

# BiAg World



# DIGEST

MARCH-APRIL 2022

THE INDEPENDENT MAGAZINE BY THE BIOAG INDUSTRY FOR THE BIOAG INDUSTRY



**FEATURING: SPAIN BUT THINKING UKRAINE**

## FROM THE EDITOR'S DESK

### Maybe We are Finally Crossing the Chasm

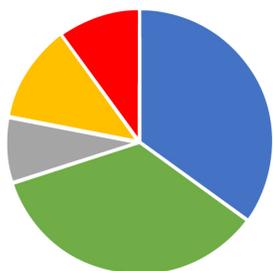
By Pam Marrone, Ph.D.

I delivered the keynote, "Biologicals primed for explosive growth", at the recent Biocontrols conference in Monterey, California, the mood was upbeat and full of lively and productive networking. The company exhibition was packed largely with small biopesticide companies. Other than UPL, none of the large agrichemical companies were there. Meister Media Worldwide opened the conference with compelling survey results on the attitudes of farmers toward biologicals.



Pam Marrone, Ph.D.

### How Do You View Biological Products?



- They're equivalent to conventional products in my crop protection and plant health arsenal
- These are unique products I use occasionally under specific conditions
- I use them due to customer expectations or requests
- It's a good marketing tool - it differentiates from competitors
- I'm not yet convinced biological products are effective

A large slice of the respondents said that biologicals are equivalent to conventional products and that they are unique products to use under specific conditions. Only about 10% said they are not yet convinced biological products are effective. In California in 2021, biopesticide treated acres were highest in almonds (likely mating disruption), followed by wine grapes, pistachios, oranges, table grapes, tangerines, and strawberries. Insecticides were 45% of the treated acres, followed by fungicides, miticides, and plant growth regulators. Top products were by number of treated acres: mineral oils, followed by *Bacillus thuringiensis*, gibberellins, potassium phosphite, and *Aspergillus flavus* strain AF36.

Another recent survey asked if you plan to increase your sales/distribution of biologicals and 68% said they plan to increase their

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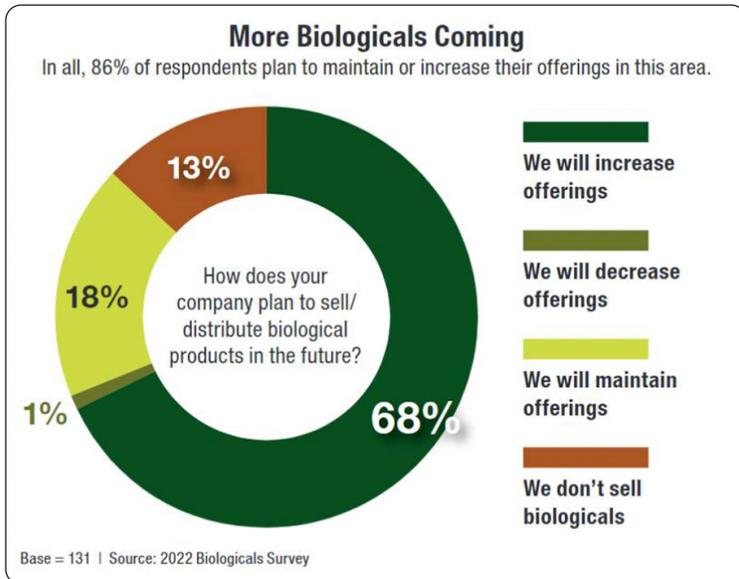
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# FROM THE EDITOR'S DESK

## Maybe We are Finally Crossing the Chasm



offerings and another 18% said they will maintain their offerings.

As per Shane Thomas' numbers from his weekly newsletter, "Upstream Insights", biologicals grow at a rate of 12% annually and chemical pesticides at 3%, biologicals will equal chemicals in size in 21 years.

Growth rate (CAGR)		12 %
Number of periods	<b>Biologicals</b>	21
Initial value	10,600,000,000	\$
Final value	114,520,791,603.36	\$

Growth rate (CAGR)		3 %
Number of periods	<b>Synthetics</b>	21
Initial value	61,300,000,000	\$
Final value	114,036,057,245.79	\$

The readers of the BAW Digest are quite familiar with the reasons for this growth:

- Better ROI (return on investment), especially in integrated programs
- Increased regulatory restrictions on synthetic chemicals
- Products are more science-based and higher performing
- Increasing grower awareness and knowledge
- New modes of action for resistance management
- MRL and Codex-exempt – spray right up to harvest; good for export
- Faster field re-entry lowers labor costs
- Fill unmet needs (e.g., thrips, nematodes, bacterial diseases, N fixation in monocots)
- Increase soil health, lower carbon footprint, and meet consumers demands for sustainability and transparency
- Lower cost to develop (<\$7 mil, <5 years)

What else needs to happen to further drive biologicals and biointensive crop production and integrated pest management (IPM)?

- More education and training needed on how the products work based on their unique modes of action. Prevention vs. knockdown or curative.
- Make proficiency in biologicals part of Cooperative Extension job requirements.
- Add more info on ecologically based IPM incl. soil health, beneficials, biocontrol/biopesticides to the crop consultants (Pest Control Advisors/Certified Crop Advisors) licensing.
- Go beyond counting bugs or leafspots. Because of biologicals unique modes of action, marketable yields, and quality (incl. nutrient density) can be the same as or better than chemical programs.
- Trials should be conducted in realistic integrated programs rather than just stand-alone comparisons.

## FROM THE EDITOR'S DESK

### Maybe We are Finally Crossing the Chasm

- Look at season long beneficial soil and plant health effects
- Go beyond small plots and conduct larger block trials

Many existing IPM programs are outdated and do not reflect the products & unique modes of action available (prevention vs knockdown or curative)

- Stop expecting single new chemical or biological silver bullets
- Systems integrators needed! Development and implementation of holistic, systems-based, integrated programs with cultural tools, crop varieties, soil health practices, biologicals, precision tools and data
- Assist growers with multiple tools integrated on-farm demonstrations vs. side-by-side single factor comparisons
- Retool PCA/CCA and Cooperative Extension training

In the 2020 article, "Biological control and integrated pest management in organic and conventional systems," published in Biological Control by Brian Baker, Thomas Green, and Ali Loker, they suggest that more resilient and sustainable approaches are urgently needed to minimize crop yield losses resulting from pest activity and reduce impacts of pest management on human health and the environment.

Strategies to speed adoption (of bio-based approaches) include increased education and extension on proven, ready-to-use biological control options; full cost and benefit accounting for biologically based alternatives to chemical controls; and public and private sector policies to encourage biological control and reduce reliance on chemical controls. Above all, producers and researchers need to overcome their historic reluctance to work together outside of their respective approaches. Whatever differences remain, all stand to benefit from working together for a sustainable and regenerative food system. 🌍

Come and join me at **BioAg World** CONGRESS  
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Countdown to 3rd BAW Congress!

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HOTEL RESERVATIONS

**FROM THE EDITOR'S DESK**

Roger's Viewpoint

Dear Friends,

As the Bioag World Congress quickly approaches, we are excited to share with you some further insight into resourceful and beautiful Spain, with Spain's rich agriculture landscape. We had no idea when we started assembling and writing our country feature that one magazine is not enough to cover the versatility of Spain agriculture. This edition of BioAg World Digest is very timely as the BioAg World Congress is also taking place in Spain, you would be able to see first hand why we chose Spain as host country for your own BioAg World Congress. We do wish to add that while we are featuring Spain and we celebrate the accomplishments and beauty of Spain, we wish also to remember and support those suffering in other parts of Europe during this difficult and unfortunate time, especially Ukraine.

In this issue, the feature on "UNITING THE VOICE OF THE SPANISH BIOLOGICAL COMMUNITY" by Spanish Association of Agronutrient Manufacturers (AEFA) including high level trends and outlook of Spanish agriculture and bio-agriculture gives us tremendous inspiration. In this issue, you will also find more cutting-edge insights and opinions from top global bioag leaders, mainly Spanish-based companies such as, Seipasa and IDAI Nature. Of course, we are also happy to dedicate our Women in Agriculture blog to two outstanding women leaders from Spain from our industry to the forefront along with exciting breaking news from companies all across the globe.

There are several interesting regular features such as HR guidance, including Terry Stone's op-ed on "U.S. Plant Biostimulant Industry Recommended Guidelines for Verifying the Efficacy, Composition, and Safety of Plant Biostimulents, a fantastic reference point. Likewise, Dr SK Malhotra's article on Biostimulant regulation in India is refreshing to say the least.

We want to build a strong community of bio-agriculture professionals to share and spread the knowledge, please send your ideas for improvement and features to be included in the next editions of BioAg World Digest. Don't forget to join BioAg World Congress in Valencia "An event By the industry For the industry", this will be a one stop knowledge sharing and networking carnival for the BioAg community.



*Roger Tripathi*

Please enjoy this edition of BAW Digest – hopefully it inspires you to join us in-person in a few weeks in Valencia! 🌍

Roger Tripathi,  
Editor in Chief and Co-Founder  
BAW Digest, GBAL CEO

**BioAg World**  
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# SPAIN: AN INTEGRAL PROVIDER OF THE FOOD BOWL OF EUROPE

## BioAg Market Leaders

Agriculture is a strategic sector for Spain's economy. In 2017 alone, the agricultural sector directly employed more than 749,000 people, generating a production of more than €25,300 million in revenues, and exports of €17,430 million. Spain is the country with the highest proportion of agricultural GDP in the EU and Spain has 750,000 farmers and ranchers, a higher figure than that of France or Germany. Being the second largest industry in the country and very close to tourism, agriculture contributes 10.6% to GDP, and 14.2% to employment. And as if that were not enough, Spain is the country with the greatest agricultural diversity in the EU, and the world's leading exporter of fresh fruit and vegetable products.

### Role of conservation agriculture and bioagriculture in fighting climate change in Spain.

There are more than two million hectares cultivated with conservation agriculture in Spain, which 'sequester' 9.9 million tons of CO<sub>2</sub> per year. This agricultural system contributes to conserving, improving and making more efficient use of natural resources, according to a study supported by AEPLA and Ansemat, and which has had the scientific and technical advice of the AEACSV.

This agricultural practice is a respectful and efficient alternative to natural resources. In our country, it accounts for 15% of the total cultivated area, with a production of 11.9 million tons.

According to the PwC study, with the support of national and European institutions, the three million hectares cultivated could be exceeded by 2030. Its maximum potential is 13 million hectares. In Spain there are 2.1 million hectares cultivated with conservation agriculture, 15% of the total agricultural area cultivated. The production of these crops is 11.9 million tons, whose total value reaches 3,668 million euros, which represents 12% of national agricultural production.

### Microbial market in Spain

The Spanish market for agricultural microbials was valued at USD 148.7 million in 2018, and it is projected to reach USD

340.0 million by 2024, witnessing a CAGR or 14.0% during the forecast period.

Virus-based microbials held the largest share of 49.9% and market value of USD 72.3 million in 2017. Bacteria-based microbial products held the second-largest market share with 29%, followed by fungi with 19.3% and other microbials with 1.8%.

The adoption rate of microbials is comparatively low, but the increase in consumption of microbials in the last two years shows a great potential in Spain.

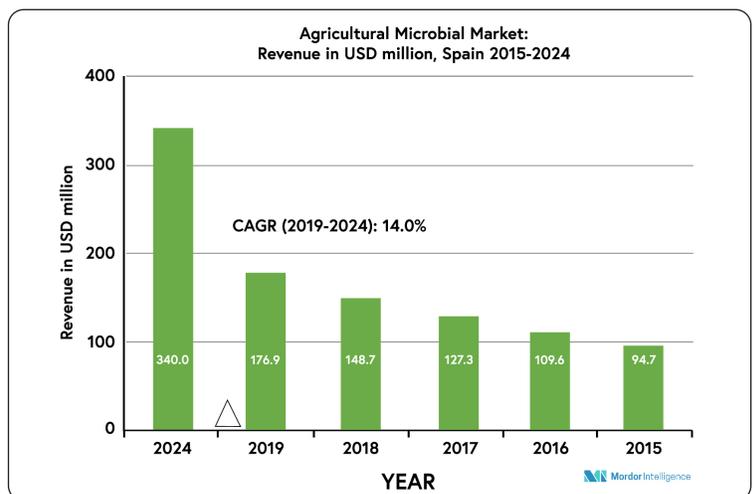
The number of registered biological products available in Spain from 1990 to present has skyrocketed. Thirty-eight private companies identified themselves as manufacturers and/or distributors of the associated microbial pest control products.

Demand for microbials in Spain is largely driven by conventional agriculture, recent changes to municipal and provincial laws governing cosmetic use of pesticides, and legislation and ensuring promotion for lower risk pest control products.

The rise in cost of fertilizers and pesticides, which also has, in turn, led to high usage of agricultural microbial products.

### Biopesticides Market in Spain

The Spanish biopesticides market is projected to record a CAGR of 5.6% during the forecast period (2020-2025). Biopesticides are pesticides that are derived from



# SPAIN: AN INTEGRAL PROVIDER OF THE FOOD BOWL OF EUROPE

## BioAg Market Leaders

natural materials like plants, bacteria, fungi, and other microbial origin along with certain minerals. When used as a component of Integrated Pest Management (IPM) programs these biopesticides can greatly decrease the use of conventional pesticides, while crop yields remain high. The increased use of synthetic pesticides, a growing general concern, and consumers' awareness of the negative impact of these chemicals on the environment, and on human health, has made way for these bio-based pesticides. Europe is the biggest market of biopesticide, globally. Of all the countries in Europe, Spain accounts for the largest share of about 25% of Europe's biopesticide market as of 2019.

### Key Market Trends

#### Increasing Awareness About Side-Effects of Chemical Biopesticides

Over the next years, crop production is likely to increase significantly to meet the needs of a rising human population. This has to be done without damaging the environment and the local ecosystem. Biopesticides are usually less toxic than conventional pesticides. This is the reason for increasing popularity of bio-based pesticides, and the awareness among farmers and consumers of the region, is likely to drive the market in Spain during the forecast period. Biopesticides are generally target specific and affect only the target pest and closely related organisms, while conventional pesticides may also affect organisms such as birds, insects, and mammals.

### Spanish Government Encourages Biological Pest Control

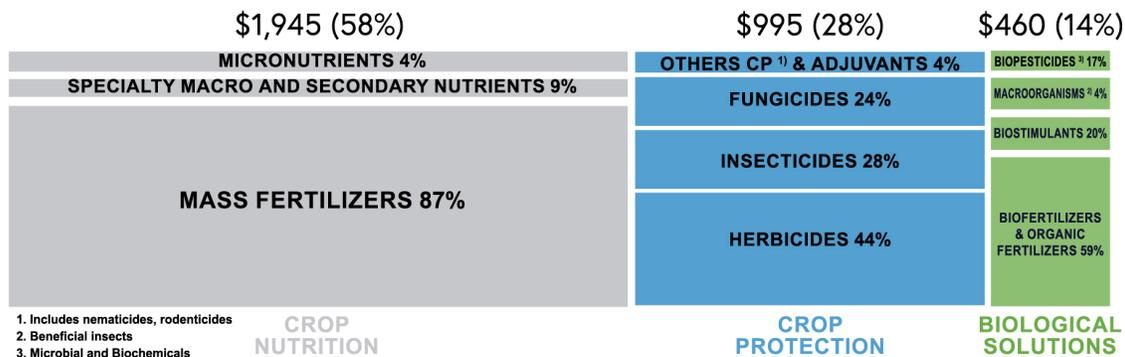
The Spanish regional government encouraged more extensive use of biopesticides and recorded a major share of the total European biopesticides market in 2019. Spanish farmers, no longer spray their crops with pesticides, instead they hang small bags of mites on the plants, leaving them to attack parasites while sparing his produce. The use of these kinds of biological control is specially common in Spain's Almeria province, where much of Europe's fruits and vegetables are grown. It is the local government bodies that encouraged more extensive use of biopesticides through various regulations and awareness campaigns aimed at controlling the hazards of climate change. This support from the government is likely to suppress the demand for synthetic fertilizers in the local market.

### Competitive Landscape

The market studied consists of prominent players, Agrauxine SA, BASF SE, Bayer Cropscience Ag., Koppert Biological Systems, and Valent BioSciences Corporation accounting for more than half of the market share. Consisting heavily of large multinational players, the market study also includes many private label players. Apart from the presence of a loyal customer base, the major players of the market studied benefit from large marketing and innovation capacities. Major Players: 1. Agrauxine SA - 2. Bayer Cropscience - 3. BASF SE - 4. Koppert Biological Systems - 5. Valent Biosciences

### 2019 Spanish Crop Input Management Market (Million Eur, % of total)

Est.  $\Sigma$  3,360 Mn (100%)



1. Includes nematocides, rodenticides  
2. Beneficial insects  
3. Microbial and Biochemicals

Source: Desk Research, Interviews, Industry Associations

# SPAIN: AN INTEGRAL PROVIDER OF THE FOOD BOWL OF EUROPE

## BioAg Market Leaders

### SPAIN: BIOPESTICIDES MARKET SIZE, BY TYPE, 2018-2025 (USD MILLION)

TYPE	2018	2019	2020-e	2025-p	CAGR (2020-2025)
Bioinsecticides	106.7	124.4	145.5	329.9	17.8%
Biofungicides	67.8	78.5	91.2	200.1	17.0%
Bionematicides	54.5	64.1	75.4	176.8	18.6%
Bioherbicides	9.8	10.9	12.2	21.4	12.0%
Other biopesticides*	14.7	15.9	17.3	24.1	6.9%
Total	253.4	293.9	341.6	752.4	17.1%

e = Estimated; p = Projected

\* Other biopesticides include *biomollusoicides*, *bioaarioides*, and *biorodenticides* Analysis.

Source: Company Press Releases, Annual Reports, Investor Presentations, Journals, Expert Interviews, and MarketsandMarkets Analysis

Increase in pest resurgence and pest resistance in protected cultivation crops such as tomato, pepper would drive for the adoption of bioinsecticides.

Government support for companies such as Seipasa for the development of the environmental solution to control harmful weeds is also driving the market for bioherbicides in this region.

### SPAIN: BIOPESTICIDES MARKET SIZE, BY CROP TYPE, 2018-2025 (USD MILLION)

CROPTYPE	2018	2019	2020-e	2025-p	CAGR (2020-2025)
Fruits & Vegetables	106.7	124.4	145.5	329.9	17.8%
Cereals & Grains	67.8	78.5	91.2	200.1	17.0%
Oilseeds & Pulses	54.5	64.1	75.4	176.8	18.6%
Other crop types *	9.8	10.9	12.2	21.4	12.0%
Total	253.4	293.9	341.6	752.4	17.1%

e = Estimated; p = Projected

\* Other crop types include turf, ornamental, and plantation crops.

Source: Company Press Releases, Annual Reports, Investor Presentations, Journals, Expert Interviews, and MarketsandMarkets Analysis

With an increase in export demand for organic fruits and vegetables with limited residue level, growing protected cultivation area would drive the adoption of biopesticides.

Increase in adoption of Bt-based bioinsecticides in protected cultivation to control *Spodoptera spp.*, *Tuta absoluta*, and *Helicoverpa armigera* is also driving the market for biopesticides in this region. 🌍

# UNITING THE VOICE OF THE SPANISH BIOLOGICAL COMMUNITY

## Spanish Association of Agronutrient Manufacturers (AEFA)

by Camino Garcia Martinez de Morentin, AEFA Director of Institutional Relations and Communications



Camino Garcia Matinez de Morentin

The Spanish Association of Agronutrient Manufacturers (AEFA) was born from the need to unite manufacturers of fertilizers and special agro-nutritional products in Spain to give a communal voice that speaks to the sector's interests.

Founded in 1997, this year AEFA celebrates its 25th anniversary and has gone from nine initial companies to over 55 today. Together, they represent more than 80% of the national market for biostimulant products and special agronutrients.

AEFA's fundamental objective is to contribute

effectively to the development and expansion of the agri-nutrition sector through a common strategy:

- Join forces to defend and promote common interest
- Share national and global market studies on fertilizers and biostimulants
- Provide effective solutions to more sustainable agriculture with innovative products in plant physiology that respect the environment, to obtain safe and quality production
- Active participation in all regulatory and legislation forums. We promote the advancement and expansion of regulations in Spain and Europe,

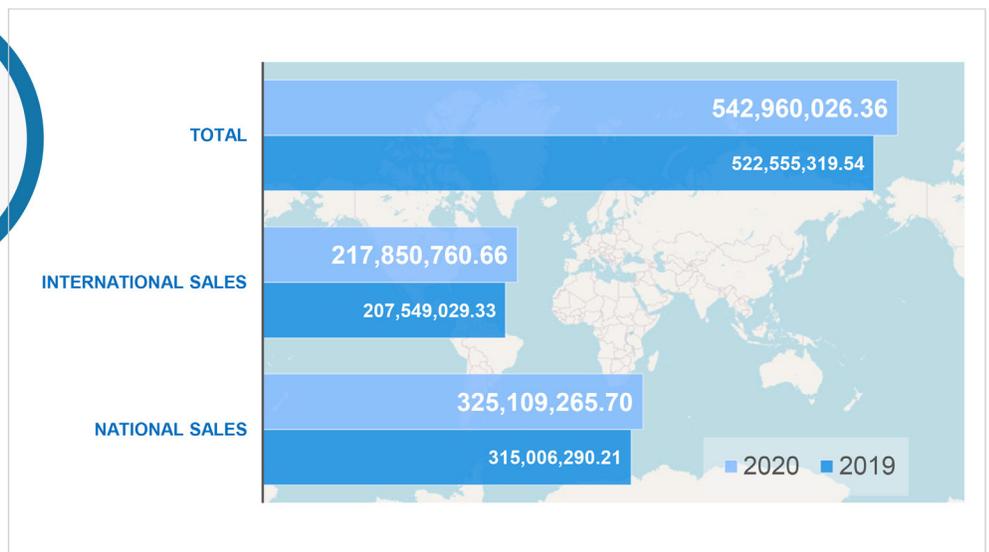
### Bioestimulants Market

### Special plant nutrients sales 2020 AEFA (eur)



60%  
National sales

40%  
International sales



Data Source: AEFA.

## UNITING THE VOICE OF THE SPANISH BIOLOGICAL COMMUNITY

### Spanish Association of Agronutrient Manufacturers (AEFA)

and we promote adaptation to technological development and modernization with new products

#### Strong Boost to Research and Development Biostimulants Market

The European biostimulant industry is a world leader, having gone from sales of 578 million euros in 2015 to an estimated 1,500 to 2,000 million in 2022, maintaining a market growth of 10-12% per year according to the European Biostimulant Industry Council (EBIC).

In 2020, the AEFA associated companies had sales of special biostimulant and agronutrient products that reached 540 million euros, 60% distributed in the national market and the rest destined for exports. Likewise, associates put on the market more than 32 million kg (or liters) of products with a biostimulant effect only, of which some 500,000 kg or liters are microbial biostimulants.

#### Regulatory Framework: National legislation.

In Spain, the marketing of fertilizers is regulated by Royal Decree 506/2013 and its subsequent amendments. Regarding biostimulants, national legislation has always

been one step ahead of Europe. Since its publication in 2013, it includes among its categories, group 4, called "Other fertilizers and special products" that covers a series of products with clear biostimulant effects such as amino acids, humic acids, silicon-based products, and algae extracts, among others.

In 2017, RD 999/2017 was also published, which modified RD 506/2013. This included a new type of product, microorganism-based fertilizers, which also have biostimulant characteristics apart from the supply of nutrients to the plant, and which require an inscription in the Registry of Fertilizer Products prior to placement on the market. In order to register these products, it is necessary to present a complex dossier, deposit the microorganism in a collection and an independent body must prepare a report with the isolation, identification and growth protocol of the microorganism in question and a positive report of the product's efficacy tests by crop groups guaranteeing the efficiency and safety of the biostimulant.

#### European Fertilizer Regulation

On July 16, 2022, EU Regulation 2019/1009 will come into application, which, for the first time, includes all types of fertilizer products. This new regulation comes after many years of work and demands from the sector within the package of measures promulgated by the EC to promote the circular economy and aims to promote the production of fertilizers from organic raw materials, bio-waste, byproducts, derivatives and digestates not imported, favoring self-supply and a sustainable production system.

For this reason, one of the key objectives of this new regulation is to promote the development of innovative products with technologies that are respectful of the environment and allow crop yields to be increased in a sustainable manner. These can accompany and

Product Function Categories (PFCs) of EU fertilising products

PFC	
1. Fertiliser	Organic fertiliser Organo-mineral fertiliser Inorganic fertiliser
2. Liming material	
3. Soil improver	Organic soil improver Inorganic soil improver
4. Growing medium	
5. Inhibitor	Nitrification inhibitor Denitrification inhibitor Urease inhibitor
6. Plant biostimulant	Microbial plant biostimulant Non-microbial plant biostimulant
7. Fertilizing product blend	

## UNITING THE VOICE OF THE SPANISH BIOLOGICAL COMMUNITY

### Spanish Association of Agronutrient Manufacturers (AEFA)

rationalize traditional fertilization, while allowing improvement in nutrients use and reducing waste.

The approach of this legislation is completely different from that of previous ones. Fertilizers are classified into Functional Product Categories (CFP) according to the functions attributed to the product, and different Categories of Component Materials (CMC) perfectly described, will be used for its formulation in Annex II of the Regulation.

Within these new CFPs is the CFP 6 Plant Biostimulants, and is broken down into CFP 6 A (microbial), and CFP 6 B (non-microbial). According to EU Regulation 2019/1009 itself, "a biostimulant is an EU fertilizer product whose function is to stimulate plant nutrition processes regardless of the nutrient content of the product, with the sole objective of improving one or more of the following: characteristics of plants and their rhizosphere: efficiency in the use of nutrients, tolerance to abiotic stress, quality characteristics, or availability of nutrients immobilized in the soil and the rhizosphere."

These products will have to meet minimum content and quality requirements, with limits for contaminants, heavy metals and pathogenic microorganisms that are detailed in the Annexes to the Regulation and must have the effects declared on the label for the crops specified in the same. In addition, to obtain the CE marking, biostimulants must pass a demanding conformity assessment by a body accredited by the notified authority designated at the national level, which certifies the efficiency of the product and compliance with all the requirements and functions claimed on the label.

Some issues that are not well defined in an excessively complex text and open to interpretations and procedures that have not yet been properly established, but are necessary to obtain the CE

marking, are concerns that keep AEFA companies and the sector in suspense. In general, these are:

- Concerns about the entry into application of the European Regulation
- Lack of notified bodies. Today, for all of Europe there are only three entities accredited by their member states to be able to carry out the conformity assessments required by EU Regulation 2019/1009. For many of the fertilizer products (including biostimulants), the regulations require the participation of these accredited bodies, so not having them will delay the placing of the products on the market
- The table with the list of byproducts of animal origin of the CMC 10 (derived products in the sense of Regulation (EC) 1069/2009) accepted as the end point in the manufacturing chain that is mentioned in Annex II of the Regulation to be established through delegated acts
- The list of microorganisms that are allowed to be used as components of microbial biostimulants (belonging to CMC 7) is very short for the needs of the sector. It only includes four different genera:



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## Spanish Association of Agronutrient Manufacturers (AEFA)

Azotobacter spp., Mycorrhizal fungi, Rhizobium spp., and Azospirillum spp. Proposals to expand the list are under consideration, but changes in this regard are not expected to be published anytime soon.

- The final technical specifications that will define the analysis methods and standards have not yet been published, a particularly critical point in products such as biostimulants that do not have prior harmonized standards.
- Among other challenges, companies in the sector also need to prepare the labeling of their products according to the new requirements. Within the National Fertilization Committee, the CTN -142, a UNE labeling standard is being developed with examples of label models in accordance with this Regulation EU

2019/1009 to help manufacturers in the preparation and interpretation of the new labels. AEFA is participating very actively in the drafting of this guide, which is expected to be published by May 2022.

### Key moment for biostimulants

European policies such as the Farm to Fork Strategy, within the framework of the European Green Deal, set ambitious goals with regards to plant nutrition: a 20% reduction in the use of conventional fertilizers and reaching 25% of agricultural land used for organic farming. To accomplish these goals will be necessary to combine more rational and precise fertilization practices with the use of innovative products resulting from the research and development of companies, such as biostimulants.

At AEFA, we believe that the specific objectives for reducing fertilization should be set realistically, with the support of an important scientific base, and through the development of technologies that allow more precise fertilization. Having a regulatory framework adapted to the needs of the sector is vital. Legislation that includes all types of biostimulant products is essential, provides security to the sector, and has the capacity to adapt to the speed of development and innovation of companies.

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## UNITING THE VOICE OF THE SPANISH BIOLOGICAL COMMUNITY

Perspective from AEFA's President

*by Juan Pardos, General Manager, Daymsa and President, AEFA*

About: Juan Pardos, general manager for Daymsa and previously Vice President of the AEFA Association, assumes the functions and new role and its path forward related to president duties. He is an experienced CEO with recognized reputation in Spain's bioag sector and other export markets.

Juan has been an active member from the very beginning of the AEFA project. His passion and leadership carried out in the association in recent years together with the Board of Directors and all the working groups, permitted AEFA to become an active organism and accomplish regulatory and commercial roadmaps in Spain and Europe of its associates. Members increased significantly in the recent years thanks to the commitment of the board members and tangible results brought in by the BioAg segment.

AEFA is an association that emerged 25 years ago to join the efforts of 9 specialty nutrition and biostimulants companies. Since then, and with a lot of work from those who have dedicated their lifetime to the association, it has evolved to become a fully functional and professional association, with a group of 58 manufacturing companies with the aim of working for the common interests of the sector.

The Board of Directors reflects the companies that make up the association, being made up of managers from both small and medium-sized family businesses to CEOs of large multinationals, all with the aim of working for the common interests of the BioAg sector. Since its foundation, the involvement and joint work of the different management teams and members of the association has allowed it to evolve and has been able to actively participate in the development and consolidation of the biostimulants sector in our

country, and pioneering new groups of products and innovative applications.

Europe, with Spain in the lead, leads the manufacture of biostimulants, but now there is a lot of competition from increasingly powerful foreign companies. The AEFA companies, pioneers in research and development of new biostimulants products, are aware of the need for the administration to be informed of technological advances, market reality and consumer needs, and thanks to the associative power, it is easier for the interests of the sector to be collected and represented. At the same time, the association actively participates in the dissemination of scientific and technical knowledge of biostimulants with its presence in all relevant events in the sector.

The guidelines that come to us from the EU are committed to environmental policies, sustainability and the circular economy, and always go through waste reduction. With biostimulants and biocontrol products, a possibility is opened to rationalize conventional fertilization and reduce the use of phytosanitary products requested by the EC by replacing chemical components with others that are more respectful of the environment. 🌍



## UNITING THE VOICE OF THE SPANISH BIOLOGICAL COMMUNITY

An Interview with Pedro Peleato, CEO, Seipasa

Pedro Peleato is the son of Aragonese farmers, who cultivated extensively. He is a native of Tardienta, a small town in Huesca. There he began his relationship with the terroir and his love for the land and livestock. He learned about the different agricultural tasks, including the sale of fertilizers, seeds and other supplies in a store. He later travelled to Italy to look for new products and thus his vision and field of action grew. His trips to other countries, including China, increasingly helped him to broaden his gaze and perspective.

But without a doubt it was his visit to Cuba and his relationship with the University of Havana that marked a decisive turning point.

Pedro is a founding partner of Seipasa since its creation in 1998. What began as a company specializing in the development of natural solutions for agriculture, has now become a multinational company with a presence in more than 20 countries. As CEO, he directed international expansion based on solid commitment to innovation, sustainability and the registration of phytosanitary products at a global level. The development of R&D led to develop the patents for the biopesticides Pirecris and Fungisei, of which he is the owner.

In 2010 Seipasa became the first Spanish company to join the BPIA, (Bioproducts Industry Alliance), the alliance that brings together the world's leading biological producers. Seipasa is also cofounder of the EBIC Task Force, the European Biostimulants Industry Council.

In 2011 Pedro founded CEPBIO, the first Spanish Consortium of Biopesticide Products, of which he is currently president. CEPBIO's objective is to unite



*Pedro Peleato*

efforts and promote the exchange of knowledge among the main Spanish companies dedicated to the production of biopesticides.

Pedro is also AEFA (Spanish Association of Agronutrient Manufacturers) treasurer.

About Seipasa: Seipasa is a pioneering Spanish company in biotechnology applied to agriculture. It designs, registers, markets, and sells solutions of botanical and microbiological origin for crop protection, biostimulation and nutrition worldwide.

The company was founded in 1998 based on the business vision of anticipating the changes and transformation that the agricultural industry is undergoing today. 24 years on, Seipasa has spearheaded the model of Natural Technology® developing high technological value-added solutions, aligned with sustainability, and applied in the most demanding agricultural systems in the world. Seipasa's solid commitment to innovation in such a traditional and strongly regulated industry as agriculture gained it the 2020 National Innovation Award presented by the Spanish Ministry of Science and Innovation. Seipasa exports its products to more than 25 countries worldwide.

## UNITING THE VOICE OF THE SPANISH BIOLOGICAL COMMUNITY

An Interview with Pedro Peleato, CEO, Seipasa

### How have you experienced the growth and/or changes in the biologicals market during your time as CEO?

Growth of the biologicals market has accelerated over the past few years. Nearly all the studies and analyses of perspectives on a 7 to 10-year horizon predict double-digit annual growth rates, which is considerably higher than the growth rate of conventional phytosanitary products.

This is a thriving strategic sector in the economy, with enormous potential. For this reason, it has captured the attention of venture capital and investment in a particularly intense way over the past 5 years.

This movement of capital has brought about profound changes in the industry's map. The numerous asset purchase operations and company acquisitions that have taken place have resulted in a concentration of players, with many biological niche companies being absorbed to complete the organic product portfolio of large multinationals.

### Why do you believe biologicals have taken off so strongly in the European market?

Climate change and increasingly stringent EU regulations on the use of phytosanitary products, and in particular a shift in the consumer mindset have all acted as powerful market drivers.

In the context of the EU, we are talking about a potential withdrawal in the short term of 40% of the active substances that are currently available. It is estimated that 2 out of every 3 conventional phytosanitary products could disappear from the market, which means that there will be considerably

fewer tools available to farmers for the control of pests and diseases. This will cause an enormous void that will have to be filled by biologically based solutions.

Biopesticides, biofungicides and biostimulants will have an even more important role to play in the way we produce. With this paradigm shift, companies like Seipasa, which from the very start opted to develop solutions of botanical and microbiological origin, have a great competitive edge.

In this equation it is important to remember the role of consumers who are now increasingly aware of the importance of consuming healthy, residue-free foods. Data published by the European Commission show that in the past 10 years, consumption of organic foods and products has doubled from 18,000 million euros to more than 41,000 million euros. These figures confirm that we are witnessing one of the major driving forces in the market.

### How would you describe the current biological marketplace environment based on the experiences of you and your team?

I would define it as extremely competitive and changeable, especially over the past few months. The industry faces the major challenge of climate change, of having to adapt to an even more extreme environment in terms of temperature and with increasing shortages of basic resources such as water. In this sense, the European Green Deal and the implementation of the Farm to Fork strategy form part of an ambitious plan that aims to transform the agricultural and food model in Europe over the next 10 years to align it with environmental protection strategies, and to combat climate change.

## UNITING THE VOICE OF THE SPANISH BIOLOGICAL COMMUNITY

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As I mentioned previously, this change of thinking is going to further reinforce the market position of companies like Seipasa that can offer a differential value in terms of the way they relate to the natural environment, i.e., companies that are able to produce criteria of efficacy, efficiency, and rationality as well as respect for the environment and for human health.

We were already aware of this environmental risk caused by climate change, but in the last year a new front of uncertainty and of unknown consequences and effects has opened. In addition to the price hike in raw materials and energy costs, the recent international crisis unleashed by Russia's invasion of Ukraine, further exacerbates these problems. In this highly unstable scenario, companies must be even more efficient; we must learn how to do more with less. Farmers should not have to shoulder all the costs of this crisis. We must help and protect farmers. As companies we must adjust our margins and offer a criterion of rationality in order not to suffocate such a key strategic sector as agriculture. This has always been Seipasa's approach up to now and it is how we are going to continue to work.

### Have you had to adapt your marketing methods or techniques as biologicals become more competitive and more widely accepted?

Yes, definitely. We have had to learn to differentiate ourselves, explain what it is that makes us unique, why we were pioneers in the industry and how we have reached our current position after almost 25 years.

Wherever you look, all companies in all industries want to be sustainable and to be able to label

themselves as organic, bio or green. Sustainability has become a kind of fit-for-all commodity, and in the process, the term has lost its rigor and with it, part of its value. In the past, the same thing occurred with "quality," which ended up diluted and no longer a valid differentiating element.

In agriculture, being sustainable is no longer enough to convince the market. This is why I keep on insisting on the need to explain what our added value is and why not all companies in the industry are the same. We must go beyond the term "sustainability" and be able to explain about the added value of our products, which is based on knowledge: we are champions of the new "agriculture of knowledge" because we have not only designed the tools for this, but we also know how to use them.

### What makes you most excited for the future of your company?

I am proud to think that after almost 25 years Seipasa remains an independent company. At a time of high concentration in the industry, with numerous acquisitions or absorptions of biological product companies by large multinationals over the past 5 years, Seipasa continues to be a company that is supported and driven 100% by its own resources, investments and equity.

We are here to be answerable to farmers, not to investment and venture capital funds. I come from a farming family, I am the son and grandson of farmers. I have trudged through mud and still have my feet firmly on the ground. I know what farmers want, I know about their needs and problems, and I want to keep on helping them. I like to think that our

## UNITING THE VOICE OF THE SPANISH BIOLOGICAL COMMUNITY

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essence is still the same: we were born to serve the interests of the people who work the land, that is what we will continue to do.

### What brought you to Seipasa?

The desire to change agriculture, and the vision of anticipating a change that was absolutely necessary in this sector. I was only 20 years old and working at my father's fertilizer warehouse. I had travelled throughout Spain and Italy in a van, selling products; I had ventured outside Spain and had the opportunity to see different agricultural systems and meet many farmers and producers. During my travels I saw there was a need and an opportunity for change.

Agriculture needed to evolve, it required a lateral view, innovative vision and a disruptive approach. The industry was dominated by chemically synthesized phytosanitary solutions, but I was absolutely sure that I could not and did not want to follow that same path.

And this is how Seipasa emerged, developing its own, exclusive model that combines nature and technology. We start off with the botanical and microbiological active substances and apply cutting-edge 21st-century technology to generate new solutions and make them available for farmers.

### What are some of your most recent accomplishments?

In 2020 Seipasa received the National Innovation Award, which is presented by the Spanish Government's Ministry of Science and Innovation. This is the most prestigious award in its

category, an award that distinguishes us as a hub of innovation and a driving force for growth within the industry.

To understand it, we must contextualize this award: 2020 was a year marked especially by the pandemic, with dramatic consequences from a social, economic and humanitarian point of view. It is highly significant that, in such a tough year, with widespread lockdowns and a drastic decline in the economy, the National Innovation Award went to a company in the agri-food sector. It could have gone to a company in the pharmaceutical or telecommunications sector, but it was awarded to a company in the agricultural sector, in this case Seipasa.

For me it meant the recognition not only of our own particular track record, but also of the work and dedication of millions of farmers throughout the world. Thanks to them, supplies of food, fruit, vegetables, and cereals were guaranteed even during the most difficult times of the pandemic. Thanks to the farmers, the world did not come to a standstill, and for this reason, this 2020 National Innovation Award also belongs to all the farmers.

### How are you planning to stay competitive in the biological market as it continues to grow?

By putting the emphasis on innovation and leveraging our main competitive advantage. Seipasa has devoted its work to the research and development of substances of botanical and microbiological origin for 24 years. All this experience has helped us accrue a profound knowhow that allows us to stay two steps ahead of the market and anticipate needs.

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We have developed exhaustive knowledge of our products: we travel to the places of origin to select our raw materials and we even know the producers who supply these raw materials of natural origin.

We have the technology to allow us to identify the most efficient active substances, and we apply an exclusive and patented formulation that enables us to develop effective solutions that are stable in all types of application conditions, as well as being environmentally friendly and respectful of people's health.

### Tell me a bit about the new plant and headquarters you have under construction. Why is this happening now?

The new production plant we have just inaugurated is the second major intervention we have undertaken in just three years. We have added a further 2,000 square meters of production facilities to continue to grow and be able to respond to the increase in demand in markets such as the USA, Mexico, Latin America or Spain, among others.

In addition, work will soon be starting on the construction of a new production plant where we will produce a new bioherbicide, which is set to be an effective, sustainable alternative to synthetic herbicides. The company's headquarters will be located next to this plant in a newly constructed building, equipped with the most cutting-edge technology and most advanced materials to create sustainable, energy-efficient facilities. Work is expected to be completed within 12 months.

Why now? Because we want to be the leaders in the market of biological crop protection products. To do this we need to build up our resources to be more efficient, more sustainable, stronger and even more agile in the service we offer our customers.

### How and why did Seipasa win the National Innovation Award in 2020?

The National Innovation Award is a recognition of our commitment to innovation in a traditional and strongly regulated sector like the agricultural sector. The award highlights our efforts to develop a Natural Technology model, which today is present in the world's most demanding agricultural systems. In short, it acknowledges Seipasa's courage, our ability to anticipate change, to go against the current for a sustained period and, naturally, our success in generating a model that is applied in more than 25 countries worldwide.

### What are your company's most exciting short- and long-term goals?

First, we want to continue being useful and essential for all the farmers that place their trust in us. We want to continue speaking the same language as them and be totally aligned with their interests, forming part of their catalogue of solutions when problems occur. After that, Seipasa's objective is to consolidate its position in the markets and of course, to expand its presence into new territories, especially the Latin American markets. To do this, it is essential that all the processes that are underway to obtain phytosanitary registrations, must come to fruition.

# UNITING THE VOICE OF THE SPANISH BIOLOGICAL COMMUNITY

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## How will the new phytosanitary registrations affect you?

Registrations are at the very base of our growth and expansion. When we enter a new international market, we do so after first having carried out an extensive rollout allowing us to work with the authorities and official bodies in each country, to present all the necessary files and dossiers, before obtaining phytosanitary registration.



Phytosanitary registration is a guarantee of quality, of trustworthiness and of safety for the market. Seipasa currently has more than 45 bioinsecticide and biofungicide phytosanitary product registrations in more than 14 countries. Extending this catalogue will allow us to continue growing and to consolidate our position in these international markets.

In this sense, not only do we need swifter decisions on registration applications, but also greater coordination and harmonisation between the bodies in each of the countries, especially regarding everything to do with product evaluations. If this does not occur, then we cannot meet the established deadlines for new products or for processes of mutual recognition.



In Europe, the registration process for a biological product is as lengthy and complicated as it is for a conventional phytosanitary product, which puts an enormous brake on new solutions coming onto the market. 🌍

## PREVIEW: MAY ISSUE HIGHLIGHTS

**Featured Leader:** CEO of BioBest

**Featured Company:** BioBest

**Country Focus:** India

**Sustainability Feature:** Nutrien

**Science Update:** South Korea

**Special Feature:** Robotics

**Regular Features:**

- Regulatory Updates
- M&A Updates
- Strategic Alliance Update
- Personnel Updates
- Farmers Corner
- Women in Agriculture
- Promising and Emerging Entrepreneur
- Global Event Updates
- HR Lessons

## UNITING THE VOICE OF THE SPANISH BIOLOGICAL COMMUNITY

An Interview with Carlos Ledó, Idai Nature Founder and CEO

Agronomist from the UPV, awarded in 2016 as its First Outstanding Alumni, Carlos Ledó has dedicated his professional career to food and population security through innovation in a sector as traditional and stagnant as agriculture.

With concern for the environment and sustainability of the planet, he invests his time and resources in research to try to leave a better world for future generations. A humble person, who highlights the importance of values as a fundamental pillar in his life, a model that he has extrapolated to his company, creating a team with principles and ethics above professional skills.

About Idai Nature: Idai Nature ([www.idainature.com](http://www.idainature.com)) is a biotechnology company based in Valencia, Spain, founded in 2009 by Carlos Ledó and specialises in the development and manufacture of products based on microorganisms and botanical extracts, mainly biofungicides, biobactericides and/or bioinsecticides.

Since 2018, the company is part of the Rovensa Group and leads its agricultural biocontrol unit, [www.rovensa.com](http://www.rovensa.com).

About Rovensa: Rovensa, formerly known as Sapec Agro Business, is a leading global player in the agricultural industry, with a long history, experience and knowledge in the sector. In September 2019, Sapec Agro Business was renamed Rovensa, with the aim of creating a prestigious international brand in the agricultural industry. The group is now organised into three main business units: Bio-Nutrition, Biocontrol and Crop Protection. With offices, factories, research centres and laboratories in Brazil, France, Spain, Portugal and Ireland, Rovensa



*Carlos Ledó*

continuously develops a broad portfolio of innovative solutions for plant health and care. All companies belonging to Rovensa share synergies and offer a catalogue of complementary products that have the same objective: Well Balanced Agriculture.

**Tell me a little bit about the Idai Nature's background. What were some challenges to the company's growth?**

Idai Nature is a Spanish biotech company founded in 2009. Idai is the acronym of R+D+I in Spanish. Along with its history, it is developing natural solutions for agricultural biocontrol. We

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An Interview with Carlos Ledó, IDAI Nature Founder and CEO



focus our efforts on providing farmers with natural and sustainable alternatives, based on plant extracts and microorganisms. We cure plants with other plants. Idai Nature's innovative solutions help farmers to make their crops more profitable in the most sustainable way possible. This increase in profitability is the result of enabling farmers to eliminate chemical residues from vegetables so that farmers can sell their crops in high-value markets with high standards of quality.

## What are the challenges of making such a big integration under the Rovensa platform?

Idai Nature joined the Rovensa group in 2018 for launching and leading the Green division. Nowadays, Rovensa is acquiring other biocontrol companies worldwide to complement its structure looking for synergies and achieving its mission of feeding the planet through healthy and safe solutions. We have already captured international synergies between Rovensa's companies and our growth, organic and inorganic, has just started. This amazing project will drive and lead the change in agribusiness worldwide.

## Which drivers do you feel will determine the higher rate of adoption of biologicals for farmers in WW?

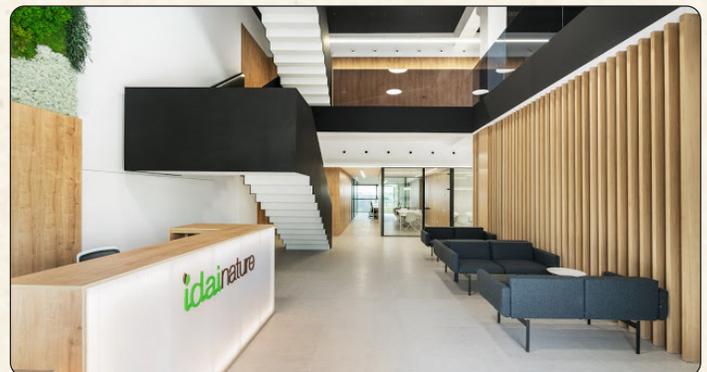
Biocontrol agribusiness is growing at a 16.5% rate as Dunham Trimmer's report mentions.

Food safety, population requirements, pest resistance, and the reduction of agrochemical active ingredients will be the key drivers of this huge growth rate. On the other hand, the conventional market will grow by 1.9% until 2025, so, change is coming.

## What are your personal values and vision regarding agricultural sustainability?

One of the foundational pillars of Idai Nature is sustainability, it is part of our DNA. Since our origin twelve years ago, our aim is to leave a better world for the next generations by promoting sustainable agriculture that is more respectful with our environment, farmers, and planet.

All our long-term efforts and vision have been recognized in 2020 with the achievement of the highest award in Europe for sustainability in business. We have been named the 'most sustainable company in Europe' in the Product and Service category of the European Business Awards' awarded by the European Commission.



## UNITING THE VOICE OF THE SPANISH BIOLOGICAL COMMUNITY

### An Interview with Carlos Ledó, Idai Nature Founder and CEO

This award is the result of a series of decisions, often at the cost of profitability and business growth, but strongly linked to our DNA and mission of being 'green' from the core, our most fundamental value since our origin. We were born naturally. Now, there's a lot of greenwashing in our sector, and the legacy and heritage of each company count for the farmers.

#### How does Idai Nature reflect those values and visions in its business?

When I founded Idai Nature in 2009, it was clear to me that I could not run a company without being aligned in values. In this sense, when the United Nations published the SDG (Sustainable Development Goals) strategy in 2015, we already had experiences and commitments in this topic because of our culture. Since our foundation, we have focused on using recycled materials, looking for packaging with less plastic, equal working conditions, gender balance, collaborations with disability groups, and of course, the actions derived directly from our activity. As a company that develops and manufactures organic products for agriculture, we contribute to the preservation of the environment and biodiversity, as well as favoring access to quality fruit and vegetables without chemical residues, supporting a healthier diet for the whole of society, affordable for all the pockets.

#### How do your customers share in your values?

Our products are formulated with natural substances from botanical extracts and that's

why we say that we cure plants with plants. Of course, we are very careful in our choice of suppliers, looking for quality, sustainable and ethically sourced raw materials. In 2021, of all the new suppliers we tested, only 30% met the requirements we required because we are very demanding in our quality standards. Improvement is infinite and change is the constant; this is our day-to-day premise in each department in Idai Nature. When you are aligned in values and culture with your stakeholders, business happens.

#### What is your company's philosophy on plant health?

Innovation is our philosophy, is our core business. We are currently carrying out 4 national and European projects with the goal to change agriculture by transforming by-products coming from plant wastes to evolve them into raw materials for new formulations. The circular economy is the way we use, to revalorize farm wastes. Last year we participated in the GREENPROTECT project of CDTI, an ambitious project in which, through an innovative process, we converted the waste generated by tomato cultivation into a bioprotection product. It is an example that can help many companies to explore new ways of research caring for our common planet.

#### In your opinion, what are some of Idai Nature's most influential innovations?

The most important innovation we have created during the years is to formulate natural substances in a highly differentiated and efficient way, being

## UNITING THE VOICE OF THE SPANISH BIOLOGICAL COMMUNITY

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able to mix different plant extracts between them and with minerals and microorganisms, adding technologies to improve the performance in the field of our biocontrol products. This is a milestone that adds value to our solutions, to the farmers and creates a differentiation to our competitors.

On the other hand, we were pioneers in applying business intelligence outputs to our offer, focusing all our efforts on providing our customers with the most tailor-made strategies to cultivate crops with fewer chemicals.

### What have you done throughout your career and personal life to support sustainable agriculture?

All my career is focused on leaving a better world for future generations. At the beginning of Idai Nature, I faced real problems convincing farmers and distributors on the efficacy of sustainable agriculture compared to chemical products. I had to prove twice that our products work at the same level without damaging our planet with zero residues. Farmers couldn't trust the very good results they obtained at the beginning, and they wanted to repeat the trials. Last year we also launched a Biodynamic line, aligned with the most demanding markets and sustainable requirements. Our company strategy is focused on finding the most innovative solutions to provide the farmers with the tools to cultivate more sustainably.

I founded a company with values for people with concerns and a focus on sustainability.

### What are your company's short and long-term goals?

The Purpose of Idai Nature is to leave a better world for future generations through our biosolutions. Aligned with this philosophy we are expanding our international footprint to be the global leaders in biocontrol agriculture by scaling our value proposition worldwide.

### What are you most looking forward to about the upcoming BAW Congress?

In my opinion, the Congress is a fantastic opportunity to interact and to pool the new trends in the agriculture market. There will be the most important companies all around the world in the sector so it will be a great forum for networking to learn and for sharing knowledge after the Covid restrictions.

### Why do you think participating in events like BAW Congress is beneficial to your company?

I think it is important for us because we will be able to show our value proposition, expertise, and knowhow in biocontrol. In this sense, we think these kinds of events are the perfect scenario to gain notoriety and consolidate Idai Nature as a reference in sustainable agriculture and Rovensa as the right partner for the distribution channel for offering the cutting-edge innovative sustainable solutions. 🌍

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## UNITING THE VOICE OF THE SPANISH BIOLOGICAL COMMUNITY

### Farmer 4.0 Training, Innovation, and Growth in the Agricultural Sector

*by Miguel Ángel Herguedas, Co-Founder and Director of Integral Media*

There is no doubt that new technologies are becoming part of everyday life in the agricultural sector, they are advancing at a frenetic pace and are here to stay. But are our farmers really prepared for all that this digital transformation entails and will entail?

#### What role does the 'farmer 4.0' play in the context of 21st century agriculture?

Young farmers have a fundamental role to play in the future of an increasingly aging sector that needs to evolve and adapt to the technological changes now present in all our daily lives.

Today's farmers are facing a truly unstoppable process of digital transformation within the sector, which must be able to integrate and combine the experience of past generations with the most advanced 'agro-technological' solutions. These will undoubtedly help us to optimise and ensure profitability in farm management, and therefore enable us to work towards higher and better yields. Today, technology is very present in society. We are constantly surrounded by new changes that place us (farmers included) in a continuous learning process.

Universities and agricultural training centres play a fundamental role in transmitting the wide range of possibilities offered by new technologies. It is essential to expand and adapt training programs to the new reality that will undoubtedly



shape the future. Without new farmers who have a more digital, big picture and sustainable vision, the sector could be displaced and/or face additional problems in a world where new technologies have already changed the mindset of millions of people. Digital transformation plays a fundamental role in the cultural change that rural territories need, to not only avoid running out of farmers, but also of people living in rural areas.

For all this to work, there is one key component: data. There has never been so much data available in the ag world, but it is just as important to have accessible and reliable data as it is to have the digital tools that allow us to process and analyse this raw data to make decisions that optimise results.

The new professionals must accept living in a state of constant training and learning, to know

## UNITING THE VOICE OF THE SPANISH BIOLOGICAL COMMUNITY

### Farmer 4.0 Training, Innovation, and Growth in the Agricultural Sector



how to incorporate technology into the daily work in the field. This involves how to integrate the simpler technology, such as day to day tablet usage as a field notebook, along with more complex integration of data from different machinery and tools to optimise agricultural inputs. In addition, there is implementation of mechanical work that integrates digital variables such as planting and/or variable fertilisation, crop yield maps, moisture maps, soil health measurements, etc. All of these, in the end, allow optimising agricultural production for quality, profitability and sustainability.

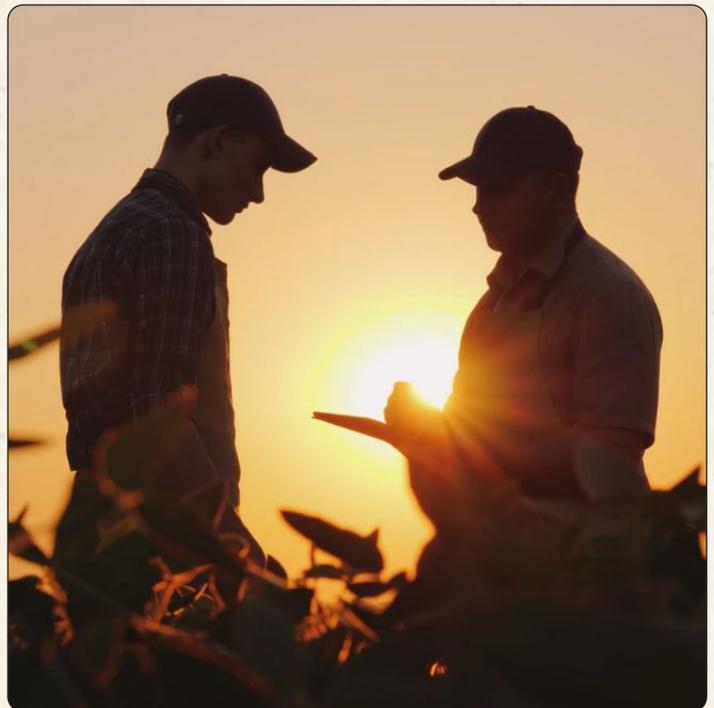
#### The farmer 4.0 has a new way of understanding agriculture.

With current and ongoing training, those who adapt and new farmers entering the industry will be the 'biostimulant' needed to provide the agricultural sector with opportunities to produce more with less, and more sustainably.

Although more and more farmers are discovering the great opportunities and benefits offered by the digitalisation of agricultural

activity, a transformation in farmers' mentality is still needed, given the external risks that affect crop production. In the coming years, these external factors such as volatile crop prices, water shortages and weather due to climate change, will become even more relevant. Only those who can go one step further will be able to continue to achieve profitability and maintain the viability of their farms.

Young people are needed, who are willing and able to integrate agricultural knowledge from a technical perspective and 'real' field knowledge with technological and digital innovations to respond to the needs of an increasingly demanding society, where innovation levels will continue to increase year after year. 🌍



## UNITING THE VOICE OF THE SPANISH BIOLOGICAL COMMUNITY

### Farmers Corner: Valencian Citrus Working Hard to Maintain Leadership

The city of Valencia hosts the 3rd BioAg World Congress this April 26-29. During that time, experts from around the world will share experiences around four main segments of bioag: biopesticides (bioprotectants/biocontrols), biostimulants, biofertilizers and bionutritionals.

The Valencian community accumulates a great experience in the cultivation of citrus fruits, since historically it has dedicated a large part of its agricultural land to this crop. Therefore, Valencian citrus fruits have been leading world markets for decades. This citrus tradition has allowed Valencian producers to accumulate a great deal of experience, both in the selection of varieties and in export. At Bioag World Digest, we have been interested in the current state of this sector. For this, we have spoken with two highly authorized sources: the Dean of the Official College of Agricultural Engineers of Levante, Baldomero Segura, and agricultural engineer (PdH) María Ángeles Forner, a researcher at the Valencian Institute of Agricultural Research.

"There is no doubt that the development of the Valencian citrus industry has acted as a technological engine for a group of companies in charge of providing services for the production, transformation and distribution of citrus fruits in the search for greater efficiency of the entire chain," says Segura. "These are Valencian companies, many of them SMEs, (small and medium sized enterprises) that have created cutting-edge technology in their field: distribution of water, plant material, agronutrients, phytosanitary products and biological control, plus cultivation equipment or treatments."

However, the multiple variables of the market and competition from other countries threaten the leadership of Valencian citrus in the world. The analysis of citrus production "can hardly be approached independently of the transformation and distribution processes to which the products obtained must undergo," according to Segura.



"The decisions adopted by agrarian businessmen and by farmers are responsible for the spatial configuration of citrus production in our community and these decisions are conditioned by the specific environment of these companies," continues Segura, "in which post-harvest and the distribution of their products are very present."

The work of researchers is essential to adapt products to market demands.

María Ángeles Forner, agricultural engineer at the Valencian Institute of Agricultural Research, explains how to work to achieve a more competitive sector: "The markets are looking for low prices, and for that we must increase the productivity of the plantations, and we achieve this with new

## UNITING THE VOICE OF THE SPANISH BIOLOGICAL COMMUNITY

### Farmers Corner: Valencian Citrus Working Hard to Maintain Leadership

patterns. They also want high-quality products. We compete with producing countries that have very low production costs, and we distinguish ourselves from them by obtaining higher quality products. Sustainability is also sought, with organic products, zero waste, and in general with less environmental impact, which are increasingly in demand by consumers. All these aspects will be determined by the patterns that we select in our plantations. The selection of the pattern is fundamental."



"Spain is one of the main citrus producers in the world, but the most important thing is that we are the world's leading citrus exporter," continues Forner. "We have achieved this and we continue to achieve this, despite the enormous difficulties we encounter in the markets with competition from third countries with very low costs, because we know how to do things very well."

Segura believes that the key to remaining competitive in international markets is "to establish a continuous flow of interrelationships between a complex network of companies, in which the functions to be carried out by each of them must be continuously reinterpreted."

And these flows must be coordinated: "If the distribution requires X tons of a certain variety of orange in the stores of Vienna, the entire system must be coordinated to achieve this objective in the most efficient way possible, reducing or eliminating all possible expenses, intermediation, and concentration of supply. In other words, avoiding the need for a legion of people who buy from small producers to achieve the committed production."

Segura acknowledges that although it is true that until now "we have been more or less ahead, we can miss the train of new technological breakthroughs such as agriculture 4.0, which require data integration to make sense, and that can only be achieved with adequate agrarian structures and with a leadership that allows to adequately concentrate and process that big data that is obtained with the millions of data points that are collected".

In addition to big data and the use of technology, genetic research is essential to lead the markets.

"In genetic improvement of citrus rootstocks we are a world reference, with requests from all over the world for our rootstocks," says Forner. "In fact, the Forner-Alcaide 5 is already an internationally recognized pattern. It is the first obtained by the IVIA through a citrus improvement program that has had so much publicity and interest. We can see it in many of our plantations."

Segura also underlines the importance of genetic research to achieve more resistant varieties: "Plant material is decisive in tolerance to diseases and in the incidence of pests, which prevents us from using phytosanitary products. And of course, in the fight against climate change we have materials

## UNITING THE VOICE OF THE SPANISH BIOLOGICAL COMMUNITY

### Farmers Corner: Valencian Citrus Working Hard to Maintain Leadership

that are more efficient in the use of water, have a lower carbon footprint, better efficiency in the absorption of fertilizers, etc. All these aspects are determined by a good selection of the rootstock and have a clear impact on the future of the crop."

The size of the farms is another crucial issue in the analysis of the Valencian citrus industry: "Many of the technological developments in the field of production services have been carried out precisely to deal with the small size of our farms. We have developed the technology to solve our problems and we have done quite well. As well as to export it and continue to be a benchmark," Segura added.

He also underlined that "the importance of the fact that the small size of the companies puts them in a situation of not being able to undertake the investments that allow them to face the changes necessary to maintain their competitive position, both in terms of varietal conversions

and adaptation to the provisions relating to food security."

The abandonment of farmland due to the low profitability of its production continues to be an Achilles' heel for Valencian citriculture.

"Every day there are more people who do not care too much about what happens to their plots, leaving them in a limbo that weighs down the rest of the farms, either due to the problem of pests and diseases, or due to the impossibility of integrating them into common or cooperative management models," warns Segura.

The dean of the COIAL admits that it is true that citrus farming in the Valencian Community "has lost weight in terms of production, profitability, and exports. This loss of competitiveness is due to external and internal factors. We cannot expect the same results as decades ago without having made any changes. We are in a different world context, and we have to adapt to these new circumstances. For example, weight should be gained in Brussels in the same way that our direct competitors do. And learn to move with the same rules that they use."

And he emphasized this message: "We have the cultivation surface, the know-how, the technology, the position in the market, the experience. It is time to take stock and consider new challenges: improvement of structures, varietal reconversion, digitization. And for this we have human capital and a network of auxiliary companies that are prepared to provide the necessary technology and knowledge for it." 🌍



**WOMEN IN AGRICULTURE: 9<sup>th</sup> Edition - SPAIN SPECIAL**

Gissele Falcón Haro, Director, Siete Agromarketing and President, AGRO Woman Project

*by Sucheta Wadhwa, Global BioAg Linkages and Primary BioAg Innovations, BAW Digest*

Gissele Falcón Haro, Director of Siete Agromarketing and President of the AGRO Woman Project, discusses the significance of the project, which champions work for real equality in the agri-food sector, as well as visibility, empowerment, and promotion of women who, although committed for centuries to working equally in the field, today still lack the recognition they deserve.

**Is equality between men and women sufficiently apparent?**

During the month of March, much of the attention of the media and society in general is focused on women, to make their achievements, the path they have travelled and the road that remains ahead to achieve real equality, visible on an international level.

I wonder, though, given we're women all year round, shouldn't we be showing the equality of conditions that is required 365 days a year? Women don't want to be "in" because of a lack of recognition or rights. To me, being a feminist means being in favour of men and women having equal rights.



This includes letting females into places previously reserved just for men. I'm in favour of gender equality, whether you're a man or a woman; that's what I stand for and that's why I am, and openly share that I am, a feminist.



**When and why did the AGRO Woman project start?**

In 2017, as an entrepreneurial woman with more than 20 years of experience in the agri-food sector, I saw the need to promote a pioneering project like AGRO Woman, hand in hand with the company I lead: Siete Agromarketing.

Six years on, AGRO Woman works to create a professional network of women and men committed to empowering the agro-professional woman in the agri-food sector and the food industry, enhancing visibility, development, and equalised work. These women and men act as a voice for and support rural women, who remain one of the most underrepresented links in the agri-food chain.

**Have you encountered support and collaboration from other organisations and companies?**

Currently, AGRO Woman collaborates closely with other Spanish and international organisations such as Global Women Fresh, which brings together

## WOMEN IN AGRICULTURE: 9<sup>th</sup> Edition - SPAIN SPECIAL

Gissele Falcón Haro, Director, Siete Agromarketing and President, AGRO Woman Project

women in fresh food production worldwide to close the gender gap in our industry.

Our mission is to create open and pluralistic communication, awareness, and actions to achieve equal opportunities for WOMEN AGROPROFESSIONALS, facilitate their social and labour INTEGRATION and promote DIVERSITY within the sector.

### What aspects should be focused on to achieve real equality in the agri-food sector?

To achieve this, it's necessary to promote social responsibility in general and equity policies in companies and institutions. This involves responsible management of the entire agri-food chain; as part of this task, the rural environment is essential for the proper functioning of our societies.



We women are charting a path towards equality. It's very important to understand, recognise and make visible the role of women in the agricultural world, so that this gap can continue to be overcome.

Women are sufficiently prepared to take on management positions in the industry. They say that

the agricultural sector is a masculinised world, where many women are leaders in the shadows, taking on technical or minor management positions that seem to be below a directorate or presidency.

However, it's also true that many of these agro-professional women are anchors, and they promote rural women and make them visible.

### The representation of women in management positions is still low. Why is this? Is progress being made in this area?

It's still a minority of women who are fully incorporated into management teams and boards of directors. There are fewer women at the head of farms and agri-food companies and, in the case of cooperatives, the percentage of women on boards of directors is just 4%. Therefore, we are still far from our goal of equality and parity. It is true that in recent years there has been greater visibility and incorporation of women. It is progress, but I'd say we're still taking small steps.

That's why AGRO Woman works and raises awareness to create a point of meeting and reflection, to break down barriers that exist today, promoting the importance of communicating on equality and CSR (corporate social responsibility), always aligned with the SDGs (sustainable development goals), because we believe that equality is a task for everyone, as reflected in the motto that's constantly with us.

### What role do women play in the rural world?

Women play important roles in the rural economy as farmers, managers, and entrepreneurs. But they aren't recognised in these roles. Not to mention that

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they work to ensure the welfare of their families, taking care, among other things, of food supply and caring for children and the elderly, with no real balancing of workload within the family or recognition of this activity.

According to the UN, "on average, women account for just over 40% of the agricultural labour force in developing countries, rising to over 50% in parts of Africa and Asia."

Currently, the Common Agricultural Policy (CAP) and the changes in its application in Spain will mean a higher percentage of aid for the incorporation of young farmers and greater allocation in redistributive payments, in the hope that administrations will continue working along these lines.

**Is AGRO Woman an inspiring tool for the agri-food sector?**

AGRO Woman and the AGRO Woman awards exist to raise our voice to increase awareness and inspire many groups and institutions in Spain, because our aim is to gain traction by highlighting the value of female agri-food leadership and the role of companies in promoting it in the rural world.

For this reason, administrations must dedicate more resources to training in new technologies, professional opportunities and business initiatives, so that women in rural areas and agro-professionals have the same opportunities.

- Photo: Image by Gissele Falcón Haro, speech II Agro Woman Awards
- Photo: I Agro Woman National Forum
- Photo: III Agro Woman Award - Mercamadrid
- Photo: Meeting with Carnimad - Meat sector 🌍

**WOMEN IN AGRICULTURE: 9<sup>th</sup> Edition - SPAIN SPECIAL**  
Dr. Beatriz Ramos Solano, Professor, Universidad San Pablo CEU

*by Sucheta Wadhwa, Global BioAg Linkages and Primary BioAg Innovations, BAW Digest*

Beatriz Ramos Solano earned her undergraduate in biology in 1991 from Universidad Complutense de Madrid (UCM) and went on to obtain her master's of enology and viticulture the following year from Universidad Politécnica de Madrid-Escuela



*Dr. Beatriz Ramos Solano*

Técnica Superior de Ingeniería Aeronáutica y Espacial/the Polytechnic University of Madrid-Higher Technical School of Aeronautical and Space Engineering (UPM-ETSIA). In 2000 she obtained her doctorate in pharmacy from the Universidad San Pablo-CEU Universities. She is involved in teaching and research within the group "Biotechnology of the Plant-microbe Interaction" from 1992 thru today at the Faculty of Pharmacy, Universidad San Pablo CEU; Professor in December 2021. As a result, more than 85 articles were published, five patents (1 PCT licensed), and five Ph.D. theses directed.

**Q1. Can you talk about your career path - how did you start your career and is this what you always wanted to do?**

I always wanted to be a biologist although I never dreamt of the career I made.

I knew I wanted to be a biologist the day I learned about the nitrogen cycle at high school, inspired by my biology teacher. As a young woman born in 1968, my parents expected me to marry and build a family, so being a biologist was good enough. Until the moment arrived, I earned my living as an air hostess. I completed my 5-year university degree in Biology with a master's in Enology and Viticulture and after that, the opportunity came along. I joined the plant physiology group to continue to

Honors degree and start my research path at San Pablo CEU; funny enough that it started somewhere close to the nitrogen cycle, but focusing on a ground-breaking new topic: rhizosphere beneficial bacteria (other than the nitrogen cycle). At that time, San Pablo CEU became the first private university in Spain, and as it grew, I got my first employment as an assistant teacher while I carried out my Ph.D. studies.

During the 25 years I have been an employee of San Pablo CEU, I have progressed along the academic pathway and recently became Professor. This achievement is the result of the research carried out, teaching, and administrative duties, mainly as Coordinator of International Relations for 15 years, but also in other roles for shorter periods. All achievements are due not only to a lot of work, but also thanks to an excellent mentor and thesis director, who has backed me up, inspired me, and allowed me to grow, and to our everchanging research team made by excellent people.

And yes, I am still married and have three children and, yes, I am really happy about it, and I love it.

**Q2. Agriculture has been dominated by men, and women have played a supportive role. Do women have an advantage in this field primarily since they have a deeper insight into "FOOD" and the "HEALTH" of the family?**

I am not sure about this assessment. I don't think that agriculture has been dominated by men throughout the history of humanity. During some stages in history, yes men performed hard work, but women did select and keep seeds as much as men. However, during the industrial revolution when women were ignored for everything, not only in agriculture, men took over industries of every kind; then, women played the supportive role, I agree.

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On the other hand, I don't think that women have an advantage in the field for the sake of having a deeper insight into food and the health of the family just for being women. That depends on personal concerns, not a matter of gender.

**Q3. Agriculture is a very dynamic industry and has been revolutionized by innovations. What is going to be the next big leap in the agriculture industry?**

My early steps in research focused on the rhizosphere "an ecosystem defined by the triple interaction plant-soil-microorganisms that extended in the 2 mm close to the plant roots". The green revolution involved chemical fertilizers that resulted in enormous yield increases; this innovation dealt with the first partner of the triple interaction, the soil. The second big revolution targeted seeds; this innovation dealt with the second partner of the triple interaction, the plant. By now, you can guess which is the third: the microorganisms, of course.

I believe that extensive agriculture in its present form is expensive and very toxic for the environment as it depends on high-quality seeds, chemical fertilizers, and pesticides, lowers biodiversity, favors pathogen development, and produce does not reach all consumers. Microorganisms represent the best biotechnological tool to obtain good production, lowering chemical inputs and increasing biodiversity, being a key player in sustainable development. To perform as expected, microorganisms need to be formulated and registered and this process needs to be regulated and backed up by governments. Furthermore, the use of microorganisms is different from the wide use of chemical fertilizers or pesticides; results may not be as impressive and, more importantly, their effectiveness may depend on soils, and they show certain specificity with plant genotypes. In summary, to be successful, a change in traditional agriculture should happen, as in any revolution.

**Q4. What is your belief for the next generation of women striving to make their career in the field of bioag?**

I hope they are open-minded and creative and never forget the definition of biotechnology "the use of living systems to obtain products or solve problems." Nature is full of resources waiting to be discovered. I wish they are inspired by the needs and challenges of our world: i) feeding the population with high-quality food to achieve food security, and ii) finding profit from agricultural wastes.

In the first objective, increasing productivity in our days is almost impossible in developed extensive areas, but in this issue, lowering chemical inputs and producing high-quality foods is the challenge. There is a lot to do in less developed low-yield areas where the first point is to increase productivity and next, increase quality.

In the second objective, recycling agricultural wastes, turning them into profitable valuable products is the challenge. For example, olive leaves are a source of oleuropein, a natural cardiovascular protector; they are obtained from pruning residues and the extract with the bioactive molecule is an asset in the commodities market.

**Q5. What are your future aspirations personally and professionally?**

My objectives are participating in the development of successful microbial products for agriculture in industry and trying to inspire students into the bioag world, by showing the delights of the complex plant physiology and the interaction with the environment, to obtain good agronomic yields, and explore the new paths to be developed. 🌍

# FARM TO FORK: IMPORTANCE OF MICRO-ORGANISMS IN CROP PROTECTION

## EU Regulations Concerning the Approval of Microorganisms Used in Biopesticides

*by Dominico Deserio, Policy Officer Pesticides,  
European Commission Directorate, General for Health and Food Safety*



*Dominico Deserio*

Microorganisms have been used for almost all of humanity's existence for bread, cheese, beer, and winemaking purposes. In modern times, their uses have been widened. They can be used as

fundamental components of probiotics for food/feed additives, or for manufacturing medicinal active substances. Microorganisms are naturally occurring and most of them are harmless for human health. Many of them play key roles in the ecosystems, for instance by decomposing organic matter in the soil to make it available for other organisms, or by enriching the soil with atmospheric nitrogen ("nitrogen fixation") to make it available for plants.

Microorganisms such as bacteria, fungi, viruses, and protozoa can also be used to protect plants, as some of them are parasites or pathogens of pest insects, plant pathogens or plant parasitic nematodes. Because of their biological properties, these microorganisms have been used world-wide for decades in the biological control of pests and plant diseases, and more recently for control of plant parasitic nematodes.

Before micro-organisms are allowed to be used in plant protection, it is critical to verify that their use is safe and has no negative consequences for human and animal health or towards other nontarget organisms. Like all the other active substances used in plant protection products, microorganisms can only be approved for use if they fulfill the approval criteria laid down in the Regulations for placing plant

protection products on the market (Regulation (EC) No 1107/2009).

The Member States, the European Food Safety Authority (EFSA) and the European Commission evaluate every active substance for safety for humans and the environment before it can be placed on the market and used in a plant protection product. This evaluation may also regard metabolites produced by microorganisms, where such metabolites have the potential of posing a risk to humans or the environment.

In a second regulatory step, Member States authorize each plant protection product containing approved active substances for the intended use. Currently more than 60 microorganisms

are approved in the EU after a scientific risk assessment confirmed that their use in plant protection products is safe and many new applications are in the pipeline.

Biological plant protection products containing microorganisms may be as effective as chemicals when used correctly and in optimal conditions. They can be specific to the pests, without harm to nontarget organisms, making them inherently safer than many synthetic chemical pesticides.

On February 8, 2022, Member States endorsed four implementing Regulations which amend the current rules applicable to microorganisms. The new rules reflect the latest scientific developments and are based on the specific biological properties of microorganisms. The new rules will facilitate the approval of microorganisms for use as active substances in plant protection products and the authorization of products containing them.



# FARM TO FORK: IMPORTANCE OF MICRO-ORGANISMS IN CROP PROTECTION

## EU Regulations Concerning the Approval of Microorganisms Used in Biopesticides

The four implementing Regulations are:

- Draft Commission Regulation, amending Regulation (EU) No 283/2013S as regards to the information to be submitted for active substances and the specific data requirements for micro-organisms,
- Draft Commission Regulation, amending Regulation (EU) No 284/2013 as regards to the information to be submitted for plant protection products and the specific data requirements for plant protection products containing microorganisms,
- Draft Commission Regulation, amending Regulation (EU) No 546/2011 as regards to the specific uniform principles for evaluation and authorization of plant protection products containing microorganisms, and
- Draft Commission Regulation, amending Annex II to Regulation (EC) No 1107/2009 as regards to the specific criteria for the approval of active substances that are microorganisms.

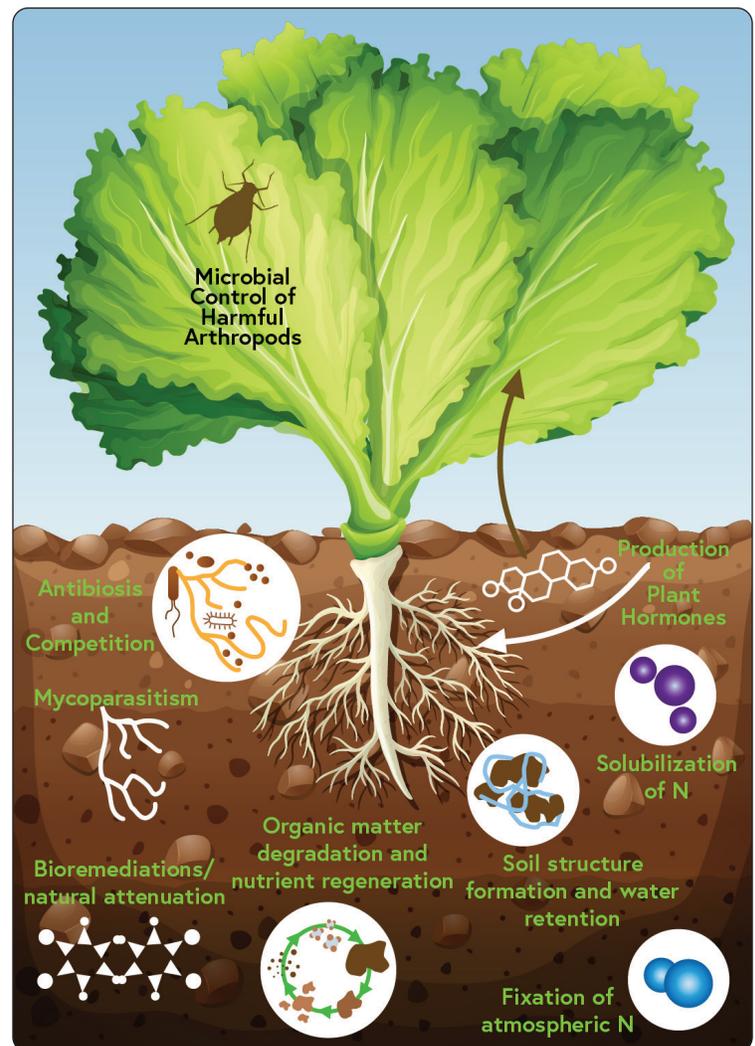
The new rules support the ambitions of the European Green Deal and will also contribute to achieving the objectives of the Farm to Fork strategy for reducing dependency on and use of chemical pesticides and supporting organic farming.

Microorganisms play a key role in Integrated Pest Management (IPM), which farmers must apply in the EU. Farmers must give preference to preventive actions, monitoring, and biological plant protection alternatives (including microorganism-based products), before using chemical plant protection products.

In addition, one of the targets of the Farm to Fork Strategy concerns the increase in the total farmland under organic farming in the EU, with at least 25% of the EU's agricultural land to be under

organic farming by 2030. In 2019 there were almost 330,000 organic farmers in the EU, reaching up to 20% share of farming area in certain Member States. The new Regulations will hopefully accelerate access to the market for microorganisms used in biological plant protection products and therefore make new sustainable alternatives available to organic farmers for controlling plant pests to facilitate reaching the target of 25%.

The implementing Regulations will now be scrutinized by the European Parliament and the Council. If none of them objects, they will be adopted and become applicable in the EU in autumn 2022. 🌍



**MICRO POWER FOR MACRO IMPACT:**  
NPP-UPL and Biosolutions' Role in Reimagining Sustainability

by Fabio Torretta, Chief Operating Officer, NPP-UPL

Take a look around you. From the amount we waste to the way we consume the world's natural resources; it is easy to think that our entire global food production system is out of balance with our planet. It's time to rethink our relationship with the natural world, and we have a responsibility to present a new model for sustainably rebalancing food production.



*Fabio Torretta*

At NPP – Natural Plant Protection – this is our mission. We believe in the power of naturally occurring technologies to shift the balance, and we have designed a comprehensive portfolio of natural and biologically derived agricultural services, products, and technologies to make this a reality.

This is a journey we have been on for decades, but last year we reaffirmed our commitment to biosolutions with a formal launch of NPP as part of our UPL OpenAg network. We share a commitment to "Reimagining Sustainability" and thought it was important to take an opportunity to show the world what can be achieved by housing the world's largest product portfolio and registrations under a single, global brand.

The timing could not have been better. The natural world is facing increasingly severe challenges; farms, farmers and food systems are under pressure from new and established threats. But NPP's biosolutions are meeting this challenge head on.

In the face of extreme weather patterns, our biosolutions are improving plant resilience. As soil health continues to decline, our biosolutions are improving nutrient availability. They are introducing beneficial microbes, moisture, and carbon into the rootzone; and as pressure grows to reduce residues and tackle resistance, our biosolutions are helping farmers grow more with less.

We want to make sure that as many farmers as possible have access to our technologies, which is why we have worked to pair the incredible impact of our biosolutions with the strength of our global platform. Plenty of amazing technologies never

reach the market, but NPP can draw on its relationships across the OpenAg network to ensure our innovations are available to the world's best co-operatives and distributors, exploiting synergies and ensuring innovation reaches farmers where they need it most.

Although we've been working on these ideas for many years, in many ways we are just getting started. The more we learn about the macro power of nature's microbes, the more opportunities we are finding to develop and scale biological technologies.

Through advanced R&D, we are continuing to explore the world of microbes and produce game-changing products that we call "Micros." By pairing ground-breaking products with crops around the world, we ensure that plants are protected, healthy, grown in harmony with nature and reaching their true genetic potential.

It's this collaboration that makes our approach at NPP so distinctive: understanding that there is no one-size-fits-all solution, and that different crops, different farms, and different parts of the world need a unique approach. It can't all be the biological, nor can it be all traditional crop protection products - it's about finding the balance.

This is where our ProNutiva strategy comes in, setting apart our approach to plant health, plant resistance and soil health. ProNutiva enables farmers to match the best chemical products with the most effective biosolutions, offering an adaptable package that solves farmers pain-points in a way that understands and embraces their unique challenges.

We are proud to be recognised as a leader, catalyst, and convenor for biosolutions across the globe. We look forward to working with you on the journey ahead. We believe we are so much stronger when we work collaboratively, and we are excited to explore new ways to empower the world's farmers, farms, and food systems with technologies whose only impact on the natural world is a positive one. 🌍



# THE VALUE OF THE BEEKEEPING INDUSTRY TO AGRICULTURE

## How BioAg Can Help!

by Jerry Hayes, Editor, Bee Culture Magazine

This is 2022 and at the end of the day it's all about data/numbers, isn't it? Two hundred years ago, one billion people were on the earth according to [ourworldindata.org](https://ourworldindata.org).

As I write this, according to the U.S. Census Bureau, the population of the U.S. has 332,479,038 hungry people with a net gain of one person every 38 seconds. The world population is 7,875,805,340 and growing. The UN is forecasting that by 2050, the world population will be 9,735,033,900.

The UN estimates that 68% of the global population is in urban areas. That is a lot of people who require housing, electricity, transportation, water, sewage disposal and regular meals. Cityscapes are resource 'black holes', however they are also the most efficient way to "house" people.

That means as populations increase, spread out and absorb agricultural areas, the remaining arable earth must exhibit phenomenal efficiency accompanied by parallel production agriculture crop protection accompanied by food safety. Considering all these factors as well as the "wild card" of climate change, finding a market while growing sales will become increasingly more challenging.

That is where bioag can play a significant positive role.

I am a beekeeper. Honeybees are a masterpiece of nature. As a result of my love and fascination of them, I have been associated with managed honeybees and the beekeeping industry while active in business, government, and media.

Here are some facts about the value of managed honeybees:

"Many of our fruits, vegetables, and nuts are reliant upon pollinators for their production. In fact, without pollinators, 70% of plants would be unable to reproduce or provide food. According to the United Nations Environment Programme, of the 100 crop varieties that provide 90% of the world's food, 71 are pollinated by bees. In North America, honeybees alone pollinate nearly 95 kinds of fruits, such as almonds, avocados, cranberries, and apples, in addition to commodity crops like soy. The health of pollinators is directly linked to food security. Pollination services are a core component of global agricultural production. In the U.S., the value of pollination services is estimated to be \$20-30 billion annually."

*~Impacts on Food Supply, Center for Food Safety*



## THE VALUE OF THE BEEKEEPING INDUSTRY TO AGRICULTURE

### How BioAg Can Help!

"Three out of four crops across the globe producing fruits or seeds for human use, as food, depend at least in part, on pollinators.

Improving pollinator density and diversity boosts crop yields – pollinators affect 35 percent of global agricultural land, supporting the production of 87 of the leading food crops worldwide.

Pollinator-dependent food products contribute to healthy diets and nutrition.

Safeguarding bees safeguards biodiversity: the vast majority of pollinators are wild, including over 20,000 species of bees.

FAO plays a leading role in facilitating and coordinating the International Pollinators Initiative 2.0".

*-UN FAO, 'Why Bees Matter'*



"Many areas of agriculture depend on pollinators. Scientists estimate that 200,000 - 350,000 different animal species help with pollination, from birds to bats, marsupials to monarch butterflies. But when it comes to the majority of crops around our globe, we have honeybees to thank. Pollinators are critical to the food system as we know it, but can we quantify their value? It turns out, maybe we can.

Every season, pollination from honeybees, native bees, and flies deliver billions of dollars (U.S.) in economic value. Between \$235 and \$577 billion (U.S.) worth of annual global food production relies on their contribution. With such an impact on the economy, it begs the question: if these critical insects were public companies, how might they stack up in the global marketplace?

Managed honeybees are the most valuable pollinators in terms of agricultural economics. These hyper-efficient insects can provide pollination to virtually any crop. Almonds, for example, are almost entirely dependent upon honeybee pollination. Without honeybees, the harvest of blueberries, squash, watermelon, and other fruits would be greatly reduced, driving up prices and disrupting the marketplace. According to the USDA, one colony of honey bees is worth 100 times more to the community than to the beekeeper — meaning the value they deliver extends well beyond their actual price.

Honey is more than just a by-product of pollination. This sweet nectar serves as an economic driver in its own right. Used commercially for food, skin creams, anti-aging lotions, and medical wound dressings, over 160 million pounds of honey are produced each year in the U.S. alone. In 2013, the honey crop was valued at over \$300 million (U.S.).

Beeswax produced by these insects is used for candles, carpentry, lip balm and other cosmetic products while pollen is valued for medicinal purposes. Propolis, a resinous sealant created by bees to construct and protect the bees from bacterial and fungi, serves as a varnish for stringed musical instruments, and in some countries a toothpaste or mouthwash.

Agricultural leaders understand both the economic and ecological importance of pollinators. Each season these insects provide a service that boosts harvest size and quality, creates value for farmers, and drives the global food supply. It's hard to imagine an ecosystem without them.



Without pollinators, more than 39 different crops would see a decline in production. In order to meet demand, farmers would be forced to pursue more intensive and less environmentally sustainable practices. More land would likely be needed to match current production levels. Farming these greater land masses would result in greater carbon emissions from the increased operation of tractors and other machinery. And by expanding the physical footprint of farms, organisms in wild habitats would risk being displaced or disrupted.

These tiny insects play a large role in the preservation of our ecosystem and economy, helping agriculture grow enough while using fewer natural resources."

*-Forbes, 'The Value of Pollinators To The Ecosystem and Our Economy'*

# THE VALUE OF THE BEEKEEPING INDUSTRY TO AGRICULTURE

## How BioAg Can Help!

There it is.

I am going to assume that you have been aware of the pest, parasite, disease, and environmental stressors that managed honeybees have had for the last three decades or so. This starts with the introduction of varroa mites to the United States in 1987 and Colony Collapse Disorder or CCD, described in 2006.

At that time, I was the Chief of the Apiary Section for the Florida Dept. of Agriculture and Consumer Services. Beekeepers reported these unusual honeybee colony deaths in Florida to me. I remember being on a call late one night with representatives from USDA, Universities, State Government, and other entities. We didn't know what was causing these deaths, so we named it Colony Collapse Disorder- a disorder because we had no clue as to the reason. What we learned was that the invasive honeybee parasitic mite, *Varroa destructor*, was one of the prime causes. As the parasitic *Varroa* mite fed on all life stages of the honeybee, it also vectored damaging viruses.

The only control option, at that time (and even now) are pesticides introduced into the honeybee colony to try to kill or damage a "little bug" (*varroa*) on a "big bug" (honeybee). The "dose makes the poison", so these varroacides are dosed to impact the *Varroa* mite but not show "acute damage" to the honeybees. But collateral damage has been noted from residues in the colony overtime. Unfortunately, we as beekeepers have no choice. If *Varroa* mites are left uncontrolled, colonies will be dead in 18 months as they continue to



"Over the entire year (1 April 2020 – 1 April 2021), beekeepers in the United States lost an estimated 45.5% of their managed honeybee colonies. This is the second highest annual loss on record, 1.8 pp higher than last year's estimated annual loss (43.7%), and a 6.1 pp increase over the average loss rate (39.4%) over the last 10 years."

~ Bee Informed

weaken from the effects of the parasites. Diseases and secondary pests also plague colonies making honeybee management post 1987 much more difficult than before.

**The Bee Informed Partnership (BIP) conducts an annual survey of managed honeybee colony losses. Here is the latest from their report.**

Let's say you are in production agriculture. And let's fantasize that you are fighting uncontrolled pests, parasites, diseases, and environmental inputs causing you to lose 40% of 'your crop' every year. Think about it. Imagine losing 40% of a herd of cattle or 40% of your yield of corn, 40% of fruit production. What would you do? Who would you reach out to?

This is where bioag solutions can positively help the situation, resulting on an increased awareness and willingness to collaborate with beekeepers. The value of managed honeybees as the only viable pollinator for production agriculture, has been devalued for too long.

The managed beekeeping industry needs you – it is critical for you and them. Many organizations have made attempts to bridge gaps in understanding between the beekeeping industry, big ag, government agencies and the public but consistent, sustainable momentum has been missing. If we all work together, we can make beekeeping and pollinator dependent agriculture more successful – and more biologically friendly – for the long term. 🌍

**PROMISING YOUNG ENTREPRENEUR: PHERONYM, INC.**  
Fatma Kaplan, CEO and Co-Founder of Pheronym, Inc.

*by Jaclyn Krymowski, BAW Digest*

Growing up on her family's farm, Fatma Kaplan understood the gravity of pest-inflicted crop damage. By the time she graduated from the University of Florida with a Ph.D. in Plant Molecular and Cellular Biology, she found that an increasing number of



*Fatma Kaplan*

farmers were interested in organic and eco-friendly sustainable pest control solutions. This prompted her to take a postdoctoral position at the National High Magnetic Field Laboratory where she discovered pheromones from microscopic roundworms called nematodes. "Nematode species had devastated the vineyards in my home country," says Kaplan. "I identified the first sex pheromone of the model roundworm (nematode) *Caenorhabditis elegans* and published it in *Nature* in 2008."

Soon after publishing the work, the USDA-ARS recruited Kaplan to apply her discovery to control agriculturally important nematodes, specifically plant-parasitic nematodes, called root-knot nematode (RKN).

From there, she co-founded Pheronym to manifest her vision – using nematode pheromones to revolutionize how pheromones are used to control agricultural pests. Nematodes can expand pheromone usage to control underground pests, unlike current pheromones on the market.

"Nematode pheromones can provide eco-friendly sustainable pest management solutions to farmers, improve soil health and reduce greenhouse gases by replacing harmful soil fumigants," says Kaplan.

**An inspiration**

Since accepting her postdoctoral position in 2005, Kaplan knew how these discoveries could revolutionize

agricultural pest control for nematodes.. "After all, pheromones had been used to control foliar insects successfully for decades," explains Kaplan. "Why not for nematodes? When I was at the USDA, I won the 2011 American Phytopathological Society Schroth Faces of the Future, Nematology Award for my vision of using pheromones to control parasitic nematodes. Then, in 2014, my article on my vision for the future of the nematode pheromone field won an essay contest sponsored by the Genetics Society of America and was published in the *GSA Reporter*. I realized that I was the only one with the knowledge, passion, and vision to make it happen."

**Company growth and accomplishments**

Since 2017, Pheronym has been hard at work. Besides proving their technology, they've also established a multi-institutional team and showed that in laboratory and greenhouse trials pheromones can improve the efficacy of beneficial nematodes in controlling insect pests in the soil. "Our results were published in peer-reviewed journals and recognized by academic and business communities," says Kaplan. "Even though Covid delayed our field trials, we have completed two successful field trials and have a third one underway for our first product, Nemastim™, which improves beneficial nematodes efficacy. "Pheronym is also developing a new product – a soil amendment called Pheroterra™. Pheronym successfully sent the first agricultural biocontrol experiment in space to the International Space Station.

In 2021, Pheronym raised seed funding from Sacramento Angels and other angels. "Like many women founders, it is challenging to raise funds from institutional investors," shares Kaplan. "Covid made matters even more difficult. Although we hear a lot

## PROMISING YOUNG ENTREPRENEUR: PHERONYM, INC.

Fatma Kaplan, CEO and Co-Founder of Pheronym, Inc.

of news of increased funding for agtech and agbio companies, it is mostly for late-stage startups, not as much for early-stage companies."

### Pheronym's Future

According to Kaplan, they will continue to unlock the wider potential of pheromones in agriculture pest control. "In the near term, we are developing methods to commercially manufacture nematode pheromones," says Kaplan. "We are also laying the groundwork to commercialize our insect control product. We are

starting with thrips and then developing seed treatment solutions to control plant-parasitic nematodes." Pheronym is also thinking far into the future and how their solution can be used for agriculture in colonies on the moon and Mars. 🌍



**TOP INDUSTRY AND INVESTMENT NEWS**  
Worth Sharing!

**AFEX's \$100 Million Bond Targets Climate-Smart Capital in Nigeria's Ag Sector**

AFEX, a commodity exchange, has worked for seven years to bring greater efficiency and transparency to West African agriculture. They strive to do this by providing farmers with tools including finances, inputs and ready market forms to increased productivity and economic growth. With an end goal to reach one million growers on the  platform in the next three years, AFEX is trying to reach across West and East Africa with a \$100 million 10-year bond called the Food Security Fund. This bond will be used to finance 250,000 hectares of commercial and smallholder farmland for climate-smart production.

**Aigen Gets \$4 Million in Funds to Boost Farm Sustainability with Solar Robots**

 Aigen, a U.S. agtech startup, recently raised \$4 million in seed funding for solar-powered robotics that automates processes based around soil health to allow farmers more precise plant management and a reduction in chemical inputs. The robots are small and utilize a system of software, cameras and sensors as they examine plants in the field and advise farmers on management tasks such as propagation and weeding.

**Certis Europe Announces Renewal of Distribution Agreement for Armicarb, Kumar and Karma**

After a successful negotiation,  Certis Europe announced they have renewed their distribution agreement for Armicarb (potassium bicarbonate), which is also sold under brand names Kumar and Karma. "The new agreement with DeSangosse, following its acquisition of Agronaturalis last year, secures the exclusive distribution of Armicarb in Certis Europe's original territory." 

**Biological Alternative Prices Increase with Mainstream Agrochemical Market**

Overall, startups working to  develop crop biologicals raised over \$892 million worldwide in 2021 according to data from AgFunder. This explosive growth is more than double the total biologicals funding in 2020. This includes all aspects of the biological space including biofertilizers, biopesticides, biofungicides, biostimulants and other biological controls. 

**GreenLight Biosciences to Establish Spanish Field Research Station for Plant Health Projects**

The biotechnology company, GreenLight Biosciences, has announced in February they reached an agreement  to operate a new field research station located in Spain. GreenLight is focused on RNAi research for human, animal and plant health. This new location, selected for its strategic position in a key agricultural area of the country, will accelerate the company's research and discovery efforts for plant health by allowing them to do real life trials in the field. 

**Bio-Cat Microbials expands fermentation capacity with \$35 million investment**

Bio-Cat Microbials has made a \$35 million investment to expand their  fermentation production by over 400% to its current facility in Troy, Virginia, USA. The first phase of the expansion involves a 53,800 square-foot expansion and a creation of 20 additional full-time positions. There is also potential to expand an additional 100,000 square feet. BioCat conducts contract fermentation services for ag biological and industrial fermentation companies. 

**TOP INDUSTRY AND INVESTMENT NEWS**  
Worth Sharing!

**South American Brand Earns Regenerative Organic Certification**

SIMPLi announced it received the **SIMPLi** Regenerative Organic Alliance's (ROA) Regenerative Organic Certified™ (ROC™) status for quinoa and lupini beans. ROA is a group of experts that promotes the highest agricultural standards in the world. SIMPLi is a modern ingredients company who aims to address major issues in the global supply chain and are proud to be the very first South American Brand to become ROC™. 🌍

**Plant Response joins the Mosaic Company**



Plant Response, a company that provides high-quality biological solutions for growers to maximize profitability and crop yields, recently joined The Mosaic Company. This merger is mutually beneficial as it allows the unique innovations of Plant Response to unite with Mosaic's market access and other assets to reach more customers worldwide. Note that this acquisition is another move by Mosaic to expand into biologicals. The company previously announced collaborations with Bioconsortia (newly expanded into N fixation) and Anuvia. 🌍

**Hello Nature and MPS Egg Farms announce site for \$50 million specialty fertilizer manufacturing facility**

Hello Nature recently announced their partnership with the Indiana-based business, MPS Egg Farms, in making a nearly \$50 million investment in a specialty fertilizer manufacturing facility to be built in Wabash, Indiana, USA. This joint venture, called Bionutrients,

will consist of two facilities for a total of nearly 300,000 square feet and will employ 46 workers. Ground is breaking early this year, but the facilities are expected to be fully operational by mid-2023.



The strategic location of this next project is a complement to two other Hello Nature facilities – a biostimulant production plant and a research and development center – which are also located in Indiana.

"We believe that this new production facility will be a turning point for the North American market," said Luca Bonini, Hello Nature's CEO in a press release. "Today the fertilizer industry undergoes multiple challenges such as rising prices, logistics issues and shortage of inputs, and there is a desperate need for innovative solutions to feed a growing population with less inputs and less land available. Our facility will ensure a regular production of sustainable fertilizers to help North American farmers achieve their yield goals. We are honored to partner with MPS and the Krouse family in this important project." 🌍

**Bioceres Crop Solutions and Marrone Bio Announce Merger Agreement**

Bioag leaders Bioceres and Marrone recently announced their merger in which they will combine their companies in an all-stock transaction. This decision was unanimously approved by the Boards of Directors for both companies. This agreement combines the expertise Bioceres has in bionutrition and seed care products with Marrone's leadership experience developing and commercializing sustainable agriculture solutions, particularly biopesticides, to create a global bioag powerhouse. 🌍



**TOP INDUSTRY AND INVESTMENT NEWS**  
Worth Sharing!

**Partnership with Botanical Solution Inc. and Syngenta expands botanical-based biofungicide distribution**

Botanical Solution Inc. (BSI) and Syngenta shared their agreement to commercialize BSI's first product, trade name Botristop®, in Peru and Mexico. Prior to the agreement, the product was successfully marketed in Chile. Botristop® is a biofungicide that's undergone years of field testing and is proven to be effective in the prevention and control of Botrytis cinerea in blueberries, vineyards and vegetables. Botanical Solution recently closed a \$6 million round of investor financing. 🌍

**Bee Vectoring Technologies makes advancements in soybean seed treatment**

Bee Vectoring Technologies (BVT) recently announced advancements with their proprietary biological control agent for seed treatment. The trials were conducted in 2021 based on proof-of-concept work done the prior year. Additionally, BVT is gaining interest from as many as eight other companies for the technology. 🌍

**MORE INVESTMENT NEWS!**

-  Agrobiológica Sustentabilidade, which specializes in biological solutions for agribusiness and belongs to Crop Care Holding, a Brazilian manager of agricultural input companies, recently acquired a site in the city of Itápolis, São Paulo.
-  Kenya's Apollo Agriculture, which helps small-scale farmers maximize their profits by providing them with advice, financing, farm inputs, insurance, and market access, raised \$40 million
-  MycoTechnology, an Aurora, Colorado-based startup using fermentation technology and mushroom mycelia to create novel food products, has closed an \$85 million round of funding.
-  Biobest invests in Plant Products Inc.



**PRIMARY BIOAG INNOVATIONS**

-  **INNOAG Stingo**  
Foliar Fertilizer 5-0-0 
-  **INNOAG More**  
Foliar Fertilizer 5-0-2
-  **INNOAG Start**  
Foliar Fertilizer 14-14-14
-  **INNOAG PepRhiza250**  
BioFertilizer 5-0-0 
-  **ORGANIKELP**  
0-0-0 

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# ALL ASPECTS OF BUSINESS MATCHMAKING

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## 10 REASONS WHY YOU CHOOSE GBAL:

1. We are locally global
2. Enablers and Accelerators
3. Global Business Match Makers
4. Instant Engagement
5. Efficient and Convenient
6. Cost Effective
7. Always Up To Date through Well-Linked Team
8. 800+ years of Proven Business Audit and Strategy Re-Vamp Experience
9. All Aspects of Go-To-Market is our Specialty
10. Intimate Knowledge of Global Bioag and Customer Landscape



# WHY PRIMARY BIOAG INNOVATIONS?

Because we need the best of the best innovations under one umbrella

We provide a unique commercialization platform for sincere innovators to commercialize integrated sustainable soil-to-shelf plant health solutions for farmers, globally.

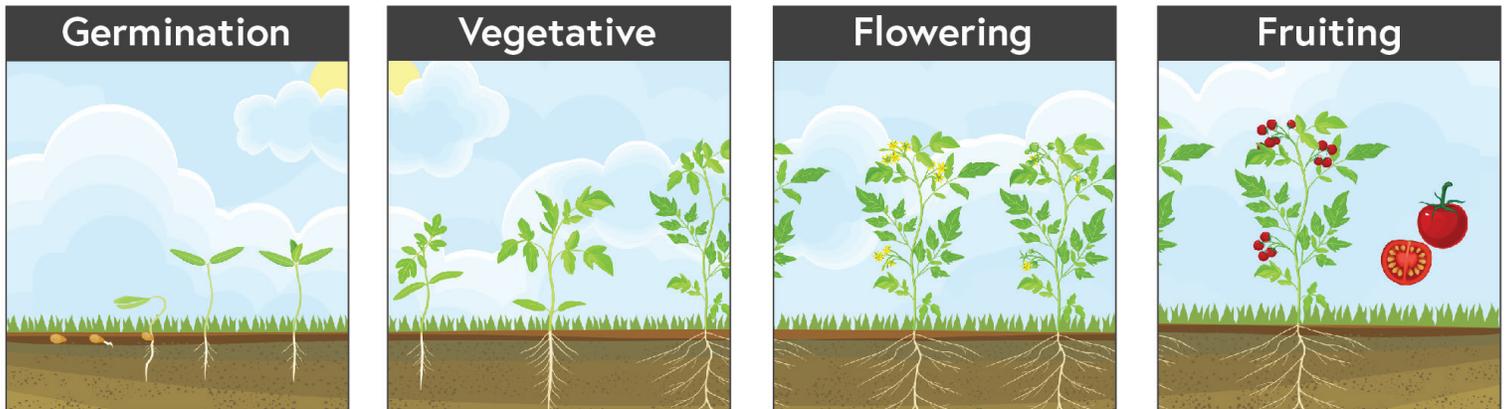
## Why Primary BioAg Innovations?: There is an unnoticed gap

- Millions of dollars are going into R&D of bioag products globally, however there are few companies that can and will successfully scale.
- After investing in R&D, these companies find how challenging it is to "cross the chasm" and gain market adoption. They run out of cash or must invest even more to meet commercialization needs.

## Unnoticed gap: Primary BioAg Innovation is filling it

- A global commercialization platform to provide commercialization partnership opportunities to outstanding innovators.
- Global commercialization platform for innovators who have spent millions in developing outstanding bioagriculture innovations, but have limited or no access to the global market.
- True partnerships at each level of product distribution, targeting a tangible ROI for our farmers and safe food for consumers.
- With the knowledge of founders, new formulations and innovations are developed with these innovators, to bring path breaking products and innovations.

## CROP STAGES & PBI PRODUCTS



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InnoAg PepRrhiza™	InnoAg Stimgo™	InnoAg More™	InnoAg Stimgo™
	InnoAg Push™	InnoAg Stimgo™	
	InnoAg Jump™	InnoAg Push™	
	OrganiKelp™	OrganiKelp™	





**INSIGHTS IN HUMAN RESOURCES**  
Predicting Our HR Future

**Resolve for 2022**

*by Nancy Hintz, Global BioAg Linkages and Primary BioAg, BAW Digest*

A tight labor market and a grueling pandemic made recent years uniquely difficult for our HR leaders. What will the next few years bring? We looked into our crystal ball by speaking with several hiring experts to get a sense of what lies ahead for the industry and the key factors HR leaders find most important in the coming five years.



*Nancy Hintz*

**Prediction #1** – Focused Training and Upskilling For years, our industry felt the impact of misalignment between the skills employees have and the ones businesses need to succeed. To stay ahead of the pack, everyone in a company should be learning and upskilling. However, most employees did not develop new skills during the pandemic. It is a way to set ourselves and the company up for success. "Competitive advantage in the future of work will no doubt increasingly be defined by talent," said Ian Fanton, Senior Vice President and head of Harvard Business Publishing Corporate Learning. Retaining and engaging employees hinges on innovative training methods, particularly in leadership. It is a new kind of competitive thrust for the industry. Unfortunately, most companies focus their training on new or promoted employees instead of upskilling existing employees according to a survey conducted by Society for Human Resource Management (SHRM). When it comes to planning out upskilling initiatives, HR holds most of the responsibility for all departments, including their own. The right training can help you close those gaps. For a hybrid workforce, utilize online training courses, subscriptions, employee mentorship programs, attend events and obtain certifications to reach desired skill levels needed to succeed.

**Prediction #2** – Switched up Employee Benefits. When employees go to an office, perks like on-site daycare, free lunches and snacks are of great value. But things are different as leading corporations and small businesses are committing to fully remote workforces, causing the previous benefit offerings to fall flat. Instead, corporations are switching up their offerings to include home office equipment, wellness programs and mental health benefits as workforces continue to grapple with the mental health fallout from the pandemic. The ultimate goal is for mental health to not just be part of the health benefits, but to be part of the overall company's culture. HR and executive leadership set the tone for workplace wellness. Supporting a healthy work/life balance, conducting "wellness surveys" and checking in on your people frequently goes a long way to incorporating mental





**INSIGHTS IN HUMAN RESOURCES**  
Predicting Our HR Future

health in the workforce culture and offering a great value proposition for your employees. What benefits should your organization offer? We recommend asking your employees to learn what they would value the most.

**Prediction #3** – People-Centric culture for a blended workforce. Work has been anything but business as usual as some employees work in-person and others work remotely. Developing a system that works for everyone is challenging. Organizations can adapt by utilizing software tools and room scheduling to forge ahead into the hybrid work future. There are multiple challenges with managing a blended workforce, but they can all be overcome with the help of software. Collaboration and communication are at the top of the list of challenges. Technology helps bridge the communication gap with meeting rooms, whiteboards, and task lists to keep everyone in-the-know on progress of important projects. Bridging the cultural divide, giving feedback and being equally fair in managing in-person and remote employees are other areas of need.

**Prediction #4** – Fast Decision-Making Speed is the new competitive advantage because agile organizations

make faster decisions, and are able to navigate crisis situations better than their peers. The key is to delegate decision making to frontline employees. When you delegate, you are coaching employees to make successful decisions and empowering them even though mistakes will happen. Risk mitigation is built in the quick decision-making process. A company can move forward with quick test-and-learn cycles that allow for nimble adjustments, allowing new opportunities where micro-innovation will hold maximum importance. This means constantly evolving innovative practices within the organization at all levels of employees and job roles. Entrepreneurial behaviors and mindsets will be at the front of the race and HR will find themselves amid all organizational frameworks.

**Prediction #5** – Utilizing Artificial Intelligence. To make well-informed decisions, HR professionals need data. If all of their time is spent performing tasks, then there is little time for strategic planning. HR will steadily move away from administration and be true business partners who drive results by creating data to strategically plan. One of the most effective tools to collect data is artificial intelligence (AI). AI refers to any simulation of human intelligence by mimicking human actions. With the help of AI, HR professionals can automate repetitive tasks allowing them to innovate and focus on making strategic decisions. Though AI applications and software exhibit human traits, HR teams can make better decisions by eliminating biases and increasing productivity. For example, AI is able to screen candidates for recruiting through the use of digital application forms, scan through and suggest high potential candidates creating a faster and more efficient hiring process. Once hired, AI can then be used to onboard the employee, facilitate in training and development with a personalized learning experience based on the employee's age, ethnicity,





## INSIGHTS IN HUMAN RESOURCES

Predicting Our HR Future

and educational background. A fast-growing area in utilizing AI is in employee engagement. Remember that engaged employees are less likely to leave an organization. Companies use chat boxes to resolve customer queries, conduct surveys to gain insight on employee satisfaction and retain talent. AI helps in detecting employees' mood patterns and anxiety levels from their behavior. Tushar Joshi, Head of Human Resources in Crop Protection, finds that AI creates a huge advantage for gaining company insight. He states that companies are utilizing software to read facial expressions of remote workers upon logging into the company system. By moderating employees' facial expressions or tone of their voice, AI can provide the information a manager needs to make informed, data-driven decisions about the welfare of their

employees. Say, for example, a decision regarding how often employees need to take a break. Collecting such data for HR leaders to effectively plan to improve the organization is what ultimately leads to gaining competitive advantages over time.

We hope you enjoyed our tour of the future. Although the future can never be predicted to an absolute, making predictions based on our history and utilizing market metrics certainly helps. HR is a fast-evolving field that is rapidly moving away from administrative and towards a technological strategic company driver that will gain a solid competitive advantage.

Want to be featured in an upcoming edition? Email us to introduce yourself and let us know how you are driving successful results in your company. Send to: [nancyhintz@bioaglinkages.com](mailto:nancyhintz@bioaglinkages.com) 🌐



**REGULAR SCIENCE DRIVING REGULATORY SCIENCE FOR BIOSTIMULANTS**  
The Saga of a New Regulatory System in India

By Dr. SK Malhotra, Agriculture Commissioner of India



Plant biostimulants are a new category of crop inputs that respond to growing farmer interest in access to new tools. Specifically, there is a demand for tools that improve nutrient use efficiency, helping plants tolerate abiotic stress (i.e., difficult growing conditions including extreme temperatures and drought or water logging), and enhancing crop quality. Biostimulants are basically organic materials that can be used for most of the crop lifecycle to increase crop yield, improve the efficiency of water usage and uptake of nutrients, and enhance crop quality. Biostimulants are differentiated from fertilizers by the miniscule quantities needed; fertilizers are applied in larger dose rates and quantities.

Dr. SK Malhotra

The Government of India (MoA) realizes the need to regulate biostimulants. In the absence of regulation, a cocktail mixture of humic acid and amino acids along with nitrogen, potassium and phosphorous were being sold at lucrative rates and swindling farmers.

There are also many representations being received from a genuine and responsible cross-section of

industry. But in absence of regulations, biostimulants were being spiked with pesticides to make them more efficacious while being promoted by unscrupulous dealers as "bio products." Because these may contain toxic impurities from pesticides illegally imported from unapproved sources, safety profiles are not established and manufactured by companies with dubious credibility. The irony is that in absence of law, there is also no enforcement or legal action possible against miscreants.

In parallel, Indian Industry Associations were striving hard to obtain no objection certificates from Integrated Nutrition Management (INM) Division of Ministry of Agriculture & Farmers Welfare authorities for selling biostimulant products. However, THE INM wing was declining to include amino acids, seaweed extract-like products to the Fertilizer Control Order (FCO) 1985, biostimulants not being fertilizers. For a long period of time, this class of products was lying in "no man's land" and remained unregulated i.e., neither fell under Insecticide Act 1968 nor under ambit of FCO 1985.

A further flashback with the chronology of events in the journey to bring biostimulants under the Indian regulatory framework, the topic of biostimulants had come up for discussions with the Registration

Listen to Dr Malhotra in person at the BAW Congress in Valencia, Spain, where he will discuss this topic further. Book your tickets and hotel NOW!

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## **REGULAR SCIENCE DRIVING REGULATORY SCIENCE FOR BIOSTIMULANTS**

### **The Saga of a New Regulatory System in India**

Committee (RC) of the Central Insecticide Board which deals with pesticides regulation. At the 371st RC meeting, it was deliberated whether biostimulants were to be proposed under FCO 1985 or under Insecticide Act 1968.

The definition of biostimulants was deliberated by a committee chaired by Agriculture Commissioner, Ministry of Agriculture & Farmers Welfare. It was also decided that biostimulants were not covered in either of the existing Insecticide Act and Fertilizer Control Order. It was found too close to fertilizers because they improve nutrient use efficiency. As per the RC decision, "it was decided that the DAC&FW/Govt. of India may be requested to cover biostimulants under FCO 1985."

However, industry associations like Crop Life India, CCFI etc., kept mooted the need for robust regulation governing the sale of biostimulants because they faced challenges at the state authorities' level while seeking sale permission with resultant legal cases in few states. Also, in absence of the regulation, farmers were getting rampantly cheated by unscrupulous manufacturers since there was no authority to authenticate the efficacy and safety of these growth stimulants. The regulatory bodies were fully concerned that farmers get genuine products that help in improving yield per hectare.

Finally, pursuant to the strong push by Ministry of Agriculture for framing the guideline policy on biostimulants regulation, a high-level committee under chair of DG-ICAR was formed, who has further constituted another subcommittee under Chairmanship of ADG (PP & BS), for regularization of biostimulants in India. MoA has organized various meetings of said subcommittee in 2018 and allowed the industry association to submit their proposals to frame appropriate guidelines by the subcommittee for registration of biostimulants in India.

There has been much discussion to decide if biostimulants should be governed under FCO or the

Insecticide Act 1968. But looking at the product nature, it was quite difficult to process these kinds of products to Insecticide Schedule, as these products are the mixture of various active components. This makes it a very cumbersome exercise to notify each component into the "Insecticide schedule."

And it was similarly felt if these products would be regulated under Insecticide Act 1968, how would enforcement issues be dealt with at the state level due to availability of various active components in one product. This was deliberated at the technical experts meeting held under the Agriculture Commissioner with Integrated Nutrient Management Division and scientists from Indian Council of Agricultural Research, and global trends of regulations were also taken into cognizance.

Ultimately, after in-depth conversations, it was unanimously decided that FCO provisions would be more appropriate to regulate biostimulants. There was also strong debate on biostimulants vs PGRs. (plant growth regulators) Finally, it was established that worldwide biostimulants have been treated differently from PGRs and the latter are mostly regulated under the Pesticide Law and former ones (biostimulants) mostly under the Fertilizer Act.

A subcommittee proposed simplified data requirements under FCO 1985 and submitted a report to the high-level committee chaired by DG-ICAR, who has further proposed to Secretary – DA&FW for approval. As of November 3, GOI issued the Draft Gazette notification for public comments. A Joint Meeting of the Industry association was invited on November 14, 2019 on the draft guidelines. Comments, objections and suggestions were proposed.

In exercise of the powers conferred by section three of the Essential Commodities Act, 1955 (10 of 1955), the Ministry of Agriculture, the Central Government has published gazette notification S.O. 882 (E) on

# REGULAR SCIENCE DRIVING REGULATORY SCIENCE FOR BIOSTIMULANTS

## The Saga of a New Regulatory System in India

23rd February 2021, which makes the Order further to amend the Fertilizer (Inorganic, Organic or Mixed) (Control) Order, 1985, namely:

1. This Order may be called the Fertilizer (Inorganic, Organic or Mixed) (Control) Amendment Order, 2021.
2. It shall come into force on the date of its publication in the Official Gazette.

In the fertilizer (Inorganic, Organic or Mixed) (Control) Order, 1985 (hereinafter referred to as the said Order), in clause 2 (i) after sub-clause (aa), the sub-clause shall be inserted, namely (ab) "biostimulant" means a substance or microorganism or a combination of both whose primary function when applied to plants, seeds or rhizosphere is to stimulate physiological processes in plants and to enhance its nutrient uptake, growth, yield, nutrition efficiency, crop quality and tolerance to stress, regardless of its nutrient content, but does not include pesticides or plant growth regulators which are regulated under the Insecticide Act, 1968 (46 of 1968).

As per the proposed guidelines, biostimulants will have to be first registered with FCO 1985 and should also be notified under "Schedule VI" before hitting the market. Proper labeling will have to be done including name of manufacturers, ingredients, and expiry date as per applicable regulation of packaging and labeling, which is also made mandatory with a separate notification published on February 26, 2021.

It was amply clarified that biostimulants do not include pesticides or plant growth regulators that are regulated under the Insecticide Act, 1968, administered by the Central Insecticides Board and Registration Committee (CIBRC) of the Ministry of Agriculture and Farmers' Welfare.

In this context, the regulation was set with high standards for product safety requirements, such as

limits on heavy metal contaminants and pesticide permissible limit (not more than 0.01 ppm), to ensure high levels of protection to human beings and the environment. There is a list of acute mammalian and ecotoxicology data points in this regulation, to address the most crucial matter of human and environment safety.

It was also acknowledged that by and large biostimulants are derived from natural resources so there is minimal risk with regards to human safety, therefore sub-chronic and chronic toxicology data are not relevant. Some representations have been received especially from MSMEs to reduce the burden of the high cost involved in acute mammalian and acute ecotox data generation. This sector has highlighted that due to the low financial return, it is not possible to invest in high registration costs for most organic substances. If data requirements are high and the registration process is adapted at par with synthetic substances, this will lead to very high costs for the registration of organic substances.

On perusal of the data requirements in high regulatory requirement countries like Japan, biostimulants are mainly being regulated as fertilizers, but are exempted from the submission of toxicology and ecotoxicology study reports unless triggering any concerns about safety, which needs to be confirmed on a case-by-case basis. Central Biostimulant Committee (CBC) is considering all such facts and is fully geared up to investigate the matter, to review the data requirements and those for the frame categories (biostimulants classified into 8 categories).

Australia is another advanced country with a framed law on biostimulants. These may be classified as fertilizers or plant growth stimulating products (products that are not for pest control or specific growth regulation). It does not require any federal registration, but must comply with state fertilizer regulations (Australian Pesticides and Veterinary

# REGULAR SCIENCE DRIVING REGULATORY SCIENCE FOR BIOSTIMULANTS

## The Saga of a New Regulatory System in India

Medicines Authority, 2021). Prior to importation, products containing components of biological origin are required to obtain an import permit under the Biosecurity Import Conditions (BICON) System and must comply with the required biosecurity conditions for every importation (Department of Agriculture, Water and the Environment, 2019). They are even encouraging ready mixtures of biostimulants + pesticides, to handle one shot insect pest and abiotic stress management for better plant growth. Such requests are being received in India also and offer "Food for Thought".

As per Indian law, the proposed specification should specify that plant biostimulants have the effect claimed on their labels. The justification for these claims (as well as compliance with the safety requirements) is verified by an independent body during the conformity assessment process. Manufacturers or importers and distributors bringing the product to the market must submit a dossier for technical review, including test results to the conformity of the proposed specification so that thorough evaluation can be organized by the assessment body i.e., CBC under the Chairmanship of Dr. Suresh K. Malhotra, Agriculture Commissioner. There is also a provisional registration possibility to continue the business of biostimulant products that were being sold for the last three years, without any ill effect on existing trade.

Central Government vide Gazette Notification dated 9th April 2021 has formally announced the constitution and composition of the Central Biostimulant Committee (CBC) consisting of the following members, namely:

1. Agriculture Commissioner, Department of Agriculture, Cooperation and Farmers Welfare, Chairperson, ex officio
2. Director General of Health Services or his authorized representative – Member, ex officio.

3. Deputy Director General, or his authorized representative, National Resource Management Division of the Indian Council of Agricultural Research –Member, ex officio.
4. Deputy Director General (Crop) or his authorized Representative, Indian Council of Agricultural Research – Member, ex officio.
5. Joint Secretary (Integrated Nutrient Management), Department of Agriculture, Cooperation and Farmers Welfare – Member, ex officio.
6. Director, Central Fertilizer Quality Control and Training Institute; Faridabad – Member, ex officio.
7. Authorized representative of the Indian Toxicology Research Centre, Lucknow – Member; ex officio.
8. Deputy Secretary (Integrated Nutrient Management), Department of Agriculture, Cooperation and Farmers Welfare – Member Secretary, ex officio.

The new regulation also introduces eight categories: (a) botanical extracts, including seaweed extracts; (b) biochemicals; (c) protein hydrolysates and amino acids; (d) vitamins (e) cell free microbial products; (f) antioxidants; (g) anti-transpirants; (h) humic and fulvic acid and their derivatives. Biostimulant regulation defines plant biostimulant as a product that functions to stimulate plant nutrition processes independent from 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: (a) nutrient use efficiency, (b) tolerance to abiotic stress, (c) quality traits (d) availability of confined nutrients in soil or rhizosphere.

Packaging labels are recommended to be legibly marked on the container and will contain:

1. Name of the manufacturer/importer
2. Name of the marketer, if any

## REGULAR SCIENCE DRIVING REGULATORY SCIENCE FOR BIOSTIMULANTS

### The Saga of a New Regulatory System in India

3. Name of the biostimulant (brand name)
4. "Direction for use" (dosage/crops), Precautions/ storage conditions
5. Net content
6. Batch number and date of manufacturing/repacking
7. Expiry date
8. Maximum Retail Price of the Product
9. Label claim of the product (Labels shall be printed in either English or Hindi or regional language of the state where marketed)

To facilitate the existing manufacturing industry, a Provisional Registration will be allowed for existing products up to February 2023 so that their sales is not disrupted. In the meantime, the stakeholders/registrants will be able to generate the stipulated data, submit dossiers and obtain regular/permanent approbation. All the existing manufacturers can apply for provisional registration in prescribed Form G-1 to the Controller of Fertilizers. They need to obtain a certificate in prescribed Form G-2 from the State Government that the product was being sold in the market for the last three years and that no harmful effects of the product have been reported.

Glaring concerns were, however, being reported by biostimulant manufacturer associations as well as by the State Governments about implementation of this Notification at state level in issuing Form – G2. DAC&FW has issued clarification stating that States are to expedite the issue of Form G-2 within 15-20 days of receipt of application from the manufacturer, to facilitate all manufacturers to submit their G-1 Form for provisional registration, by the month of December 2021.

Central Government has also enlightened the procedure and guidelines to be followed for issuance of the requisite certificates by the State Government in Form G-2 by verification of sale for the last three years, and no hazardous effect of the production.

This clarification allows the industry to provide self-certified documents for production/trade of the

product for the last three years duly verified by a Chartered Accountant and self-declaration of "No ill effect or hazardous effect" reported. It has also been elucidated that the provisional registration will be granted based on Form G2 even from one state, and then other states to grant sales permission based on the provisional registration. There is also provision for sample draw as an enforcement measure to monitor the quality, and is applicable once the product gets provisional registration status.

India has proven to be a pioneer country in developing biostimulant regulation in an agile manner with well-defined criteria/definition, data requirement/guidelines, and enforcement measures. Many other countries are still in the midway stage to develop biostimulant regulations. The India biostimulant market is projected to witness a CAGR of 16.49% during the forecasted period to reach a total market size of US \$180.95 million by 2023, increasing from US \$71.23 million in 2017. Increasing investment coupled with the need to improve yield per hectare will drive the demand for biostimulants in India. In addition, rising demand for organic food products will increase the demand for organic farming, which in turn will boost the demand for biostimulants.

However, limited awareness regarding the potential benefits of biostimulants amongst farmers restricts their growing demand over the forecasted period, highlighting the need to popularize this class of products with joint efforts by all the stakeholders and extension agencies. The law now in place in India may go a long way forward to benefit our farming community in getting quality products and to help them increase farm productivity by enhanced growth and resistance to biotic and abiotic stresses. It is really a beauty that the small concentrations of biostimulants are efficiently favoring the good performance of the plant's vital processes, allowing high yields and good quality crops. 🌍

## U.S. PLANT BIOSTIMULANT INDUSTRY RECOMMENDED GUIDELINES

For Verifying the Efficacy, Composition, and Safety of Plant Biostimulants

*Op-Ed by Terry Stone, Global Regulatory Leader-Biologicals, Corteva Agriscience*

There is a growing interest by farmers, growers, and consumers to produce healthy food utilizing sustainable agriculture principles and by urban architects and residents to utilize green technology. One of the valuable tools for sustainable crop production as well as for professional landscape and residential uses are plant biostimulants. These products are not fertilizers or pesticides. They are a unique category of products that improve natural plant growth processes, which can result in improved plant health, tolerance to abiotic environmental stresses, and enhanced overall plant growth, quality, and yield.

Biostimulant products can increase the uptake and utilization of native and applied nutrients, thus reducing the potential for off-farm nutrient runoff into rivers, lakes, and streams or loss to the atmosphere as greenhouse gases such as nitrous oxide. Plant biostimulants can also contribute to yield and quality without increasing applied fertilizer, water or planted acres; thus, sustainably enhancing the efficient use of these inputs and natural resources.

Plant biostimulants represent a broad category of products from microbial inoculants or their metabolites through the plant and algal extracts, complex carbon-based natural deposits, and their extracts like humic and fulvic acids, protein hydrolysates, to purified single molecules derived from natural or synthetic sources. They can be used for conventional and organic crop production, as well as non-agricultural, turf, and ornamental applications.

Innovation and new biostimulant product development are accelerating by public and private institutions and companies of all sizes throughout the world. While estimates of the industry's global growth vary, plant biostimulants are expected to become a ~3-bil-

lion-dollar market by 2025 (Dunham Trimmer® Global Biostimulant Report, 2021).

Today, plant biostimulant products and technologies face regulatory challenges that can limit their use, thereby reducing the benefits these products offer.



*Terry Stone*

The global regulation of plant biostimulants varies greatly. In India, and member states of the European Union, the term "biostimulant" has been defined and regulatory requirements to verify product efficacy, safety and composition have been established or are in development.

However, the regulatory path for biostimulants has not been established in the United States, thus preventing developers to register products according to their intended use, benefits, and safety.

The United States Department of Agriculture (USDA) proposed definition for the term is:

"A plant biostimulant is a substance(s), microorganism(s), or mixtures thereof, that, when applied to seeds, plants, the rhizosphere, soil or other growth media, act to support a plant's natural nutrition processes independently of the biostimulant's nutrient content. The plant biostimulant thereby improves nutrient availability, uptake, or use efficiency, tolerance to abiotic stress, and consequent growth, development, crop quality or yield." (USDA Report to the President of the United States and United States Congress on Plant Biostimulants, 2019).

Technology developers, depending on the product's composition and intended use, must either register their product as a fertilizer, soil amendment, beneficial substance, or inoculum with the Department of



## RESEARCH DEMONSTRATES BENEFITS OF SOIL BACTERIA ON WHEAT

Science Corner

*by Professor Kadambot Siddique, The UWA Institute of Agriculture, The University of Western Australia*

New research has shed light on the beneficial effect a specific strain of beneficial soil bacteria has on wheat crops when under abiotic and biotic stress.

In a recent study published in *Chemosphere*, an international research team investigated how multi-stress-tolerant soil bacteria strain *Beijerinckia fluminensis* BFC-33 could promote wheat growth and potentially increase tolerance to stresses such as drought and heavy metals.

The team included researchers from King Saud University in Saudi Arabia, Aligarh Muslim University in India and The University of Western Australia in Australia.

Wheat (*Triticum aestivum* L.) is one of the most extensively farmed food crops globally, with about 760 million metric tons produced annually in 2019 and 2020.

The world's climatic scenario is changing, amplifying weather and climate extremes, with enormous impacts on agricultural outputs. Wheat is subjected to various stressors (abiotic and biotic) that affect the crop's physiological and metabolic activities.

Environmental challenges like drought, salinity, heavy metals, and pesticides each directly and indirectly influence the environment and decrease the agricultural output. Drought stress adversely affects plant morphology, physiology, and biochemistry due to the production of reactive oxygen species. Salt stress impedes plant growth, chlorophyll formation, protein synthesis, and lipid metabolism, affecting plant development and reducing crop outputs. Similarly, heavy metals decrease plant metabolic activities, soil fertility, soil microorganisms and their associated activities.

Furthermore, phytopathogens are responsible for 20 to 40 per cent of global yield losses, valued at USD \$40 billion. Wheat is vulnerable to numerous devastating soil-borne plant infections, as well as foliar fungal diseases which can significantly decrease wheat growth, N content, and grain protein content.

Ecologically and environmentally friendly techniques

are crucial for reducing abiotic and biotic stress effects on crop productivity.

Certain beneficial soil bacteria that can ameliorate environmental stresses can be exploited as crop growth promoters/enhancers under adverse situations. *Beijerinckia fluminensis* BFC-33 is a novel multi-stress-tolerant soil bacterium.

In this study, the researchers found that strain BFC-33 (isolated from potato rhizosphere) tolerated various abiotic (drought, salinity, temperature, heavy metals, and fungicides) stresses. It demonstrated multifarious plant-growth-promoting characteristics, such as the production of indole-3-acetic acid, P-solubilization, ACC deaminase, ammonia, siderophore, HCN, EPS, and extracellular enzymes.

Bacterization of wheat seeds with a multi-stress-tolerant strain revealed BFC-33 to be a plant growth enhancer and biocontrol agent. Furthermore, BFC-33 potentially enhanced the defence responses in wheat seedlings by increasing a number of enzymes that play a significant role in protecting plants from phytopathogens.

By successfully establishing a product with the requisite effects under field settings, selecting multi-stress-tolerant and antagonistic plant growth promoting rhizobacteria (PGPRs) would be helpful to end-users.

Future use of native multi-stress-tolerant bacteria as biocontrol agents in conjunction with existing drought, salinity, heavy metal, and pesticide tolerance can contribute to global food security.

The study concluded that BFC-33 has the potential to be a viable biofertilizer and biopesticide for field use due to its ability to alleviate different stressors and promote plant growth. More research is needed on multi-stress tolerant PGPRs (plant growth promoting rhizobacteria) such as BFC-33 in arable crops under in vivo conduction, as well as mechanistic investigations of the interactions between beneficial microbes and crops. 

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