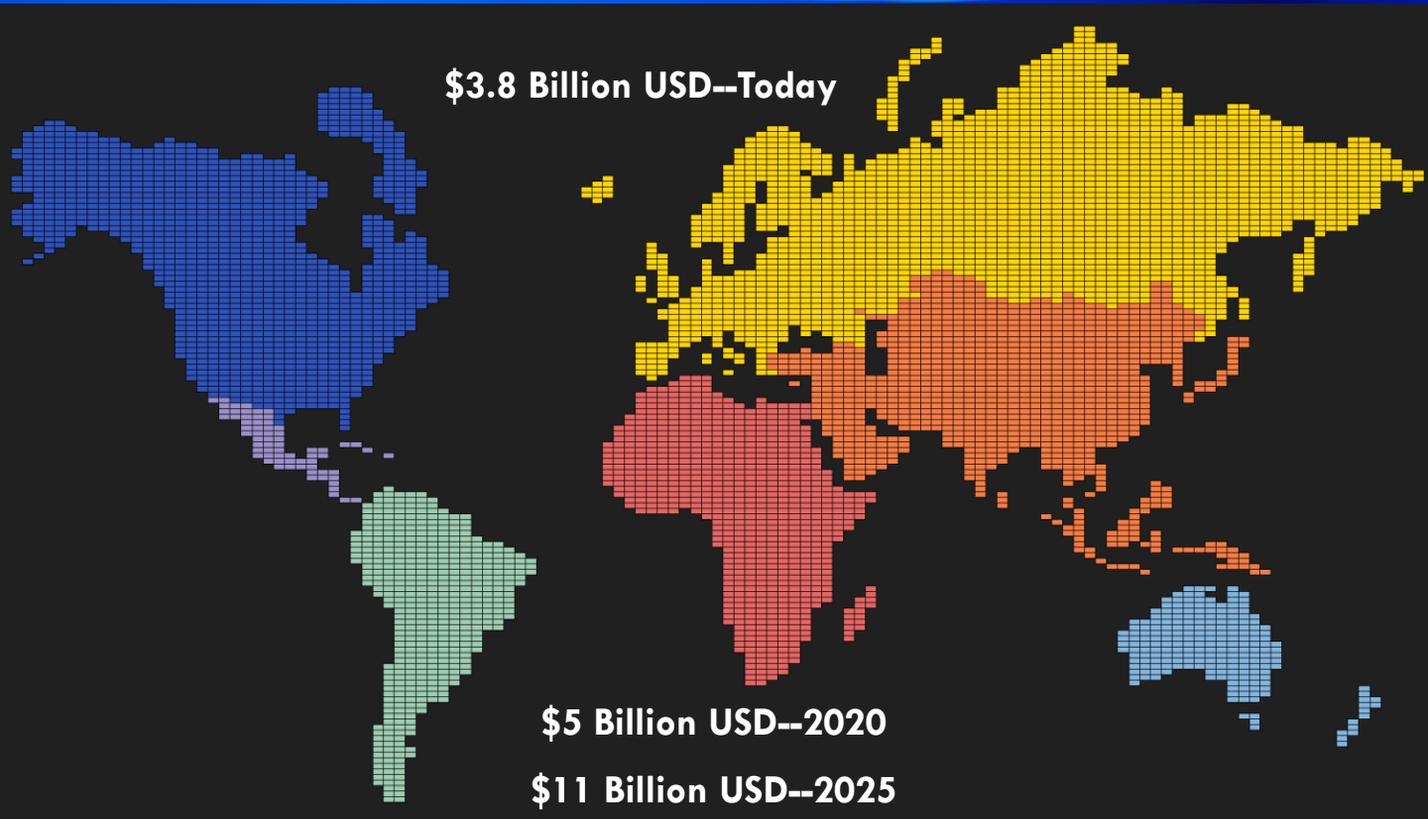
Market Values – multiple data sources including conference presentations, executive interviews, past market data, various market reports, biocontrol company data, 2BMonthly, company websites, annual reports, governmental research data, etc.



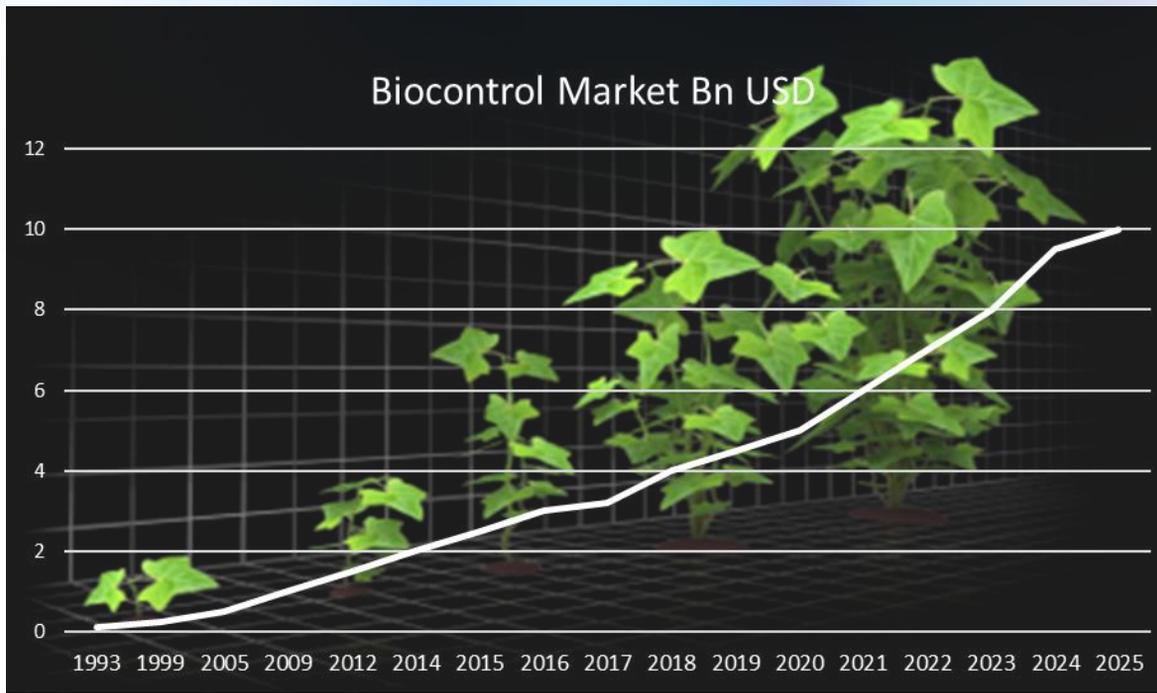
Data Processing

- Data collection and organization
- Data breakdown and cleaning
- Data analysis and application of market insights
- Data systemization and criteria unification
- Data organization in Excel charts
- Data optimization and graphic representation

Global Landscape



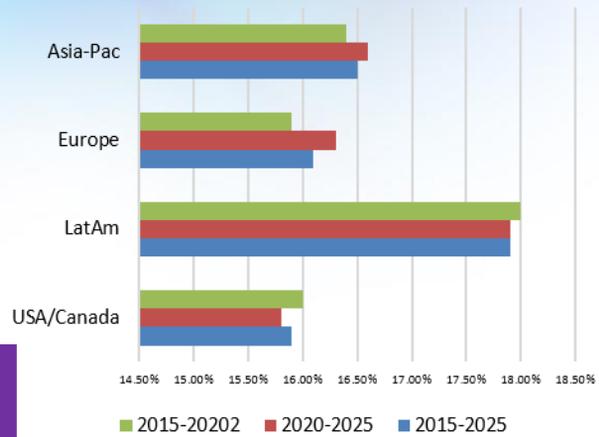
Accelerating Growth



Global Regional Performance



Global Biocontrol Mkt – Regional CAGR



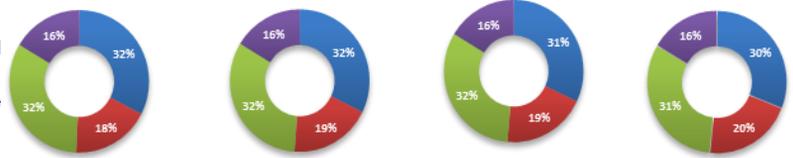
2015

2018

2020

2025

Global Biocontrol Regional Mkt Share

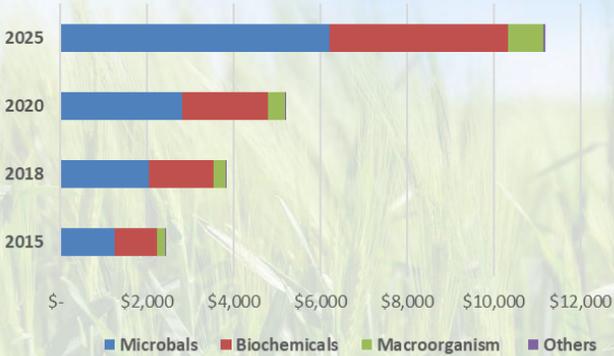


Biological Control—Sustained Growth —16%-17% (CAGR)

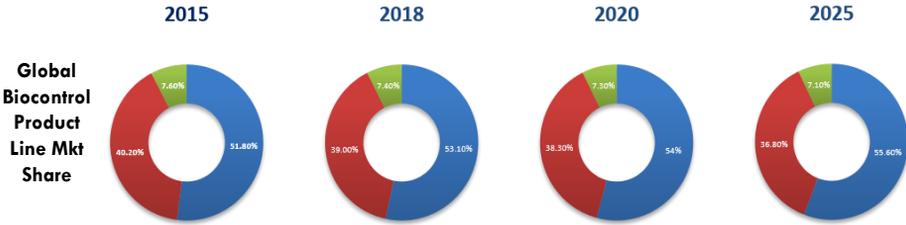
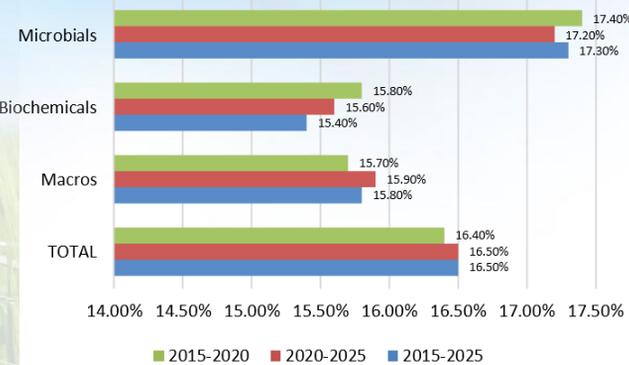
- Latin American fastest growing region
 - Climate and crops grown in LatAm well adapted to use of biopesticides
- USA/Europe represent 2/3 of global biocontrol market
- EU growth could accelerate if regulatory system is revised to give more preference to biopesticides

Global Product Line Segments

GLOBAL BIOCONTROL PRODUCT SEGMENTS--(Mns USD)



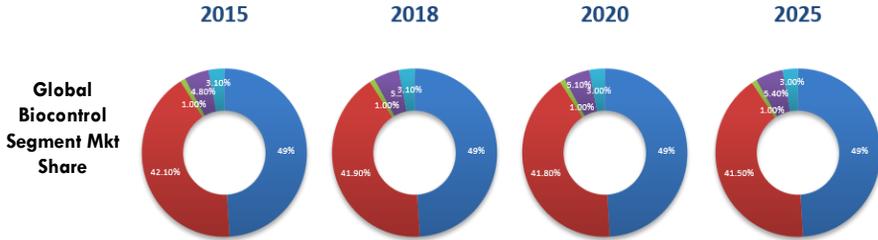
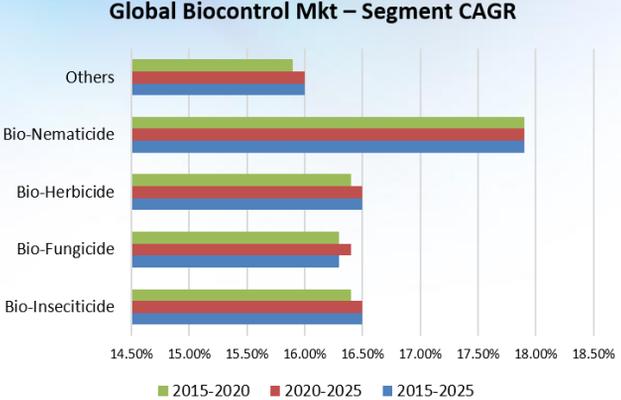
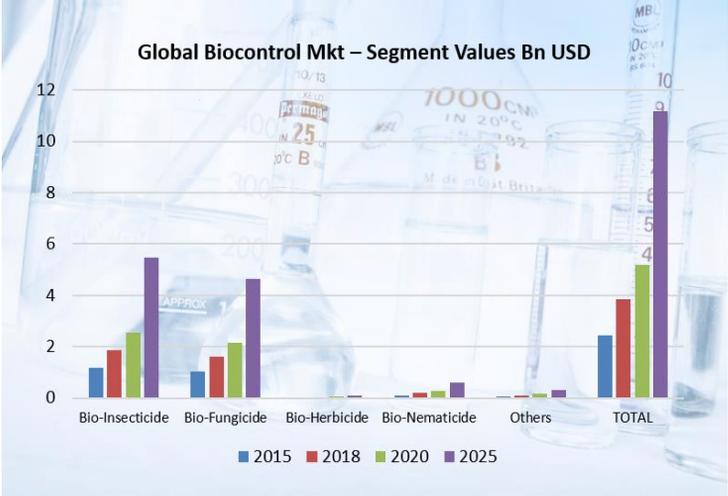
Global Biocontrol Mkt – Product Line CAGR



Biocontrol market dominated by microbial products

- Microbials will continue to make up nearly 60% of total market through 2025
- All three product segments growing much faster than the traditional crop protection market
- Microbials growing faster as both small and large companies invest in microbial discovery and development

Global Product Use Segments

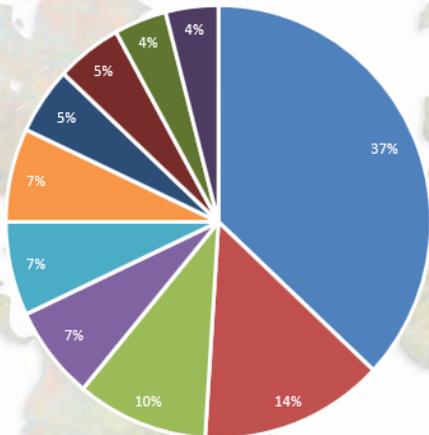


Void in use segments is lack of bioherbicides

- Bioinsecticides and biofungicides make up over 90% of market
- Bionematicides growing quickly with recent entry of new products and more in company pipelines

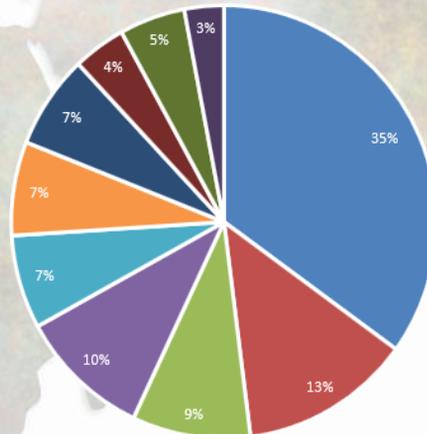
Top 10 Countries by Use Segments

Top 10 Country Biocontrol Markets 2020



- USA
- Spain
- Italy
- Brazil
- China
- France
- Mexico
- Canada
- India
- Japan

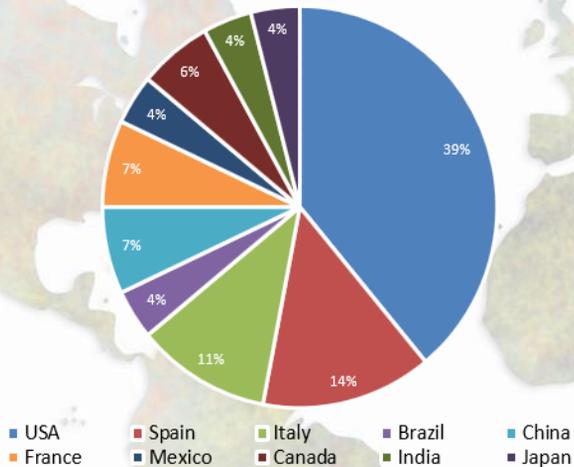
Top 10 Country Bioinsecticide Markets 2020



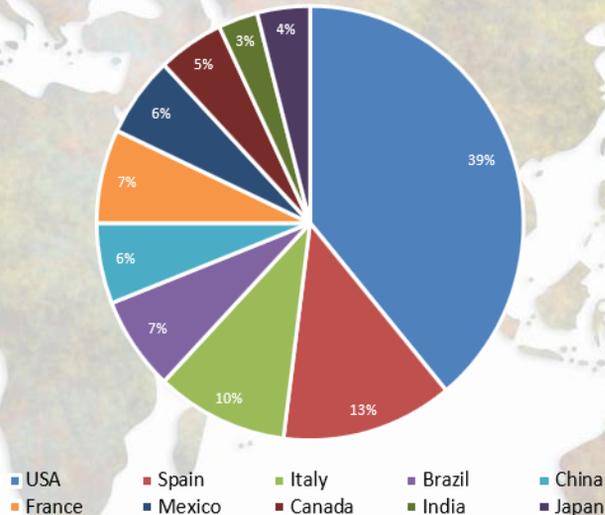
- USA
- Spain
- Italy
- Brazil
- China
- France
- Mexico
- Canada
- India
- Japan

Top 10 Countries by Use Segments

Top 10 Country Biofungicide Markets 2020



Top 10 Country Bioinsecticide Markets 2020



How Biocontrol Really Fits

Integrated Part of the Plant Protection Market

Position in Plant Protection Market

Traditional Pesticides – Sustainable??

Sustainability in Summary



Biocontrol an Integrated Part of the Plant Protection Market

Assumptions

- **Conventional Global Plant Protection:**
 - \$64 billion¹
 - Herbicides 40% | Insecticides 30% | Fungicides 25% |
 - Row Crops & Cereals 70% | Fruit & Veggies 20% |
 - Slow growth (<6% CAGR) or even stagnated

Conclusions

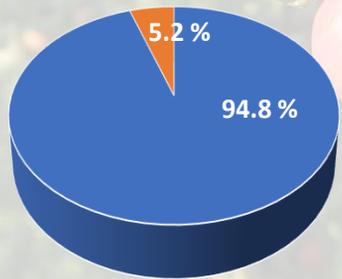
- Biocontrol products represent ~ 5% of total P.P. Market.
- They are positioned on a different way in terms of Use's & Crop's Segments²:
 - Biocontrol products are mainly used in Fruits & Veggies (~80%).
 - Bioherbicides are very small share of Biocontrol.
- Biocontrol is growing at 17% CAGR

Source: 1: Philipps McDougal & Others | 2: DunhamTrimmer Bio Market Report

Biocontrol's Position in Plant Protection Market

Biocontrol in the Protection Market 2017

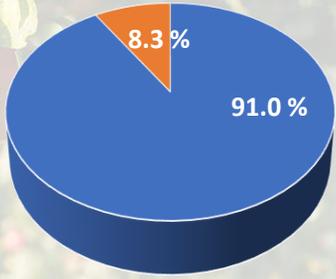
Global Crop Protection



5.2%

Share on
C. Protection

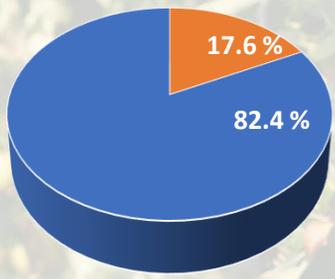
Without Herbicides & Bioherbicides



8.3%

Share on
C. Protection
w/o Herbicides

Fruits & Veggies



17.6%

Share on
C. Protection
in F&V

Biocontrol

Conventional

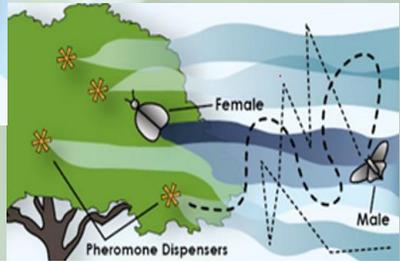
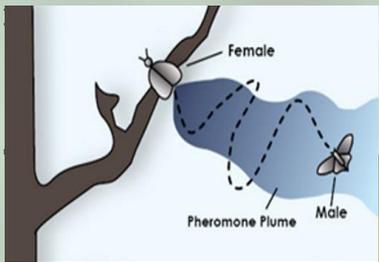
Traditional Pesticides—Sustainable??

New Product Launches

1980-1989173 Products
 1990-1999.....178 Products
 2005-2014.....73 Products

Products Processed to Reach Registration

	<u>Research</u>	<u>Development</u>	<u>Registration</u>
1995.....	52,500.....	4.0.....	1..
2000.....	139,429.....	2.0.....	1..
2005-8.....	140,000.....	1.3.....	1..
2010-14.....	159,754.....	1.5.....	1..

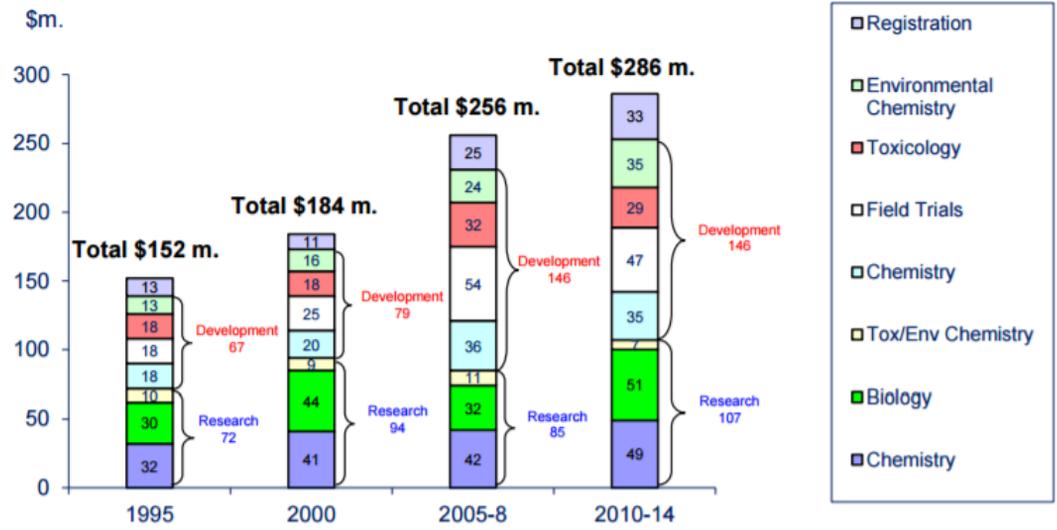


Source: Crop Life

Traditional Pesticides—Sustainable??

The Cost of Developing Chemical Pesticides

Discovery and Development Costs of a New Crop Protection Product



Source: Crop Life

State of Crop Protection Market

State of the Biocontrol Market

- Lack resources to build organizations and create market access in multiple crops and countries.
- Is this sustainable?

State of the Chemical Pesticide Market

- Research model that is 50 years old
- **Extremely large upfront investments** to discover, develop and launch new products
- Cost of product launches increasing annually
- Need a **Huge \$** revenue product to recover investment
- **Regulatory hurdles** are increasing time to market
- **Pest Resistance** continues to build to many MOA
- Is this sustainable?



What makes Biopesticide Market Attractive?

- Biopesticide market is growing faster than chemicals
- Cost and time to develop biopesticides is very attractive
 - New chemical active ingredient develop costs >US\$250 million and takes >10 years
 - New biopesticide development costs less than 1/10 as much and approval can be obtained within 3 to 4 years in some markets
- New chemical active ingredients becoming much harder to find and develop
 - Last new herbicide mode of action discovered >20 years ago!
 - Increasingly strict regulatory barriers
 - Secondary residue standards proliferating from food retailers
- Biopesticides can be used with older chemistry to extend commercial life
 - Chemicals and biopesticides work well together in programs
 - Biopesticides are excellent resistance breakers due to complex modes of action
 - Biopesticides can reduce consumer residue concerns

Industry Consolidation Conclusions

Drivers

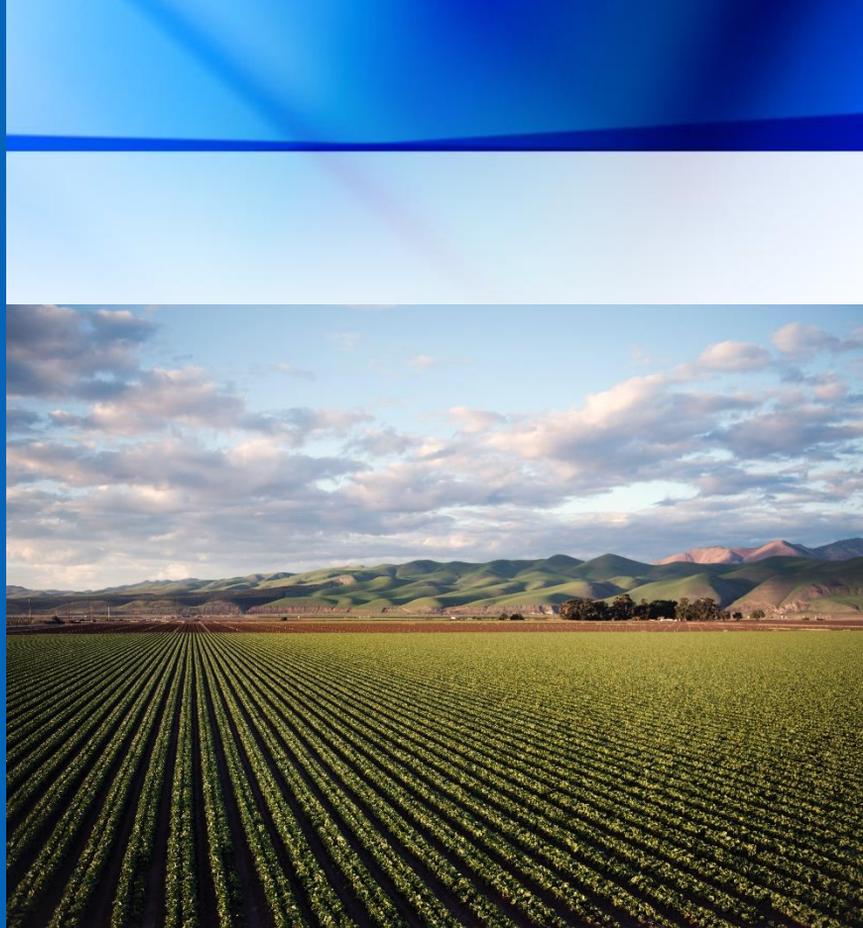
- Bio manufacturers need market access and a field force to create on a broader scale
- Global crop protection need for new products, stronger market growth & portfolio renewal
- Lower costs & shorter registration timeline in key markets make biopesticides attractive
- Biopesticide attributes address consumer demands

Conclusions

- Consolidation will continue to be prevalent in bio industry
- Innovative products & technology with strong barrier to entry will be highly attractive to global companies
- Green (impact) investors will continue to evaluate ag bio opportunities
- Consolidation will help to drive continued strong CAGR for bio industry

Global Organic Market & Biocontrol

World Organic Agriculture
World Organic Retail Sales
World Organic Farmland
Global Organic Market Facts
Organic and Biocontrol



World Organic Agriculture

The World of Organic Agriculture 2016

Organic Farmland 2016



57.8 m ha Organic farmland in million hectares

178 Countries with organic farming

+15% From 2015

Top 3 countries (land in million of hectares)



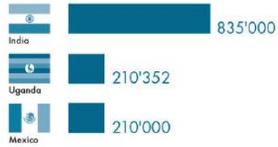
Organic Producers 2016

The number of organic producers is increasing

2.7 million Organic farmers

+12.8% From 2015

Number of producers: Top 3 countries

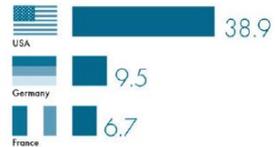


Organic Market 2016

The global market is growing and consumer demand is increasing

More than 80 bn € Global organic food market in billion euros

Top 3 countries (market in billion euros)



21.8% Organic market growth

9.7% Market share

274 € Highest per capita spending is in Switzerland



Source: FiBL survey based on national sources © FiBL 2018 More information: www.organicworld.net

Infographic 1: Organic agriculture worldwide: Key indicators 2016

Source: FiBL survey 2018

World Organic Retail Sales

ORGANIC RETAIL SALES 2016



The largest single market is the USA followed by the EU (30.7 billion €) and China. By region, North America has the lead (41.9 billion €), followed by Europe (33.5 billion €) and Asia.

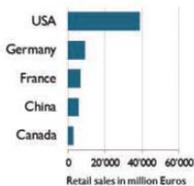


Distribution of retail sales value by country 2016

FiBL



The countries with the largest market for organic food are the United States (38.9 billion €), followed by Germany (9.5 billion €), France (6.7 billion €) and China (5.9 billion €).



The five countries with the largest markets for organic food 2016



Switzerland has the highest per capita consumption worldwide, followed by Denmark and Sweden.



The five countries with the highest per capita consumption 2016



The highest shares the organic market of the total market is in Denmark, followed by Luxembourg, Switzerland, Sweden, and Austria.



The five countries with the highest organic shares of the total market 2016

Source: FiBL survey 2018 www.organic-world.net

Infographic 4: Organic retail sales 2016

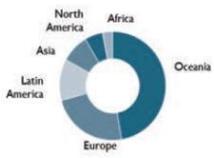
Source: FiBL survey 2018

World Organic Farmland

ORGANIC FARMLAND 2016



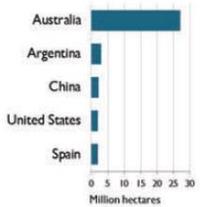
In Oceania there were 27.3 Mio ha, in Europe 13.5 Mio ha, and in Latin America 7.1 Mio ha.



Distribution of organic agricultural land by region 2016



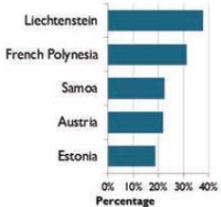
The ten countries with the largest organic agricultural areas represent 76% of the world's organic agricultural land.



The five countries with the largest areas of organic agricultural land 2016



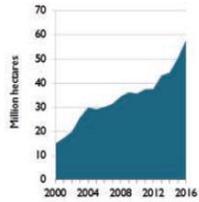
15 countries have 10% or more of their agricultural land under organic management.



Top 5 countries with more than 10 percent of organic agricultural land 2016



In 2016, over 7.5 million hectares more were reported compared with 2015.



Growth of the organic agricultural land 2000-2016



Source: FiBL survey 2018 www.organic-world.net

Infographic 2: Organic farmland 2016

Source: FiBL survey 2018

Global Organic Market Facts

Distribution of main land use types and crop categories 2016

Source: FIBL survey 2018; based on information from the private sector, certifiers, and governments.

Land use types 2016

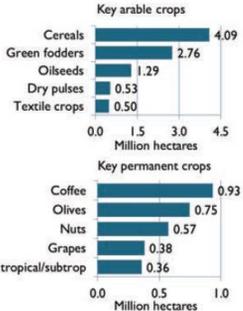
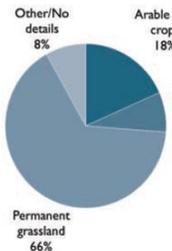
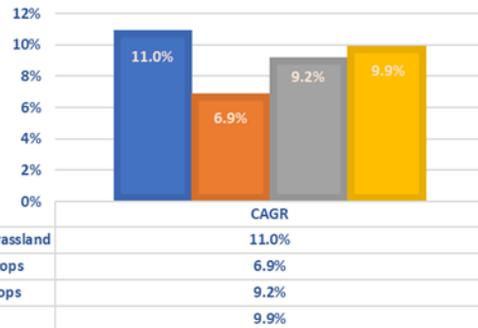


Figure 18: World: Distribution of main land use types and key crop categories 2016

- Over two-thirds of the organic farmland is grassland/grazing land (38 million hectares)
 - This is the fastest growing segment—CAGR 11%
- Australia is largest individual country with 47% of the total area
 - Over 95% of it is grassland/grazing land
- 57.8 million hectares of organic farmland
 - Only 26% of the area is arable land crops & permanent crop land
- Organic land use is fastest growing land use segment with an 11% cagr
 - Arable land crops: 6.9% CAGR
 - Permanent land crops: 9.2% CAGR
- Organic is 1.2% of agriculture land
 - < 0.4% arable/permanent crops (without grassland/grazing land)

CAGR BY ORGANIC CROP TYPES



Source: FIBL survey 2018

Development of the organic land by land use type 2004-2016

Source: FIBL-IFOAM-SOEL-Surveys 1999-2018

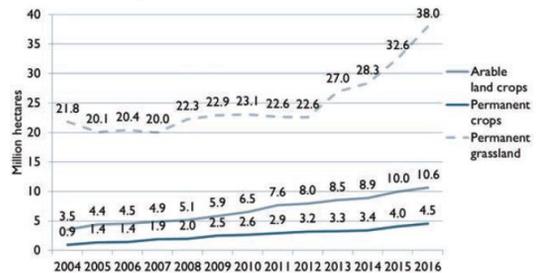
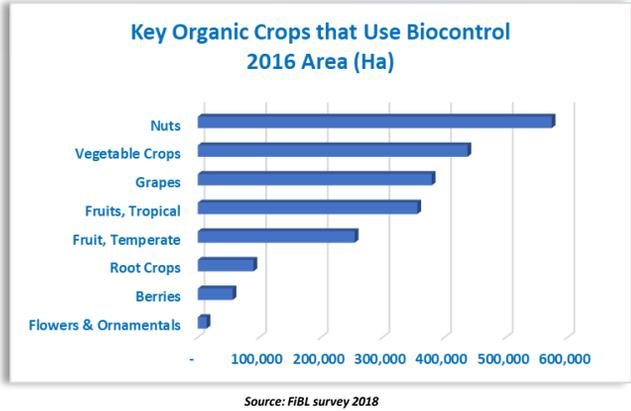


Figure 19: World: Development of organic arable land, permanent cropland and permanent grassland/grazing areas 2004-2016

Organic & Biocontrol



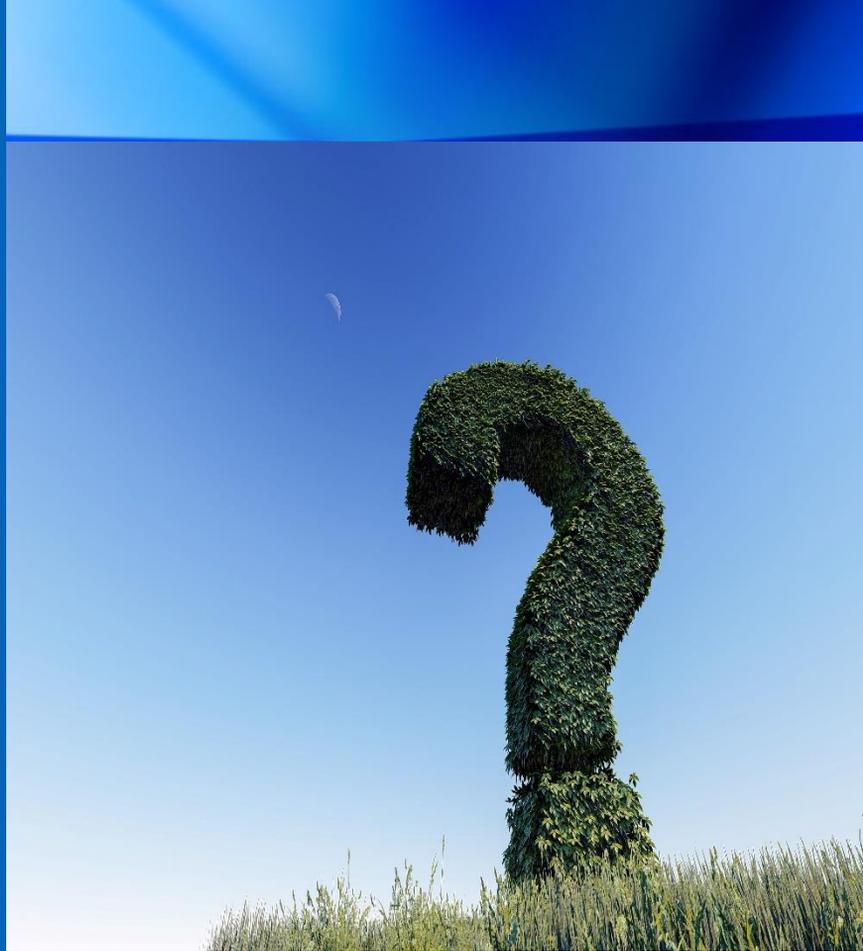
Biocontrol & Organic Crop Use

- Key organic crops that use biocontrol represent 2.2 million ha
- Even at \$150 usd/ha these crops represent \$330 million usd value of biocontrol.

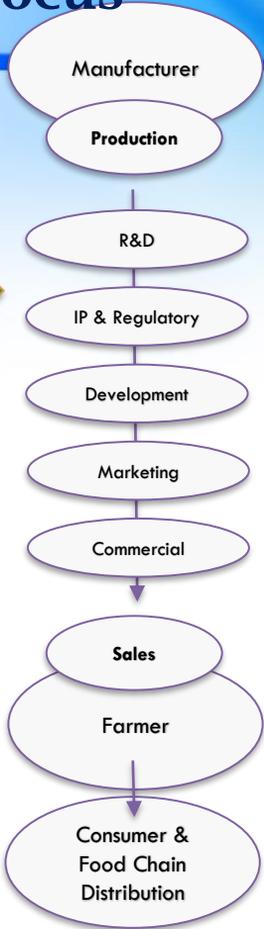
DunhamTrimmer's Conclusions

- Organic use is approximately 10% of the value of Biocontrol
- Organic use and growth is not driving the rapid growth of Biocontrol at 15%-17% CAGR
- The use of Biocontrol on traditional crops and others issues already mentioned in this presentation are driving the growth of Biocontrol

What is Missing?



Biopesticide Sector Focus



Biocontrol Summary / Conclusions

Biocontrol Summary SWOT

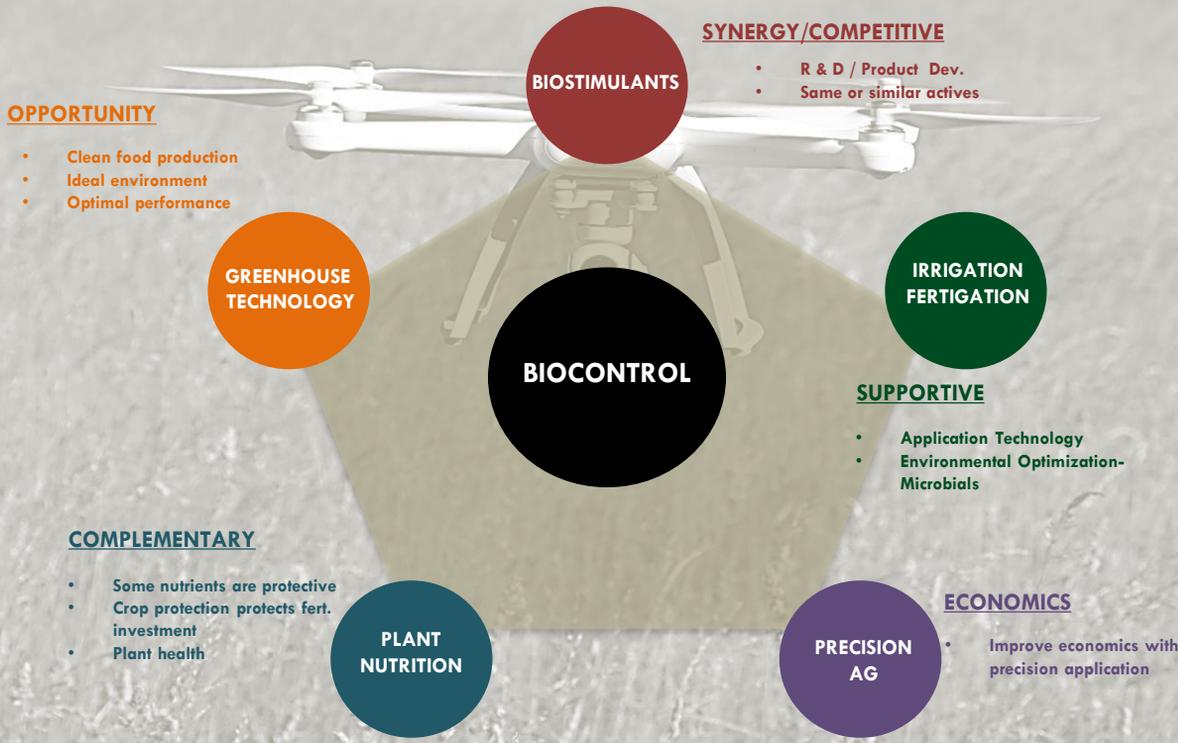
Biocontrol's Fit with Other Technology

Global Market – Performance

General Conclusions



Biocontrol's Fit with Other Technology



Sustainability In Summary

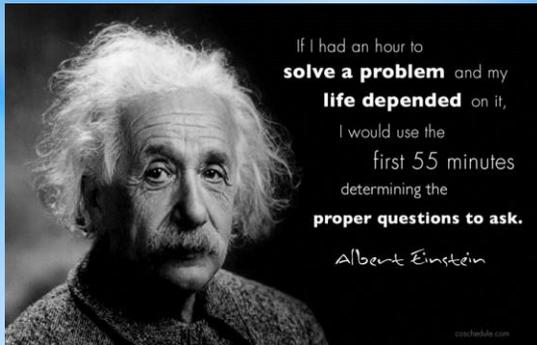
Traditional Pesticides SUSTAINABLE??	Biological Control Products SUSTAINABLE??
High Cost of Development <ul style="list-style-type: none"> • >11 Years to Market • >\$286 M for One New Product 	Lower Cost of Development <ul style="list-style-type: none"> • 3-5 years to Market • \$25-\$50 M for One New Product
Decreasing Performance <ul style="list-style-type: none"> • Increasing Pest Resistance • Reduced Life Cycles • Decreasing Products in Pipelines 	Increasing Performance <ul style="list-style-type: none"> • Reduced Pest Resistance • Lengthy Life Cycles • Ample pipelines (entrepreneurial)
Environmental Safety <ul style="list-style-type: none"> • Environmental Pollution (Grd. H2O) • Non-Target Insects (Pollinators) • Re-registration--reducing products 	Environmental Safety <ul style="list-style-type: none"> • Attractive environmental profile • Non-toxic to Predators & Beneficial • Attractive Registration Cycle
Global Restrictions <ul style="list-style-type: none"> • Export Restrictions • Supermarket - Reducing Residues • Regulatory Actions More Stringent 	Global Restrictions <ul style="list-style-type: none"> • Less export restrictions • Exemption residues – Attractive to SupMkts • More Attractive Regulatory Environment

General Conclusions

- Biological Ag Industries—Sustainable Growth-12%-17%
- Green technology / Sustainable technology
 - **Biocontrol** / Biostimulants / Biofertilizers
- More efficient use of resources
 - Pesticides / Fertilizers / Inputs
- Rapidly growing entrepreneurial companies
- Consolidation – Market Access



Dunham Trimmer
International Bio Intelligence



Thank You

DunhamTrimmer LLC
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Dunham Trimmer
International Bio Intelligence

Bio Control Drivers

Biocontrol Market Macro-Influences

Biocontrol Market Micro-Influences

Key Drivers – Manufacturers

Key Drivers – Growers

Key Drivers – Consumers

Key Drivers – Channel

Key Drivers – Summary



Biocontrol Market Macro-Influences

Increasing Population & Food Demand

- The United Nations is projecting the population to increase to > 9 billion by 2050
- The projected population increase is expected to drive food demand to unprecedented levels with the potential food scarcity in many areas

Climate Change – will negatively impact global food production

- Will create more variability in weather with droughts & excessive rainfall cycles, extreme temperature variation both hot and cold in many areas.
- The rise of sea level and coastal flooding will reduce the amount of land available for agriculture
- *The real effects of Climate Change will not have significant impact during the time frame covered by this report*

Decreasing farmland available or food production will impact food availability.

- Available farm land will continue to decrease

Decreasing inputs for agriculture production

- Available ag inputs will decrease including fertilizers and water



Biocontrol Market Micro-Influences



Regulatory

- Biopesticide inherent lower toxicity leads to advantages over chemical pesticides in regulatory costs and timelines

Resistance

- Pest resistance increasingly prevalent
- Fewer new chemical modes of action makes this problem critical

Residues

- Consumer demand for reduced pesticide residues driving food marketers to set secondary standards

R&D

- Better biological technologies being discovered and developed leading to market expansion

Key Drivers-Summary



Biopesticide Product Benefits & Drivers

- Regulatory
 - Lower cost & shorter timeline
- Pest Resistance
 - Multiple MOA (Mode of Action)
- Portfolio Mgmt Tools
 - Full Program Offer
- Consumer Demand
 - Reduced chemical residues
- Worker safety/flexibility
 - Re-entry / Pre-harvest
- Sustainability

Manufacturers	Growers	Consumers
✓		
✓	✓	
✓	✓	
✓	✓	✓
	✓	✓
✓	✓	✓

Channel

Biopesticides provide benefits to all parts of the food marketing value chain.

Consumers are Driving Change

Consumers & Food Sustainability

Consumer Food Concerns

Consumers – Supermarkets

Growing Consumer Awareness of Residues

Brazil Food Residue Data

Brazil Supermarkets & Biopesticide Program

Brazil Program Results

Supermarket Reaction to Consumer Demand

Consequences of Secondary Standards



Why Biocontrol is Growing



Quote from Marcelo Morandi, General Manager of EMBRAPA Environment and the coordinator of Working Group on Biological Control of the Plant Health Committee of the Southern Cone.

“Biological control is no longer the “ugly duckling” of plant health. It is today a robust and recognized science. Technical and technological solutions to the key challenges are available in the R&D institutions and companies (advances in computational biology, molecular biology, analytical chemistry, statistics, etc. that allow the understanding of plant-pathogen interactions). The social and environmental impact of biological control, are (to some extent) known to the consuming public, who demand for more sustainable practices in food production.”

Consumer Food Concerns

Pesticide Residues and Consumer Concerns



Consumers health considerations impact food purchase decisions.

- **2/3 of shoppers** agree food choices are an **important factor** impacting their health
- **82% of consumers** put some effort into **healthy eating** with **34% put in significant effort**
 - Those putting in significant effort shop more frequently at specialty stores, natural/organic stores, or farmers' markets
- **Over 50% of shoppers** purchase at least **one organic food item per month**
 - **Over 50% of organic food purchasers** state the reason for their choice is to **avoid pesticide residues**
 - **Millennials** (born between 1981 – 1995) are **more likely to buy organic** than older shoppers
- **Over 70% of shoppers** have purchased **locally grown foods** in last year
 - **Nearly 1/3** of these state **avoiding chemical pesticide residues** is reason for this purchase

Source: "Shopping for Health" published by Rodale Inc. & Food Marketing Institute, 2016

Growing Consumer Awareness of Residues

New USDA data

85% of tested foods have pesticide residues

New U.S. Department of Agriculture (USDA) data released last week, shows residues of many types of bug-killing pesticides, fungicides and weed killing chemicals have been found in roughly 85 percent of the thousands of foods tested.

The data shows varying levels of pesticide residues in everything from mushrooms to potatoes and grapes to green beans. One sample of strawberries contained residues of 20 pesticides, according to the Pesticide Data Program report issued this month by the USDA's Agricultural Marketing Service. The report is the 25th annual such compilation of residue data for the agency, and covered sampling the USDA did in 2015.

Notably, the agency said only 15 percent of the 10,167 samples tested were free from any detectable pesticide residues. That's a marked difference from 2014, when the USDA found that more than 41 percent of samples were "clean" or showed no detectable pesticide residues. Prior years also showed roughly 40-50 percent of samples as free of detectable residues, according to USDA data. The USDA said it is not "statistically valid" to compare one year to others, however, because the mix of food sampled changes each year. Still the data shows that 2015 was similar to the years prior, in that fresh and processed fruits and vegetables made up the bulk of the foods tested.

Though it might sound distasteful, the pesticide residues are nothing for people to worry about, according to the USDA. The agency said "residues found in agricultural products sampled are at levels that do not pose risk to consumers' health and are safe ..."

Residue content does not exceed legal limit

Greenpeas: 'too much' residue on European apples

Greenpeace tested apples from supermarkets in eleven European countries and found pesticide residue on 83% of the tested apples. According to the organization, half of the pesticides are harmful to organisms living in water, bees and other insects. Greenpeace tested organic apples as well and found no pesticides on these apples. They are therefore calling for an increase in the cultivation of organic apples.

New large-scale study from Norwegian Food Safety Authority

Norway: Residues in more and more fruit and vegetables

The random controls carried out by the Norwegian Food Safety Authority (NFSA) revealed that pesticide residues were present in 58% of the fruit and vegetables we consumed in 2013, compared with 55% in 2012 and 50% in 2011.

There are, however, fewer samples with toxic residues above the permitted limit compared with previous years. "The detected levels are mostly low," assures Birgitte Lyrån, senior advisor at the NFSA, responsible for the report.

"The increase may be due to this year's climatic conditions, namely high rainfall, which could have resulted in a greater need for pesticides; however, the high proportion may also be the result of an increase in import volumes," explains Lyrån.

From the 1,388 samples analysed last year, pesticide residues above the permitted levels were found in 2.4% of the imported products. That's down from 2.6% of the previous year and 6.8% in 2006.

"Pesticides are more frequently detected in imported products. This is the sixth year in a row where Norwegian products have not exceeded the permitted residue limits," says Lyrån.

31% of Norwegian products had traces of pesticide residues, but all within the permitted limit.

**Although MRLs rarely exceeded, in mind of consumers:
RESIDUE = RISK**

Supermarket Reaction to Consumer Demand

- European supermarkets, in particular, impose additional secondary standards on residues
- Secondary standards vary among retailers and have no scientific base, as they are market oriented.
- They are more strict in terms of MRL, ARfD and number of active ingredients detected

Retailer	MRL per active compound	Max ARfD value per active compound	Max sum of ARfD values	Additional requirements
	70%	-	80%	Different maximum number of active compounds per crop (3,4,5)
	70% 50% for 'Gärtners Beste'	100%	-	-
	70%	70%	100%	Manufacturing Restricted Substances List (MRSL) (Page 5)
	70%	70%	100%	-
	33.3%	100%	100%	-
	70%	70%	100%	-
	33.3%	100%	-	-
	70%	100%	-	Maximum 4 numbers of active compounds
	80%	80%	-	Maximum of 5 numbers of active compounds

Source: Rovag Fruit BV, Extra retailer demands version July 2014

Consequences of Secondary Standards

Escalation of Restrictions

- Supermarkets compete on basis of their residue standards
- Consumer lacks understanding of science. Concludes more restrictive is better.

Growers Must Comply

- Vertical and horizontal integration of food chain forces grower to meet secondary standards
- To maximize market for their crop, need to meet most restrictive standard
- Standards often present significant challenges in how crop is produced

Biopesticide Opportunity

- Most biopesticides are exempt from tolerance (MRL) and have short PHI
- Offer tools that growers can use in place of chemical pesticides
- Use of biopesticides, particularly late in season, can help growers meet stringent residue standards

Biocontrol Summary SWOT

- Lower regulatory barriers
- Reduced residue/short PHI
- Pest resistance tools
- Worker safety
- Address consumer demands



- Combinations with chemicals
- Increased investment with global company entry
- Partnering with food channel
- Integration with precision ag
- Greater row crop penetration
- Sustainability story

- Fragmented market
- Weak market access
- IP weaker than chemicals
- Require more technical training at outset
- Cost of goods challenge

- New technologies – CRISPR, RNAi, syn bio could reduce market potential
- Inconsistent regulatory treatment
- Distributor resistance

Disclaimer

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DunhamTrimmer has developed databases covering the biological industries of Biocontrol, Biopesticides, Biostimulants & Biofertilizers including data on companies, products and market landscape. All databases are available for purchase from DunhamTrimmer.

For more information about these products please contact DunhamTrimmer LLC at info@DunhamTrimmer.com