



Biostimulants: Opportunities & Challenges in the Global Context

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Chief Operating Officer



**Traditional
inputs:**
are they the only
solution?



**Organic
farming**
viable?



do **more**
with **less**

the **Valagro**
Third Way:
Science at the service
of Nature



GEAPOWER
TODAY FOR TOMORROW

Evolution of Farmer's Toolbox

do **more**
with **less**



**Agronomic
management
practices***



**Crop Genetic
Improvement-
Breeding**



**Biotechnologies
Gene editing**



Biostimulants

**Cropping systems, fertilizers, pest
control, weed management, etc.*

What are Biostimulants?

«A **plant biostimulant** shall be an EU fertilising product whose function is to **stimulate plant nutrition processes** independently of the product's nutrient content with the sole aim of improving one or more of the following characteristics of the plant or the plant rhizosphere: *i) nutrient use efficiency, ii) tolerance to abiotic stress, iii) quality traits, or iv) availability of confined nutrients in the soil or rhizosphere*»



nutrient
Use Efficiency



tolerance to
Abiotic Stress



crop quality
traits



availability of
nutrients in the soil or
rhizosphere

*Biostimulants have no direct action against pests, and therefore **do not fall** within the regulatory framework of pesticides!*

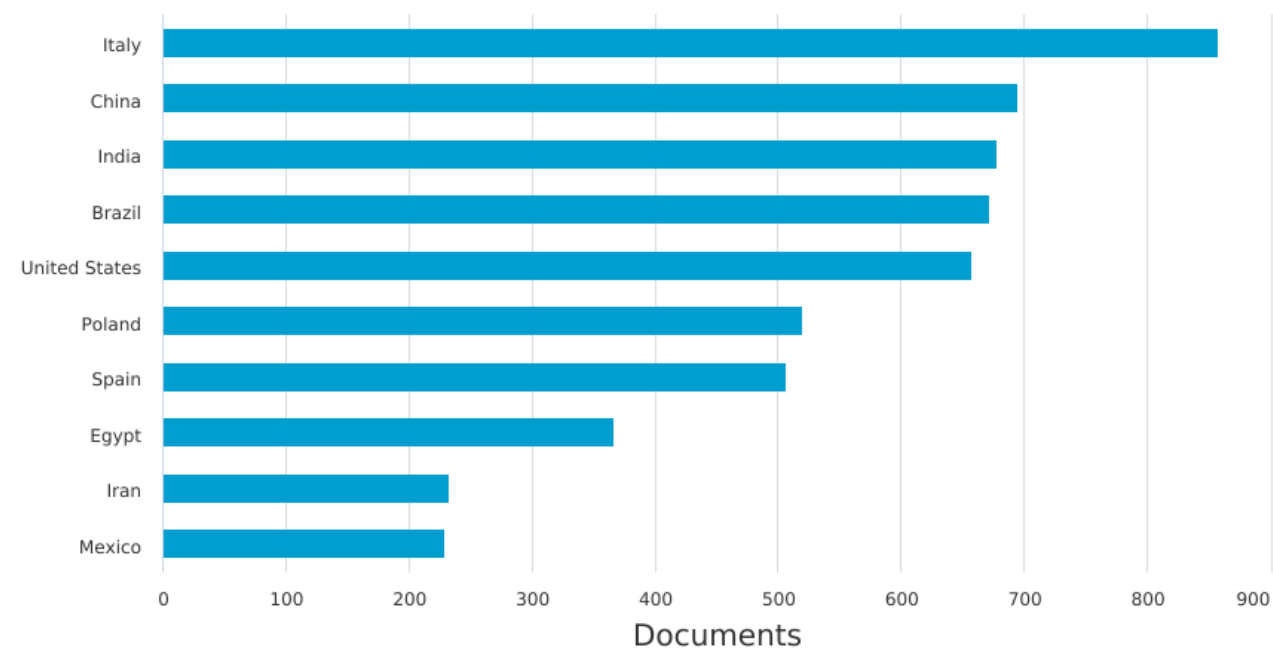
GLOBAL RESEARCH ON BIOSTIMULANTS | BIBLIOGRAPHY

SCIENTIFIC PAPERS USING THE WORD “BIOSTIMULANT” (Title, abstract, keywords)

Documents by country or territory

Compare the document counts for up to 15 countries/territories.

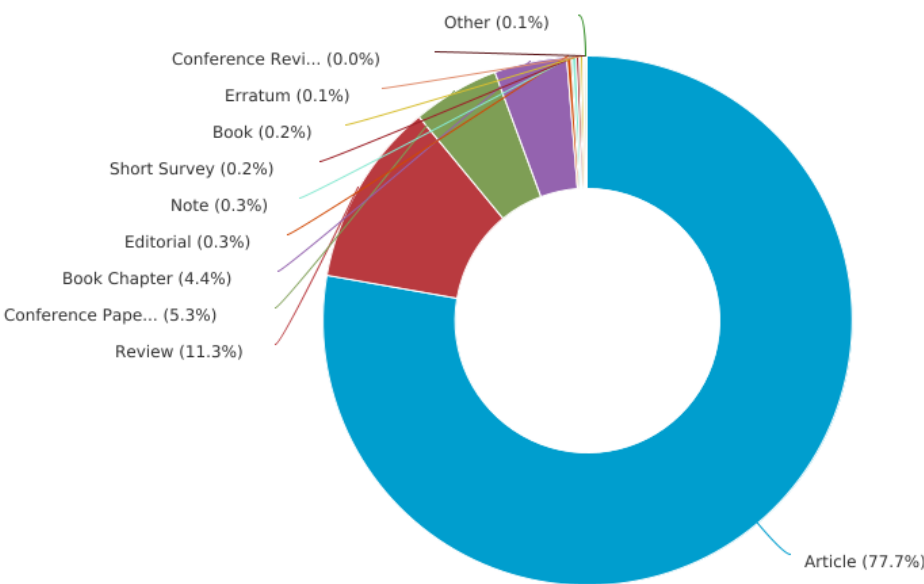
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Documents by type

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Biostimulants

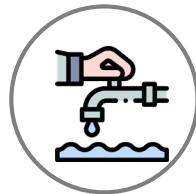
provide

Sustainable Outcomes



Water Quality

increased uptake of applied or existing nutrients reduces potential for runoff



Water Use

greater yield from same or less water applied extends available supply for all uses



Soil quality

enhanced microbiome improves composition, organic content, and carbon sequestration



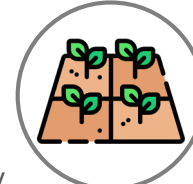
Carbon Emissions

increased plant uptake of applied or existing nutrients reduces N2O emissions



Food loss

improved quality increases harvest of marketable produce and grower profitability



Land Use

greater yield per acre reduces need to cultivate additional acres

Biostimulants application



Plant Health

- Nutrient use efficiency
- Crop quality
- Abiotic stress
- Microelements deficiencies
- Nutrient feeds
- Biocontrol
- Seed Treatment

Soil Health

- Nutrient use efficiency
- Crop quality
- Microelements chelates feeding
- Seed Treatment

Water Care

- Abiotic stress
- Crop quality
- Water Management



GEAPOW
TODAY FOR TOMORROW

**GEAPOW REDUCES THE COST OF TAKING A SOLUTION TO MARKET
WHILE ENSURING CONSISTENT EFFICACY**

1



DEEP KNOWLEDGE OF ACTIVE INGREDIENTS AND RAW MATERIALS

- This enables Valagro to identify, characterize and preserve specific active ingredients that can achieve targeted physiological responses in plants



2



PROPRIETARY EXTRACTION PROCESSES

- Customized extraction processes help maintain the correct ratio of each ingredient in complex natural mixtures
- Fermentation development and Processing of extracts

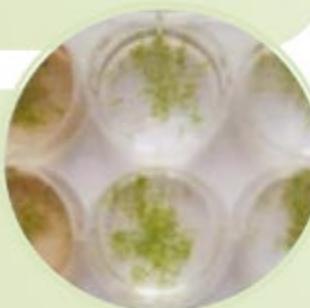


3



ADVANCED SCREENING AND INVESTIGATION TECHNOLOGIES

- Genomics, phenomics and other “omic” sciences allow Valagro to decipher the genetic and molecular triggers for specific physiological responses in plant systems.
- Screening of hundreds of samples per experiment.
- Academic Partnerships



4



PROVEN ABILITY TO PROVIDE COMMERCIALLY VIABLE SOLUTIONS

- Extensive experience with field experiments
- Commercial function and research function are closely integrated
- Allows Valagro to fast-track product candidates with the best chance of attaining commercial viability

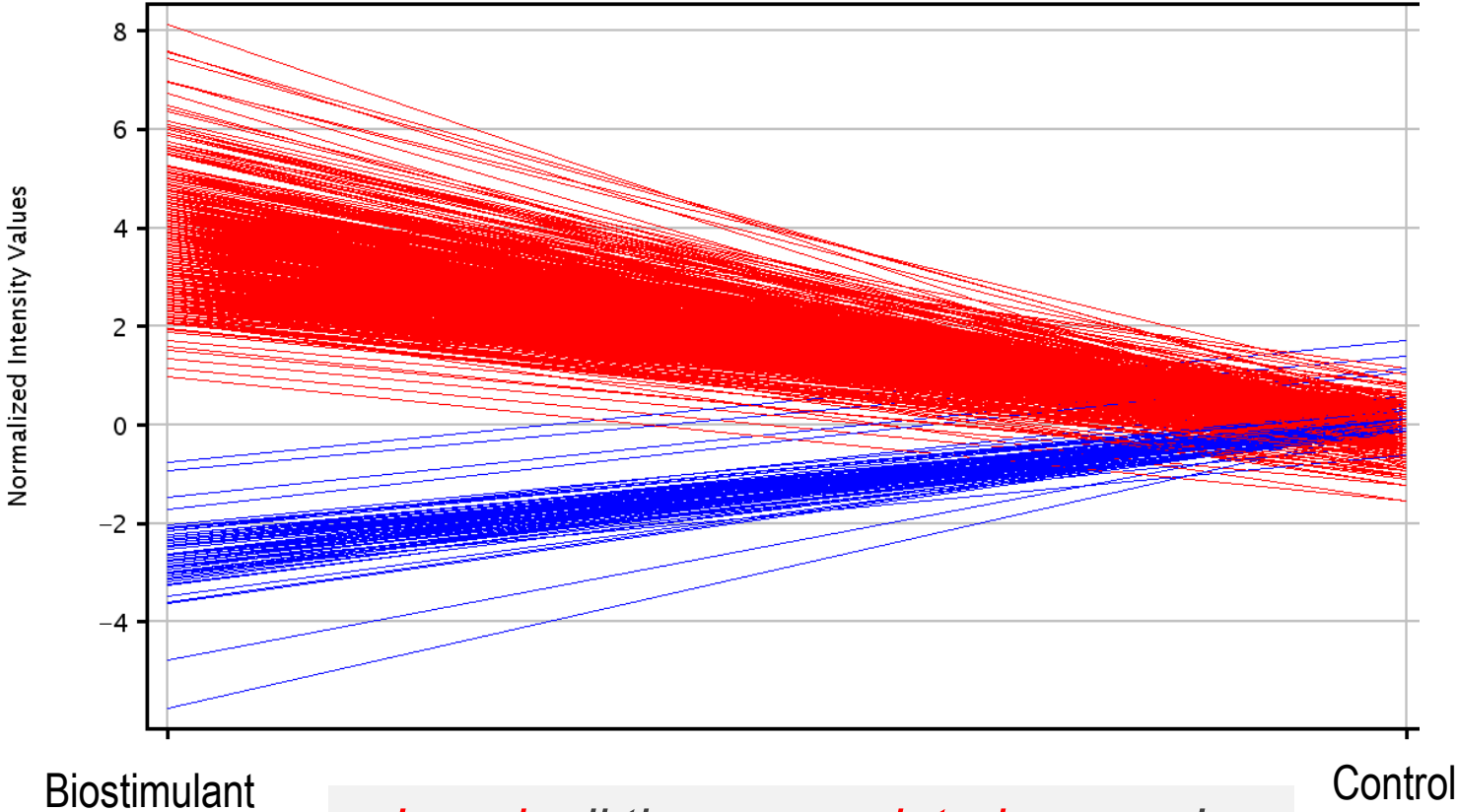


RESEARCH ON BIOSTIMULANTS – EXAMPLE: GENE CHIP ARRAY

FUNCTION	MEGAFOL F
STRESS wound	62
STRESS anoxia	46
STRESS biotic eFP	33
STRESS anoxia	25
STRESS salt eFP	18
HORMONE ABA eFP	17
STRESS wound	16
STRESS anoxia	14
STRESS salt eFP	10
METABOLISM	10
STRESS cold wound eFP	8
HORMONE ABA eFP	8
STRESS cold eFP	8
STRESS osmotic eFP	7
STRESS cold eFP	7
HORMONE ABA eFP	7
STRESS drought	6
STRESS wound eFP	5
STRESS osmotic salt eFP	5
STRESS osmotic eFP	5
HORMONE ETHYLENE	5
STRESS heat	5
STRESS cold wound eFP	5
STRESS cold eFP	5
STRESS biotic	5
STRESS anoxia	5
HORMONE ETHYLENE	4
STRESS osmotic eFP	4
STRESS osmotic eFP	4
STRESS osmotic eFP	4
STRESS osmotic eFP	4
STRESS osmotic	4
HORMONE ETHYLENE	4
TRANSPORT	4
HORMONE AUXIN	4
METABOLISM	4
HORMONE ABA eFP	4
HORMONE ABA eFP	4
HORMONE ABA eFP	4
HORMONE ABA eFP	4



Example: Megafol treatment induces several genes involved in abiotic stress response

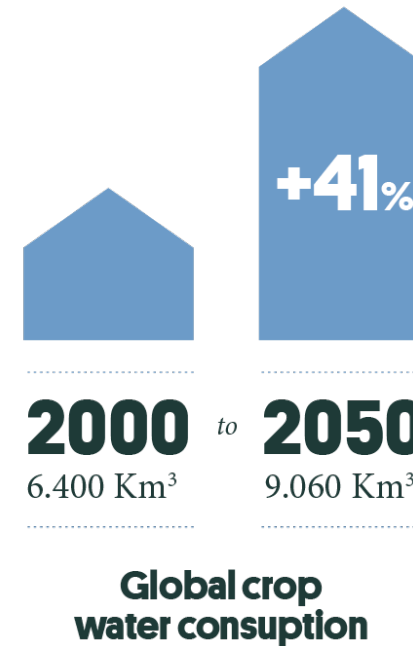
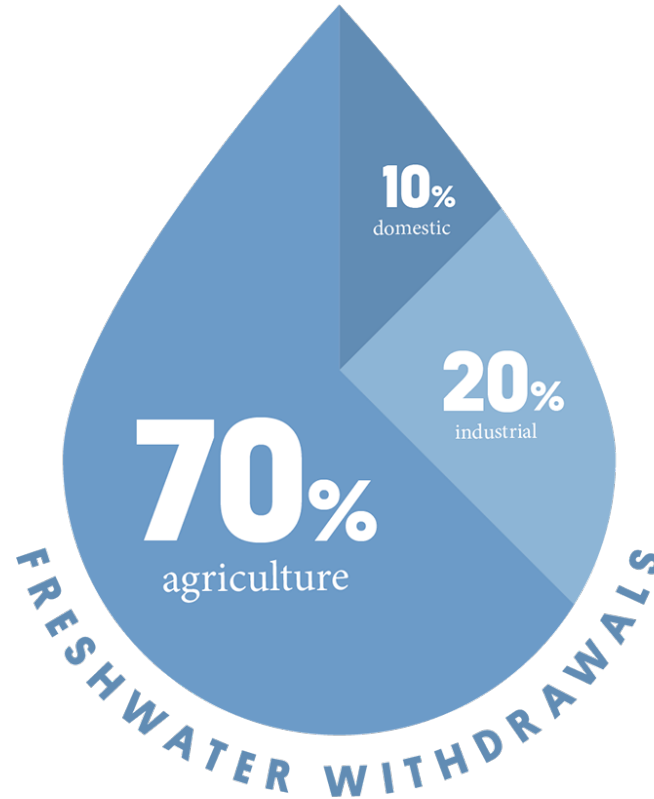


In red, all the up-regulated genes. In blue, the down-regulated genes after treatment with a biostimulant.

The SDG goals – Every Drop Counts

Case Study

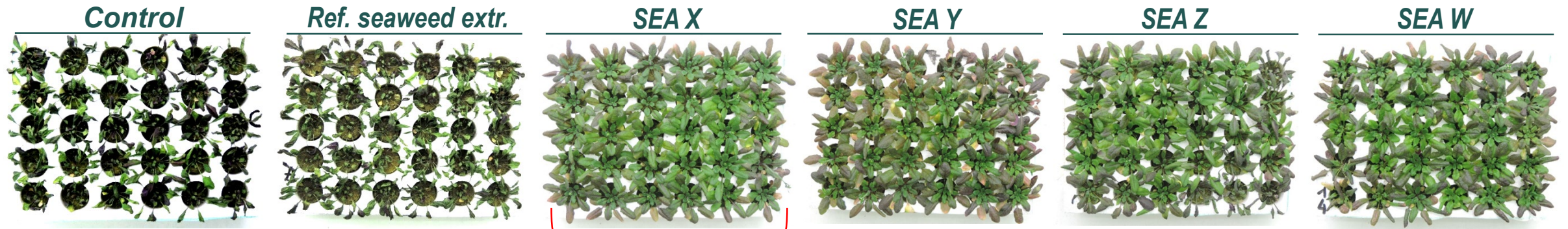
Water management



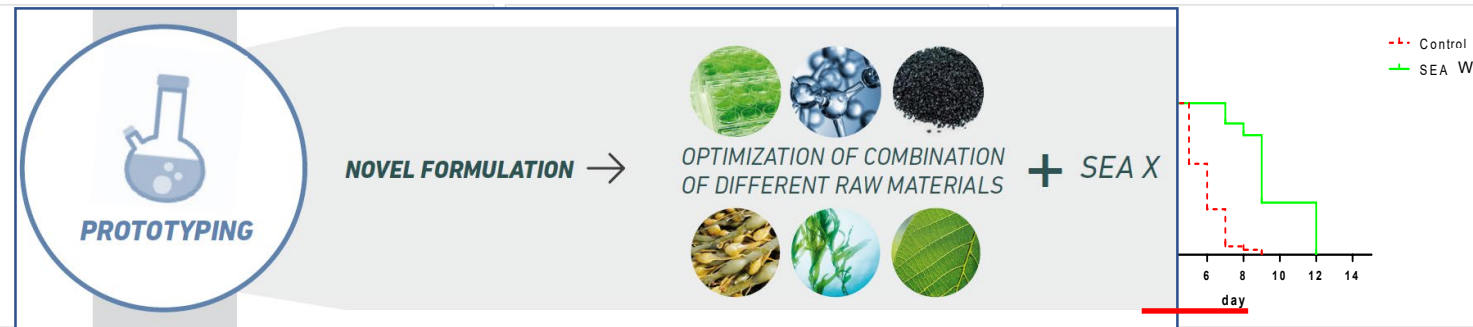
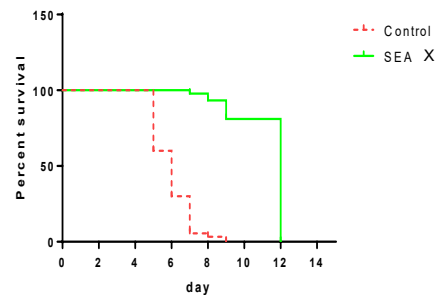
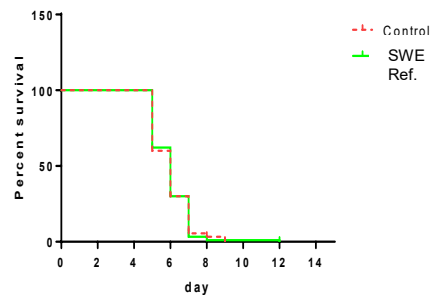
Agriculture faces the **challenge** of ensuring global food **security** by increasing yield **without** increasing **freshwater consumption**

Water management

In vivo bioassay by inducing water scarcity/drought in *Arabidopsis* and applying a set of new *A. nodosum* extracts (SEAX, SEA Y, etc.) obtained with different specific extraction processes:



Better efficacy under water stress



Water management

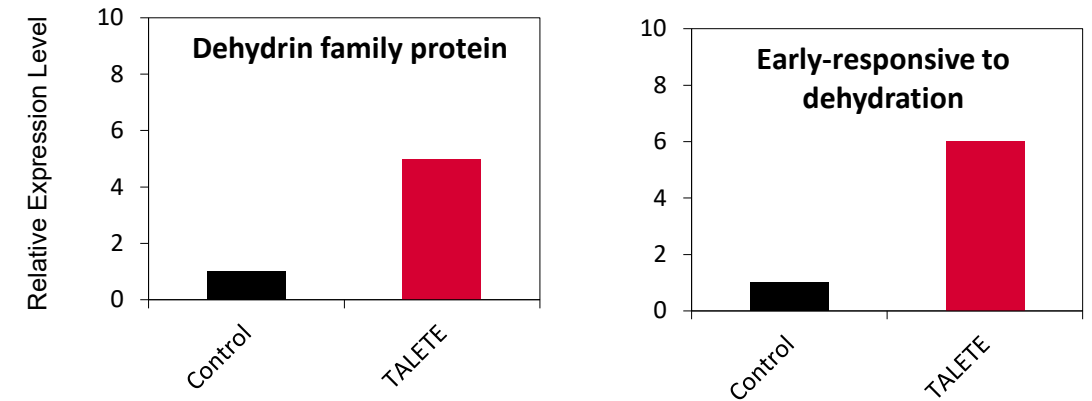


A. Induction of water responsive genes

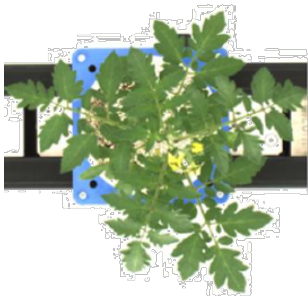
Dehydrins and early responsive to dehydration genes (ERD) play several important roles:

- Increase water binding capacity;
- Provide stability to other proteins and macromolecules;
- Drive rapid change in the activity of cells depending on the presence, absence, and concentration of water.

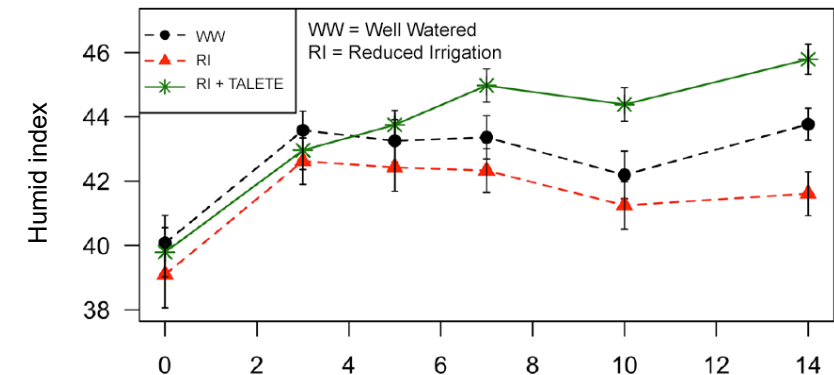
TALETE induces several genes belonging to the dehydrin and ERD families



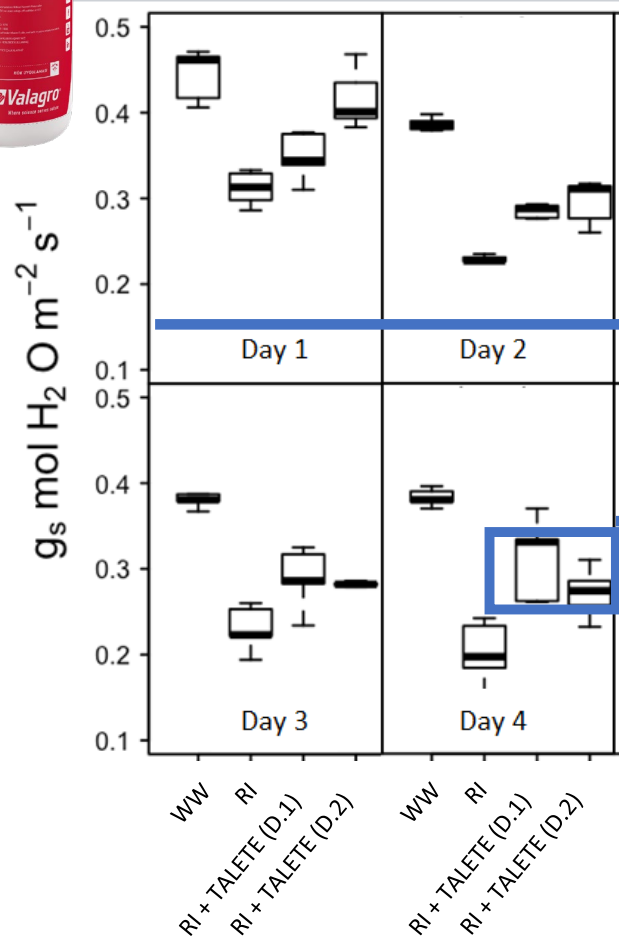
Phenomic analysis on tomato



**WATER CONTENT
(humidity index)**



Water management



B. Increase in stomatal conductance

Drought stress takes place below stomatal conductance value 0.15.

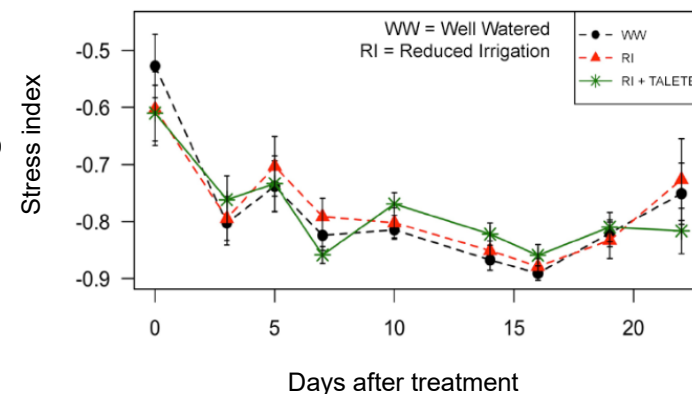
Here we are always above this value

(non-stressing condition)

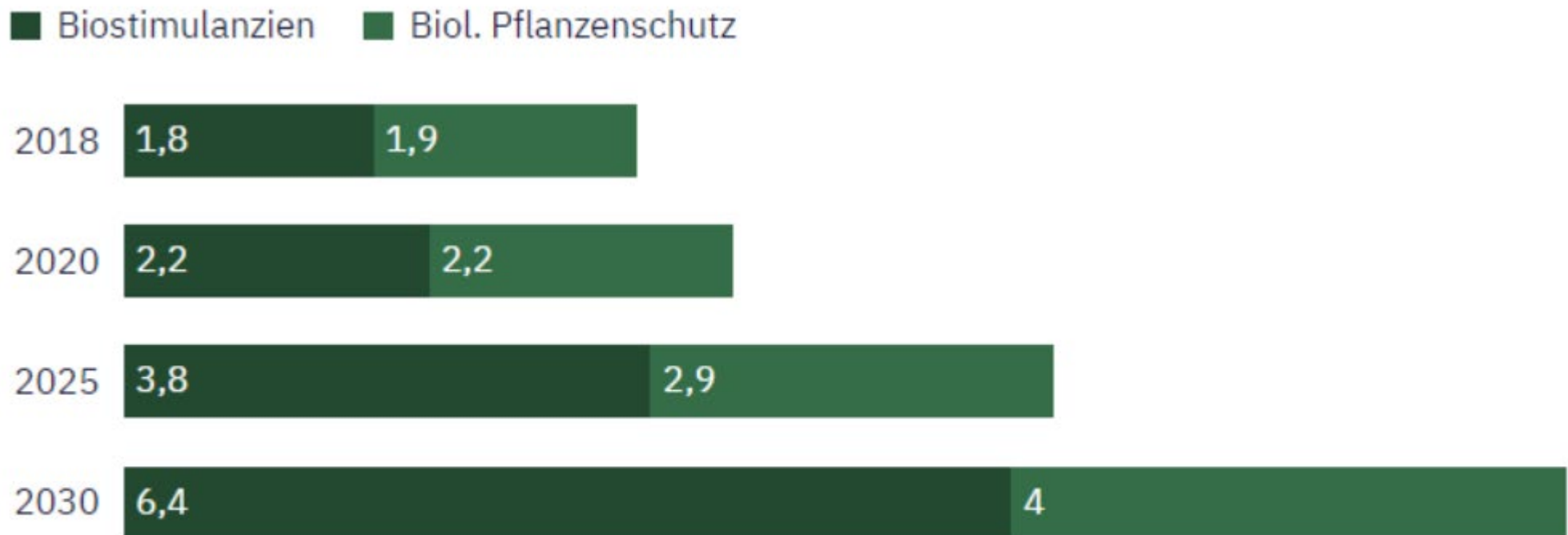
TALETE increases/balances stomatal conductance in tomato in comparison with RI...

WW = Well Watered
RI = Reduced Irrigation

Confirmed also by the «stress index», same for all experimental conditions

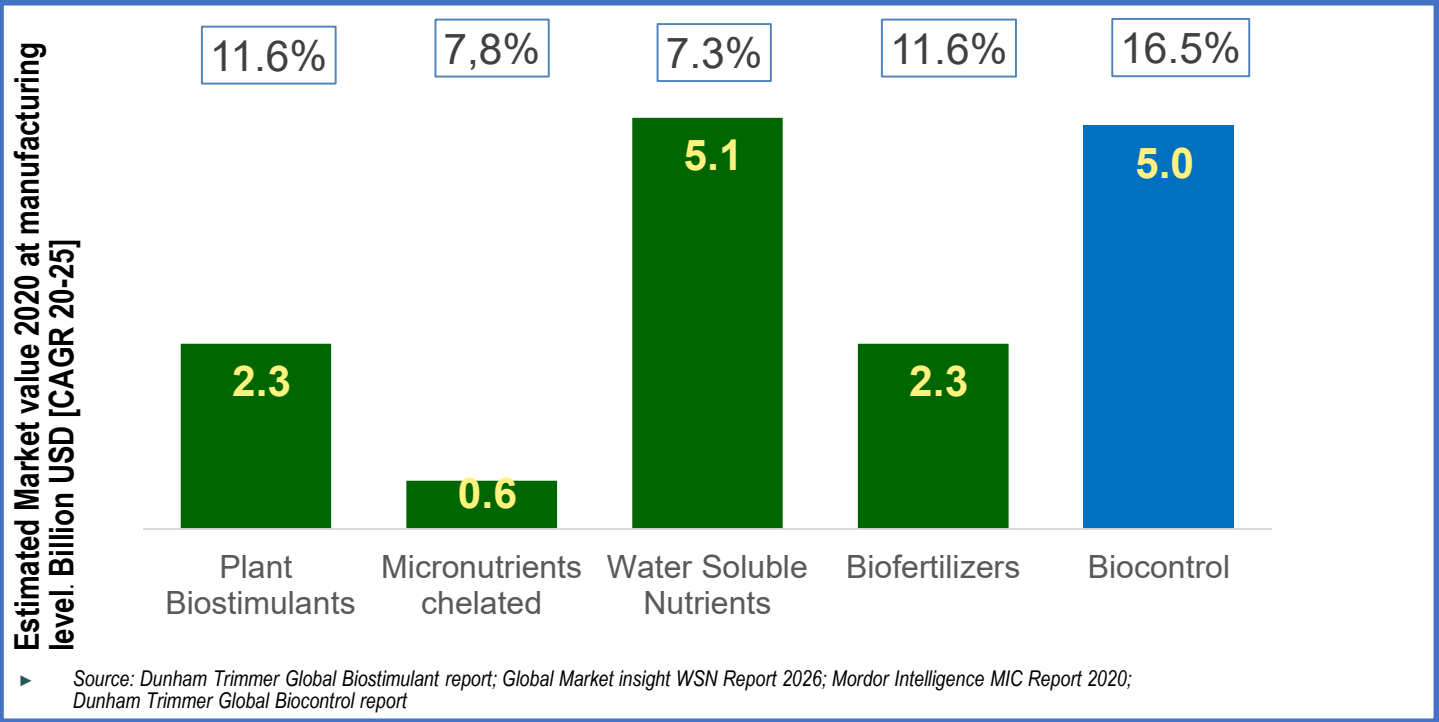


Market opportunity

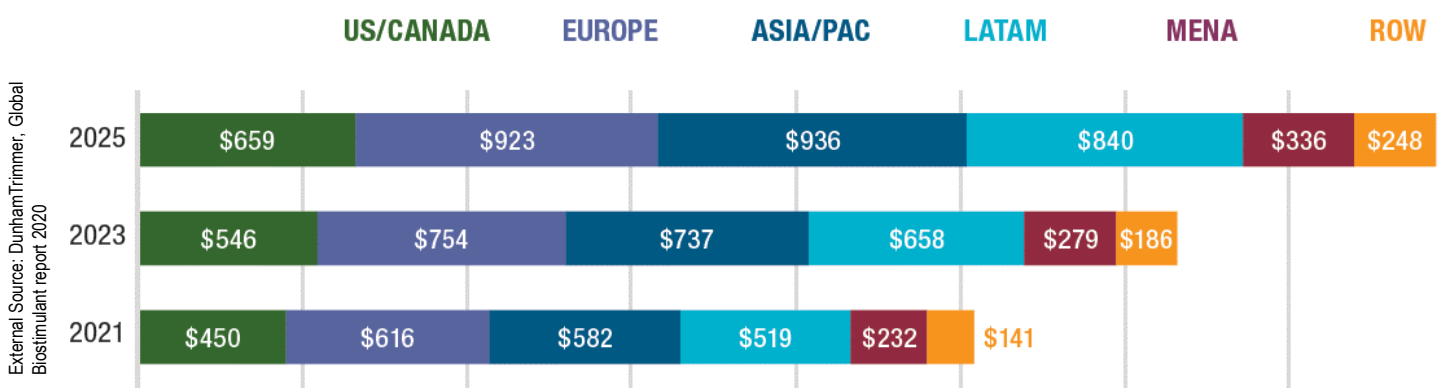


Grafik: ali; Quelle: SYT Marktschätzung / Syngenta; [Daten herunterladen](#)

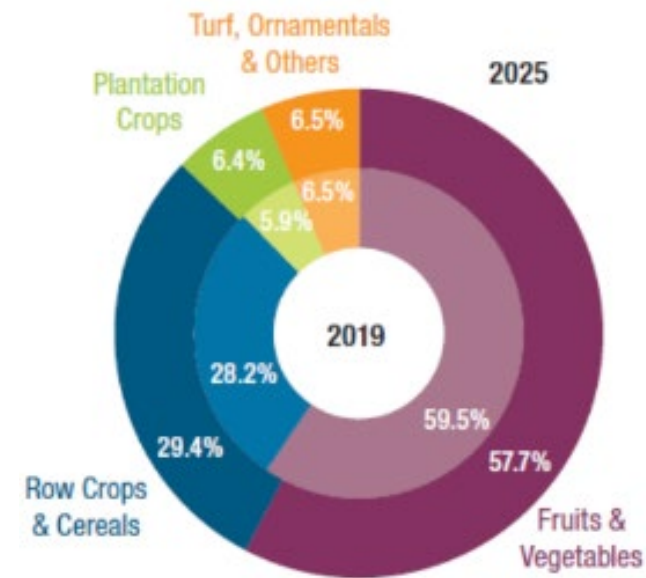
MARKET TRENDS | MARKET SEGMENT OVERVIEW



MARKET VALUE (Mln USD) 2021-2025 BY REGION



CROP GROUP MARKET SHARE – GLOBAL PBS



The Global Biostimulants Market is projected to reach **\$3,943 MN USD by 2025.**

The **Row crops & Cereals** segment occupies more than a quarter of the market and will gradually increase its relative importance. **MICROBIAL PRODUCTS** offer great possibilities to penetrate this segment strongly. **New monitoring and application technologies** will support this trend.

Opportunities

- **Nutrient use efficiency (NUE)**
N high priority
P priority
- **Soil & Plant health**
- **Crop quality**
e.g. fruit color and size, protein content

Challenges

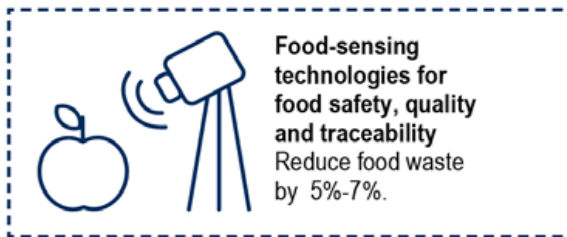
Adoption
Scalability
Quality
Consistency
Regulatory

Changing the shape of demand



Alternative proteins

Agriculture's impact on freshwater withdrawal could reduce by 7%-12%.



Food-sensing technologies for food safety, quality and traceability
Reduce food waste by 5%-7%.



Nutrigenetics for personalized nutrition

Reduce total global overweight population by 1%-2%.

Promoting value-chain linkages



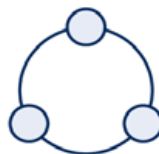
Mobile service delivery

Increase farmer income by 3%-6% and reduce food loss by 2%-5%.



Big data and advanced analytics for insurance

Farmer income could increase by up to 2%.



Internet of things for real-time supply chain transparency and traceability
Reduce food loss by 1%-4%.



Blockchain-enabled traceability
Reduce food loss by 1%-2%.

Creating effective production systems



Precision agriculture for input and water-use optimization

Reduce agriculture's impact on water use by 2%-5%.



Microbiome technologies to enhance crop resilience

Increase farmer income by 2%-3% and reduce food loss by 1%-2%.



Off-grid renewable energy generation and storage for access to electricity

Increase farmer yields by 4%-7% and reduce agriculture's impact on freshwater withdrawal by 4%-8%.



Gene-editing for multitrait seed improvements

Increase farmer income by 1%-2%.



Biological-based crop protection and micronutrients for soil management

Increase yields by up to 1% and reduce agriculture's greenhouse-gas emissions by up to 1%.

**Good Science +
Innovations
make the
difference**



Core transformative technologies supporting innovation in traceability initiatives

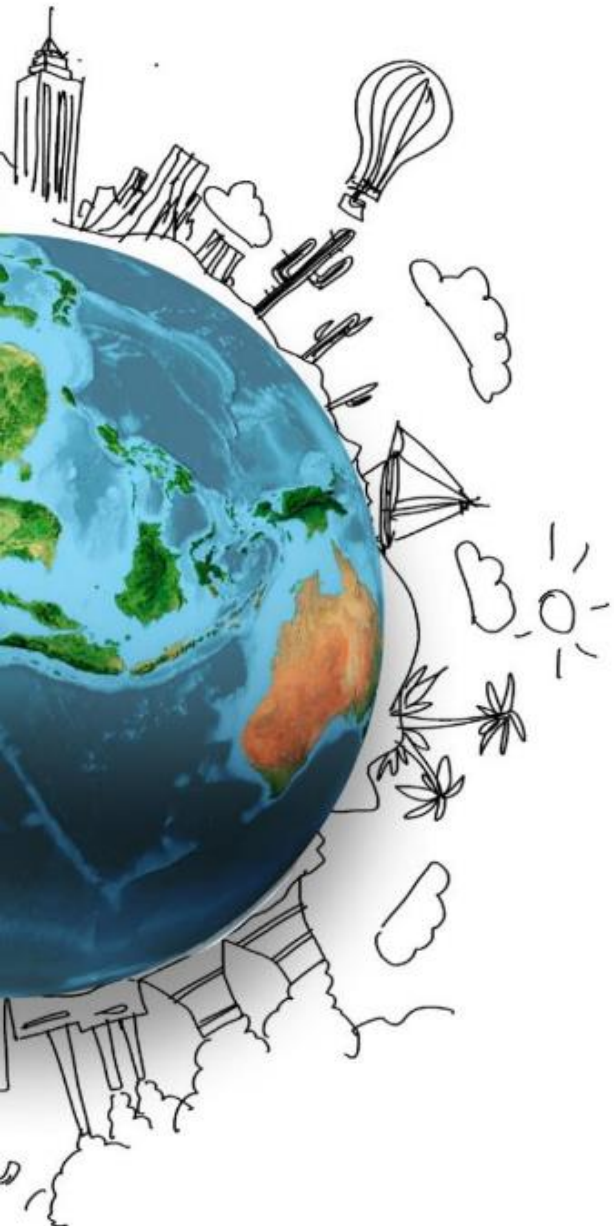
World Economic Forum

=

there has never been
more
important time
to **embrace**
disruption in
agriculture...



there
is **NO**
PLANet
B



WIN THE GLOBAL CHANGE TOGETHER