



# BRAZILIAN AGRITECH CATALOGUE

## 2020

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## Federal University of Viçosa (UFV)



### Tecnological Park of Viçosa

The Technology Park of Viçosa (tecnOPARQ) is a campus research park of Federal University of Viçosa (UFV), one of the most important universities in Brazil. The Park is located at Minas Gerais State, which is the country's third GDP. Its mission is to promote the creation and development of technology-based companies and the diffusion of entrepreneurial culture and innovative technologies from the academic community, contributing to local development. In order to fulfil its mission, tecnOPARQ was designed as a differentiated innovation environment, both with regard to its functioning and structuring, as well as with regard to products, services and benefits offered to companies, scientific community and stakeholders.

The Park is one of the units of the Technological Center for Regional Development of Viçosa (CenTev), an organ of UFV, directly linked to the Rectory, composed of tecnOPARQ, by the Technology-based Business Incubator (IEBT / CenTev / UFV), by the Central of Junior Companies (CEMP) and by the Center for Social and Educational Development (Nudese).

The tecnOPARQ is a promoting agent of the innovating culture, industrial competitiveness, business training, and the transfer of knowledge and technology between universities, research institutions, and companies, to promote the generation of wealth for the community and regional development.

The Park offers interaction with the UFV, synergy between companies, and networking; easy access to advanced scientific and technological knowledge, research centers, and specialized and renowned laboratories at UFV; access to its service portfolio.

In the tecnOPARQ, the technology-based companies, be they large companies, startups, spinoffs, business projects and academic research may be supported in terms of acceleration, preincubation, incubation and resident company program. By its incubator and accelerate program, tecnOPARQ offers valuable services for turning research into businesses and jobs, launching companies and negotiating master research agreements. The incubation services offer a way to more readily connect people, ideas, projects and resources for accelerate business relationship, partnership and innovation. By its resident companies' program, the tecnOPARQ team provide management, technological and innovation assessment for development, grow and competitive of the firms.

Area(s) of expertise:

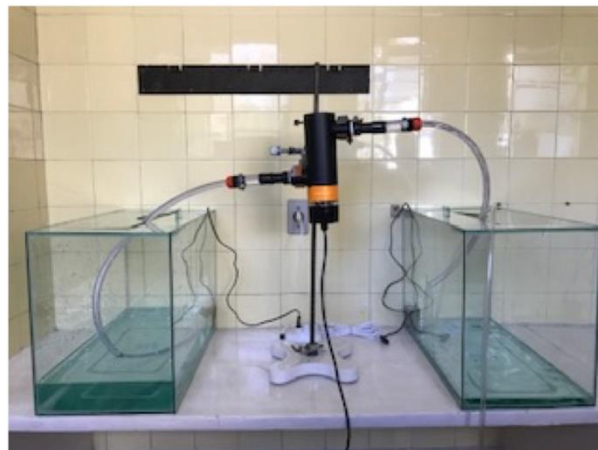
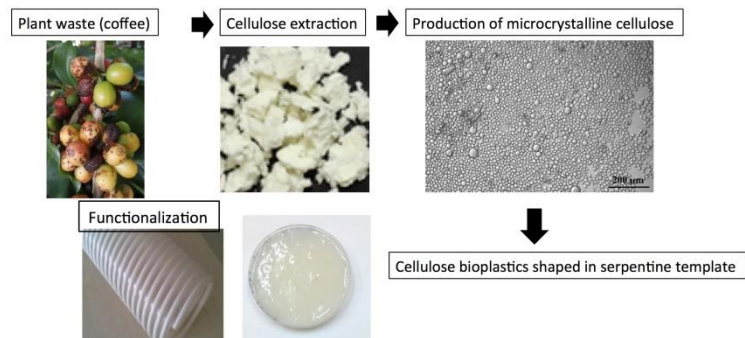
- Agriculture
- Forestry
- Food technology
- Animal health
- Information technology

## Biochemistry and Molecular Biology

### Filters based on biodegradable cellulose membranes to eliminate plant pathogens in irrigation waters

Irrigation water can carry various plant pathogens and become a source of contamination for plant crops. This transmission potential is increased when reuse water is used for agricultural irrigation. Chemical pathogen elimination processes can generate large volumes of waste that is harmful to the environment. On the other hand, complex physical methods have a high cost that hinders the application of these technologies by small producers.

We have developed a filter composed of a functionalized cellulose membrane to adsorb bacterial cells, fungal spores and nematode eggs and larvae that cause plant disease. The filter also has a UVC lamp that kills attached pathogens allowing their complete removal from irrigation water. This UVC lamp is attached to a galvanic cell that uses solar energy for its operation.



The filter was efficient to eliminate the bacterium *Ralstonia solanacearum* that causes bacterial wilt,

spores of the fungus *Phakopsora pachirhizi* that causes soybean rust and eggs and larvae of the root gall nematode *Meloidogyne* sp. The elimination of pathogens was four times more efficient than using only the membrane or the UVC lamp. This efficiency was also maintained with an increase in the water flow, a different result when only the membrane or the lamp is analyzed.

The next steps in the project include scaling up the production of the filters and testing for other plant pathogens.

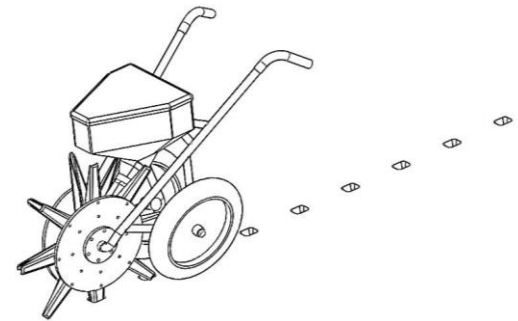
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## Production and Mechanical Engineering

### Precision Punch Planter for Conservation Agriculture

Agriculture is both affected by climate change and an important contributor to greenhouse gas emissions. A shift to a decarbonized economy is paramount to promote 'climate-smart' ways of producing food. Conservation agriculture aims for high and sustained production levels, while conserving the environment. It has three main principles: mechanical soil disturbance as minimum as possible; keeping natural organic soil cover; and using crop rotations or plant associations, depending on the crops. Precision planting machines typically open a continuous furrow in the soil but place seeds discretely inside this furrow. Therefore, a lot of energy is wasted moving unnecessarily soil where there will be no seeds. Power demand increases when planting in no-till systems, because the soil is harder to work and cutting the residue cover requires additional power.

The concept of opening holes in the soil instead of furrows saves energy and it is thoroughly aligned with the main objectives of conservation agriculture. I have been developing innovative technology for precision punch planting, including a hand pushed rotary punch planter for conservation agriculture for smallholder farmers. This project was sponsored by the Bill & Melinda Gates Foundation and oriented for women in the sub Saharan region.



The strength of the concept comes from two rotating punch wheels positioned in "V" and how the seed selection unit and the seed delivery system are integrated with them. Punch wheels rotation are synchronized through punch engagement around the touching point (just before penetrating the residue cover). As the wheels rotate these half punches get away from each other (laterally) to open the hole. Seeds are delivered into the holes by gravity guided by the funnel formed by the two engaged half punches. These mechanical systems provide outstanding control of seed travel and positioning in the soil. Soil and organic cover disturbance is minimum. You can hardly see its fingerprints in the field. Power demand is very low (60 W). While working in Africa I could not obtain a precise and reliable seed selection due to high variability on seed shape and size of local seeds. The latest concept made recently is handling better this variability, but still needs developments. All concepts developed used mechanical principles. It is not a concern when using pneumatic principles for seed selection.

#### *Suggestions for Joint Developments:*

Autonomous planting robots, planting two or more crops perfectly intertwining plants, high speed precision planting, planting through plastic mulch, seed printer, precise control of seed position in relation to fertilizer (or other material), Maps showing seed positions in the field for Precision Agriculture applications, planter performance monitoring system.

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## Agricultural and Environmental Engineering

### Smart-Map: A OpenSource QGIS Plugin

The Smart-Map is a software developed to be used as a plug-in of the QGIS (an open-source GIS software). This plug-in can be applied for digital mapping and for management zones generation. Two options of digital mapping are provided: one based on geostatistics techniques (Krigagem) and the other based on Machine Learning. Management zones are generated using Fuzzy K-means algorithm, a Machine Learning techniques.

### MPP: A manual precision planter

The MPP is a manual precision planter with controller for variable-rate seeding, based on a map. The same machine and controller can be used to apply fertilizers, also at variable-rate. The target audience for this machine is smallholder farmers, who do not have access to the precision farming technologies available on the market.



### CFS: A costal fertilizer spreader



The CFS is a costal fertilizer spreader with controller for variable-rate application, based on a map. The target audience for this machine is farmers who cultivate in mountainous field, where wheeled machines, that are available in the market for variable application, can not be used.

### PMPSM: portable multisensor platform for soil mapping

The PMPSM is composed by sensors of soil apparent electrical conductivity, moisture, temperature and penetration resistance. The use of this equipment provides a better characterization of soil spatial variability. The low-cost, portability, and the no need of a vehicle to pull the sensor over the field allows its use in small areas and mountainous areas.



### AI Spec: portable spectroradiometer for soil physicochemical characterization

The AI Spec is a VIS-NIR spectroradiometer sensor with 18 bands in the visible spectrum and a 10nm resolution between 900nm and 1700nm wavelengths. The equipment uses chemometric and machine learning techniques to predict the soil's physicochemical characteristics, reducing cost with laboratory analysis, and enabling instantaneous results. The equipment can measure both solid sample reflectance and liquid sample transmittance. Therefore, the AI Spec can be used in several applications besides soil characterization just by performing the calibration of the model.

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## **Food Engineering**

Study of national biodiversity - collection of lactic bacteria with technological potential for the food sector.

Projects in the Amazon - Pará, and in northeastern, regions where crops are wild - biodiversity differential.

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## Skydrones



For precision agriculture, SkyDrones offers complete solutions, from early pest and area diseases mapping to chemical spraying with surgical accuracy, both large or smaller crops, including spots that are hard to reach.

SkyDrones Tecnologia Avionica S/A (SD) was started in 2008 by air and automation entrepreneurs/engineers. The founders have extent experience from previous companies like Embraer (Brazil), Elbit Systems (Brazil/Israel), Litton Industries Italy (now Northrop Grumman). Until 2010 when SkyDrones was officially founded at the UNITEC building (Unisinos University at São Leopoldo, RS, Brazil), prototypes and trials were made with local Police forces, civil defense and agriculture.

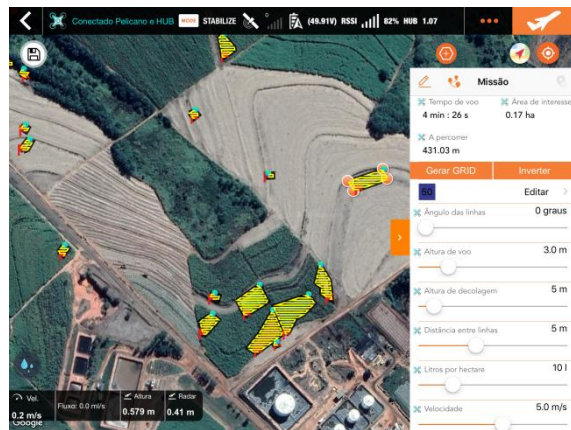
Now, at company's own facilities with more than 15 employees and high end partners, there is design, construction, integration, software development and operation of small UAVs (fixed and rotary wing) for the agriculture, inspection and security imagery/data market. Innovation is in the DNA of the company, which since its early days works at the edge of state-of-the-art Micro UAV technology. In 2018 SkyDrones obtained status of a Defense Company (develop dual systems for civil and military use). Since 2017 specialized in Crop Spraying drones (Pelicano line).

We develop hardware, software, and ground station App/Cloud platform. Also specialised in sensor integration with UAV. Recently released electrostatic crop spraying technology for Drones.

Ulf Bogdawa, CEO

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## J. Assy



J.Assy is specialized in technology solutions for agribusiness. We are one of Brazil's largest investors in R&D on this industry. From the product design to finishing, or from the diagnosis in the field to after-sales, we devote all our efforts to help, improve and monetize the daily lives of farmers in several countries.

TITANIUM seed meter has a high performance in skips and doubles reduction. Accuracy and precision to increase the farmer's profitability.



Features:

- Seed disc window - It allows you to see the disc with the seeds working in real time and check the performance.
- ESCOVAFLEX - It works expelling the seeds that did not fall by gravity. This contact is homogeneous and smooth, generating less rubbing and damage.
- POLIFLOWS - three polyurethane organizers directs the seed flow exactly to the disc holes reducing mechanical damage to the seeds.

SELENIUM'S main feature is that there the crop kit is a single part. The disk, singulator, and ejector are designed together. There are no meter adjustments because SELENIUM maintains 99% singulation in its compatible crop types (Cotton, Edible beans, Corn, Soy and Sorghum).



Features:

- High quality spacing
- Exclusive seed disc window allows you to see the disc with the seeds working in real time and check the performance
- Robust to withstand tough conditions in the field

The VISUM Fertilizer sensor system monitors the flow in each line and alerts the operator about product plugging and flow failure.

Features:

- 100% wireless
- Resistant to dust, dirt, water and corrosion
- No maintenance
- No battery replacement
- Compatible with ISOBUS standard
- Monitor up to 99 rows
- It allows the simultaneous monitoring the flow of fertilizer and small grains



José Roberto Assy, Founder and President

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## Justy BioSolutions



Justy BioSolutions was founded in September 2019 by Ana Paula Justiniano Régo (PhD in Applied Microbiology - Scientific Director), and by partner João Justiniano Régo (Entrepreneur-Coordinator). The company is incubated at EsalqTec, a technological incubator at the University of São Paulo, in the city of Piracicaba, State of São Paulo. We had support from the Research Support Foundation in the State of São Paulo, in the Innovative Research in Small Companies Program (PIPE-FAPESP, PHASE I).

We develop solutions for the agricultural and environmental market. The company's expertise is the use of specific microorganisms capable of remedying in soils contaminated by toxic metals. Our product is an organic fertilizer, based on agricultural residues, such as coffee husk, which can be applied to soils that are low in nutrients, with low productivity, especially those with a history of chemical fertilizer application, which have toxic metals in their constitution, contaminating the soils. In this way, our product is capable of remedying soils contaminated by toxic metals and promoting an improvement quality and fertility of these soils, resulting in increased agricultural productivity.

The crops already tested in the agricultural area were: corn, beans and *Brachiaria brizantha*. The next crops that will be tested are: soybeans, wheat and *Brachiaria decumbens*.



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## Intergado



Intergado was designed to be part of the transformation of Brazilian agribusiness. We believe in the potential of precision technologies to assist quick decision making, aiming at the efficiency of production systems.

We are in line with current trends in the use of genetic selection for food efficiency and the development of research to monitor animal health and early diagnosis of diseases, through the assessment of changes in behavior and consumption. This means optimizing the use of natural, human and financial resources.

Our goal is to develop and provide precision livestock solutions to the market, improving the quality of information, adding value to the activity and maximizing the client's financial results.

The Intergado Beef Solution allows daily monitoring of animal weight and behavior at all stages of creation, in addition, it allows the identification of management failures and diseases that may affect the herd. In this way, we anticipate decisions and optimize the sale of animals.



The Intergado CriATECH Solution allows daily monitoring of growth, body condition and behavior of dairy calves at all stages of creation. Compare the animals with the breed standard or with the goals defined on the property and detect problems in the breeding program early. CriATECH is the guarantee of productive and healthy cows in the future.

Intergado Science is an innovative product line focused on scientific research. Our equipment makes information collection faster and generates qualified data automatically and reliably.

The Intergado Efficiency solution performs the evaluation of feed efficiency, recording daily food consumption, weight gain and other parameters associated with the animals' ingestive behavior.

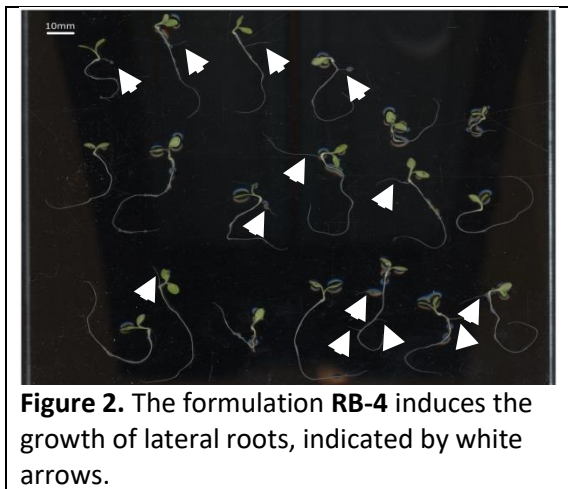
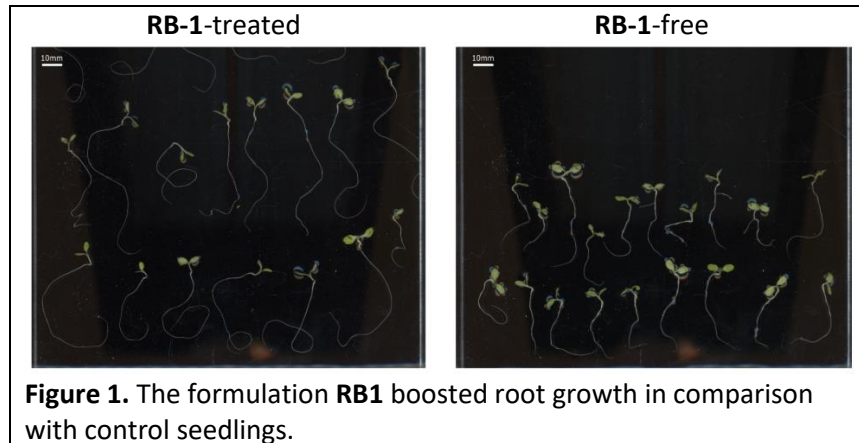


Marcelo Ribas

**Non-toxic Synthetic Biostimulants**

Roots are pivotal for plant growth and development as they function as soil explorers for water and mineral nutrients. Organic substances potentially eligible to stimulate root growth were designed based on the structure of natural products and synthesized by our research group following standardized procedures. Liquid formulations (RB) were developed with such substances and investigated for the effects on seed germination and seedlings development.

The length of roots from seeds treated with the biostimulant formulations was in the range from 200% to 216% higher than that of roots from seedlings devoid of biostimulant exposure (Figure 1).

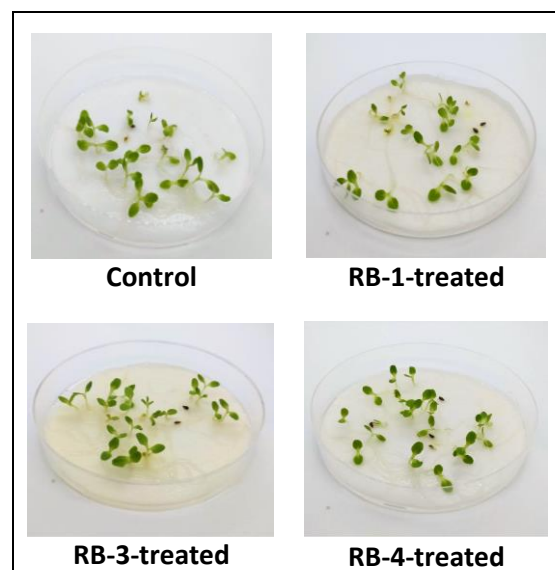


Lateral roots also increased upon the treatment of seeds with RB-4 (Figure 2). The natural products by which the biostimulants originated from were not effective in stimulating root/lateral root growth.

Overall, none of the formulations were detrimental to seedlings development (Figure 3), indicating the great potential of the designed substances for use as biostimulants.

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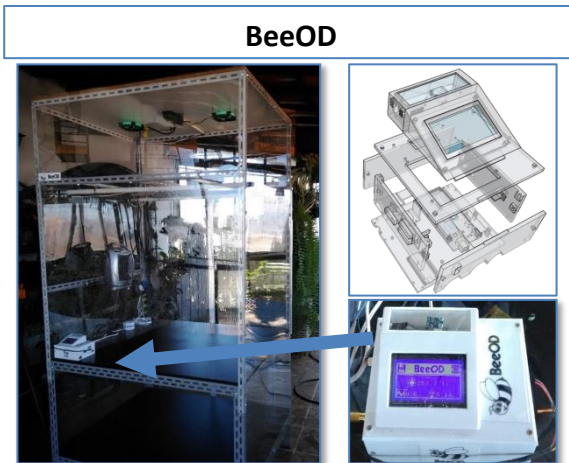


**Figure 3.** Effect of RB formulations on seedlings development.



## StopRot Project

This technology involves multiplatform proximal image sensing (thermal, UV, near IR and depth) to early detection of fungal diseases in plants at LOW COST, using open source hardware and software, edge and cloud computing and machine-learning analyses (CNN).

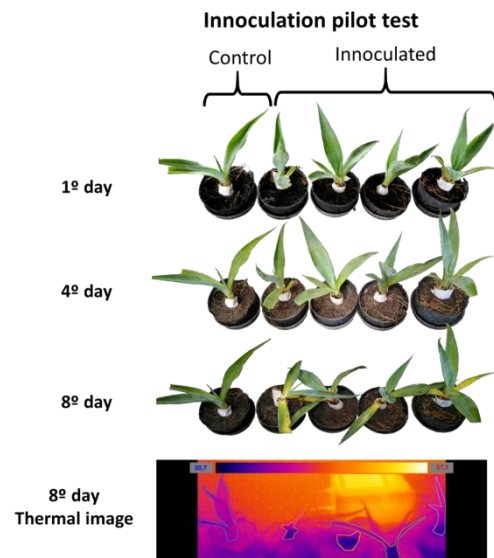


**BeeOD**  
Low cost climatic chamber prototype (BeeOD): Created using Open Source Hardware and software. The computational platform with the imaging sensors will be placed inside this chamber. This chamber is capable of control basic environmental variables like temperature, humidity and light, simulating the conditions of the semiarid region where the sisal crops are.

The use of proximal image sensing offers the following advantages: (i) it is a non-intrusive method; (ii) the use of new sensors on the market aimed at embedded systems, with affordable prices (\$500 or less); (iii) explore different bands of the electromagnetic spectrum for early detection of the disease (thermal, UV, near IR, etc); (iv) use of Open Source Hardware and Software to minimize costs; (v) ease of implementing the solution to the field (use of drones), (vi) local decision making (edge computing), (vii) data collected can help in the study of the epidemiology of the disease in the region (cloud computing). Finally, a computational solution created in this pilot project can serve as a basis for studying and controlling diseases that affect other types of cultivation.

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The present work aims to create a computational platform for the early detection of the disease of red rot of sisal (*Agave sisalana*), caused by the fungus *Aspergillus welwitschiae*, using images. Sisal is an important crop in the semiarid regions of the Northeastern Brazil, which is the largest world producer of sisal's fiber. This crop is the main source of income for thousands of people in the region, composed primarily of small farmers in poor conditions. Therefore, the solution must be at low cost. Currently, the process of detecting and controlling the disease in field is very rudimentary, based primarily on the detection of the symptoms of the disease in the leaves of plants at naked eye. Nonetheless, the visible symptoms are late, resulting in a poor disease control.



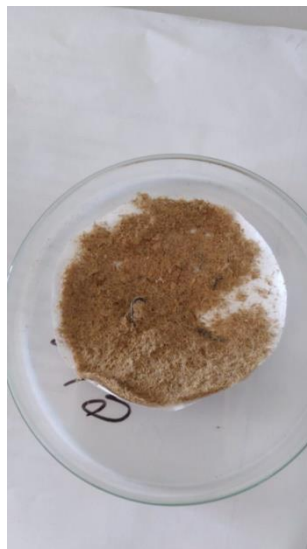
1º Innocation pilot test on BeeOD: The inoculated especimens shows a rapid disease evolution, with visible symptoms in 8º day. The thermal image shows promising results, being able to detect the tissues affected by the disease.



## The Full Potential of Insects

The world population is estimated by 9 billion people by 2050, and it is necessary to find alternative sources of proteins and food to meet this new demand. In this context, insects represent a potential and sustainable protein source, in addition to its high nutritional quality. Besides the essential amino acids, including those there are missing in vegetable protein, insects could provide other important nutrients like fatty acids polyunsaturated, prebiotics, and vitamins.

Fermentation is very useful process to increase the nutritional value and safety of food and feed, resulting in production of bioactive compounds and substantial increment in bioavailability of nutrients like proteins.



In this sense, our research aims to boost and consolidate the insect chain, with the focus in developing technologies to add value to insect meal, either through whole fermentation or isolating components for biotechnological process.

In this sense, we aim to gather talented researchers from public and private sector with complementary skills for the joint development and exploration of new technologies for food, feed, and pharmaceutical industry.

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