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## STRATEGIC PLAN

2024 – 2029



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## Fundació Centre de Recerca en Agrotecnologia's Strategic Plan for 2024-2029

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## ACRONYM LIST

### Agrotecnio Research Groups:

A	Agronomy
AB	Animal Breeding
AM	Applied Mycology
ANE	Animal Nutrition and Environment
APB	Applied Plant Biotechnology
CPro	Crop Protection
CPhy	Crop Physiology
BR	Bovine Reproduction
EPC	Environmental Physical Chemistry
FBC	Food Bioactive Compounds
FM	Forest Management
GRAP	AgroICT and Precision Agriculture
NTFP	New Technologies for Food Processing
PBT	Post-harvest Biology and Technology
PP	Plant Phenomics

### Institutions:

UdL	Universitat de Lleida
DACC	Departament d'Acció Climàtica, Alimentació i Agenda Rural
DGR	Departament de Recerca i Universitats
IRTA	Institute of Agrifood Research and Technology

### Others:

CAP	Common Agricultural Policy
TFEU	Treaty of the Functioning of the European Union
EGD	European Green Deal
F2F	From Farm to Fork strategy

## 1. The Catalan and EU Agrifood System

### a. Components of the agrifood system

The agrifood system is defined as the value chain for food and non-food agricultural products, comprising primary production, storage, handling, processing, distribution and consumption, as well as waste disposal. It can be divided into multiple sectors including crops, livestock, forestry, food transformation, aquaculture, and fisheries. Multiple actors contribute to the agrifood value chain, which involves a strategic partnership between inter-dependent businesses that collaborate to create value for consumers, and to realize a collective competitive advantage. These partners include producers, food processors, marketers, food service companies, retailers, and supporting stakeholders such as researchers, knowledge conveyors, policy makers, shippers, and suppliers. Society, as the ultimate recipient of the foods and nonfood goods produced by the agrifood value chain, is an integral component of this interconnected system.

This framework often goes unnoticed, with the valuable results generated by researchers sometimes irrationally rejected due to public perception. The acceptance of new technologies can be improved by demonstrating their benefits and explaining any potential drawbacks to the public, enhancing consumer awareness. Intensification across agrifood systems involves the use of knowledge to reduce or replace physical inputs such as energy, land, pesticides, and nutrients. If this reduces the extraction and degradation of nonrenewable resources while increasing benefits for society, it can be deemed sustainable.

### b. Social and economic relevance of the agrifood system in Catalonia, Spain, the EU, and Globally

*From agricultural policy to food policy* – Food is the vital link between agriculture, health, the environment, and consumers. Society currently faces challenges such as food insecurity, dwindling resources, declining productivity and unhealthy lifestyles. At least 10% of the world population is undernourished either due to food insecurity and hunger or unhealthy eating, and we are still consuming nonrenewable resources to grow food, whilst the amount of food produced per hectare is stagnating. We need to transition from an agricultural policy to a more holistic food policy to address these issues. The agrifood system should be aligned with the United Nations Sustainable Development Goals (SDGs), as much as possible to facilitate the transition.

*The agrifood sector in Catalonia* – The agrifood sector is Catalonia's largest and most dynamic export sector, with a turnover of €43 billion (equivalent to 19 % of the Catalan Gross Domestic Product, GDP) and directly employing 177 031 people. It therefore holds a pivotal role in the region's economic landscape, currently comprising 57 427 agricultural holdings, 4 253 companies representing the food and beverage industry, and 658 companies in the agrifood auxiliary sector. Catalonia's food and beverage industry accounts for 23 % of the sector in Spain. The meat industry is the largest

processed food subsector, followed by vegetable oils, wine, fruits and vegetables, cereals and grain products, fish and seafood.

*The agrifood sector in Spain* – The agrifood sector accounts for 5.8 % of Spain’s GDP (11 % when considering the entire food chain) and a large proportion of the export market, making the sector highly resilient to economic fluctuations. Accordingly, the Spanish agrifood industry is holding up well despite challenges from international trade tensions and Brexit.

*The agrifood sector in the European Union* – The agrifood industry accounts for 3.8 % of the EU’s GDP, highlighting the dominance of this sector in Spain (5.8%) and particularly in Catalonia (19 %). The strategic importance of the agrifood industry in the EU is underscored by the Common Agricultural Policy (CAP), which accounts for ~**36 % of the EU’s overall budget**. Agricultural producers and the food processing industry jointly account for 7.5 % of employment and 3.7 % of EU’s total added value. With 4.72 million employees, a turnover of €1.2 trillion, and €236 billion in added value, the food and beverage industry is the largest manufacturing industry in the EU, playing a pivotal cultural and social role and supporting rural economies across all member states.

### c. Policy framework of the agrifood system

*The Common Agricultural Policy (CAP)* – The CAP helps to foster a viable agricultural sector, the sustainable management of natural resources, climate action, and balanced territorial development. It emphasizes the importance of food security in a single market, the strategic role of agriculture under common trade policies, and the transnational nature of sustainability, requiring a robust transnational policy at the EU level. The objectives of the CAP are outlined in Article 39 of the Treaty of the Functioning of the European Union (TFEU). They seek to increase agricultural productivity, ensure a fair standard of living for the agricultural community, stabilize markets, ensure the availability of supplies, and ensure reasonable prices for consumers. As the EU transitions to a circular and net-zero economy, the CAP will reinforce the efforts of European farmers to meet climate objectives and protect the environment. The proposed future CAP will be implemented through national CAP Strategic Plans, defining key parameters for the implementation of all CAP instruments. However, most recently, increasing apprehension on the way the CAP is being implemented has resulted in massive mobilization and protests of farmers across Europe. A number of reasons underpin this unrest. Input costs, particularly energy and fertilizers have been rising substantially while agricultural commodity prices remained constant at the farm level. Furthermore, the CAP has resulted in ever increasing bureaucracy and restrictions to agricultural practices related to environmental protection. Farmers have serious legitimate concerns about the availability of instruments to carry out the Green Deal strategy and the costs associated with its implementation. This requires the continuous support of research, development and innovation.

*The European Green Deal* – The CAP is being used to support the European Green Deal (EGD), which envisions the EU transformed into a fair and prosperous society with a modern, resource-efficient, competitive economy and no net emissions of greenhouse gases by 2050. This new growth strategy aims to decouple economic growth from

resource use, while protecting natural capital and the health and well-being of citizens from environment-related risks. Forests play a key role in supporting the new growth model advocated in the EGD. The development of a new **EU Forest Strategy** is essential to mitigate climate change, enhancing resilience and developing the circular bioeconomy while contributing to biodiversity objectives.

*The Farm to Fork Strategy* – The F2F strategy aims to establish a sustainable food system with a neutral or positive environmental impact, ensuring food security and public health well-being by facilitating access to nutritious and healthy diets. This aligns with the SDGs and encourages appropriate labeling and other schemes to improve consumer awareness, leading to a review of the EU marketing standards and school schemes.

*Policy framework of the Catalan agrifood system* – The policy of the Catalan agrifood system within the EU framework must ensure food production, transformation, storage, and consumption aligned with current demands for increased productivity, sustainability, and safety. The **Strategic Food Plan for Catalonia (2021–2026)**<sup>1</sup> outlines current challenges, most of them selected by Agrotecnio to drive its research and development (R&D), technology transfer and educational activities, as set out in Section 2.

#### **d. Catalan agrifood system and actors in its value chain**

*The Catalan food value chain* – The agrifood system in Catalonia is the largest market segment in the Catalan economy. Initiatives in the Catalan agrifood value chain seeks to find and exploit synergies to propel the Catalan foodservice subsector by driving new and transformative projects. However, the agrifood sector must adapt to climate change as well as mitigating any causes originating from within the industry, such as energy management and the use of chemical inputs. **Research and technology transfer activities in Catalonia represent a third way to make the agrifood value chain more sustainable.** This adaptation involves the replacement of nonrenewable resources with knowledge to increase productivity without increasing resource use.

*R&D, innovation and technology transfer in the Catalan agrifood industry* – As noted in RIS3CAT (2017) and updated Catalan documents, research priorities include food security, sustainable agriculture, forestry, and activities in the bioeconomy within the EU Horizon framework. Similar priorities are outlined in the Strategic Food Plan for Catalonia (2021–2026). CERCA research centers and universities play key roles in R&D, innovation and technology transfer in the agrifood sector. At least eight CERCA centers are directly or indirectly involved in the agrifood sector and its relationships with the environment and resource utilization. Prominent topics covered by Catalan research centers and universities include biotechnology, which is recognized as a key driver for long-term sustainable growth. Catalonia leads the Spanish biotechnology market, contributing a 35 % business share and 24 % of all Spanish biotechnology companies. The Catalan agrifood sector also leads efforts to mitigate climate change by replacing

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<sup>1</sup> [https://agricultura.gencat.cat/web/.content/04-alimentacio/consell-catala-alimentacio/enllacos-documents/fitxers-binariis/strategic-food-plan-catalonia-2021-2026\\_executive-summary.pdf](https://agricultura.gencat.cat/web/.content/04-alimentacio/consell-catala-alimentacio/enllacos-documents/fitxers-binariis/strategic-food-plan-catalonia-2021-2026_executive-summary.pdf)

fossil fuels with renewable energy sources, implementing carbon sequestration in agricultural processes, and reducing the greenhouse emissions of livestock. Building and improving the circular bioeconomy should help to achieve a more sustainable food value chain.

*Conclusion* – Society plays a key role in the agrifood value chain. The introduction of changes is therefore influenced by popular perceptions and preferences. However, achieving the dual goals of higher productivity and greater sustainability goes beyond consumer preferences, requiring constant innovation generated by R&D, technology transfer and education across the entire spectrum of food production and distribution.

## 2. Evolution of the Agrotecnio Center

### a. History and antecedents

Agrotecnio evolved from the creation of the UPC-IRTA Joint Center almost 40 years ago, bringing together active research groups from the School of Agriculture (ETSEA Campus), at the time representing the Polytechnic University of Catalonia (UPC), and from the Institute of Agrifood Research and Technology (IRTA) of the Generalitat de Catalonia, also located on campus. It was the first such joint center between IRTA and any Catalan university, establishing a model that was subsequently replicated by IRTA with groups from other universities. For many years, the UPC-IRTA Center was one of the most active and successful centers in competitive calls launched by the Spanish Agriculture National Research Programs, thereby significantly contributing to agrifood research in Catalonia.

In 1992, the Universitat de Lleida (UdL) was created by the Government of Catalonia incorporating all centers of the UPC, the University of Barcelona, and the Autonomous University of Barcelona, located in the city of Lleida. The UPC-IRTA Joint Center thus naturally evolved into the UdL-IRTA Joint Center. In 2006, the name and legal status changed (UdL-IRTA Foundation) but the joint activities of the UdL-IRTA groups declined due to administrative and financial difficulties, with a risk of dissolution.

In a parallel development, 11 ETSEA research groups answered the former Spanish Ministry of Science and Innovation Severo Ochoa Call for Centers of Excellence in 2011. Having achieved an excellent rating, but remaining ineligible for selection, the principal investigators established a permanent group aiming to become a CERCA research center ([www.cerca.cat](http://www.cerca.cat)). The group gained consent from the UdL and IRTA governing bodies and the Directorate General for Research (DGR) to take over the UdL-IRTA Foundation, and formally adopt new statutes in December 2012, with Prof. Paul Christou as first Director.

Approval of the bylaws by the Board of Trustees sequentially expanded the groups in the Center to the current number of 15, which are listed in full in **Table 3**, also including an associated University of Barcelona research (Plant Phenomics) and a Joint Research

Unit with CTFC, another CERCA center in Lleida. The statutes of the Agrotecnio Center were adapted to follow the rules of Catalan foundations and were approved on 23 January 2014 by the UdL Consell de Govern, with additional support from the Catalan Department of Agriculture, Livestock, Fisheries, Nutrition and the Environment on 24 April 2014. The statutes were submitted to the Registre de Fundacions on June 10, 2014 and were formally approved on July 31, 2014.

Following an external evaluation, Agrotecnio was recognized as a member of CERCA in 2015, promoted by the Government of Catalonia, albeit without permanent structural funding. The agreement between UdL and Agrotecnio allowed UdL to transfer base funding corresponding to 50% of indirect costs associated with activities secured by Agrotecnio researchers, covering the creation of a minimal administrative structure. The engagement of the Agrotecnio directors (Paul Christou 2012–2015, Ramon Albajes, Vicent Sanchis and Gustavo Slafer co-directorate 2016–2018, Ignacio Romagosa 2018–2023, and José Antonio Bonet 2023 to date) have kept the spirit of the research center alive, investing the limited Agrotecnio economic resources in the development of collaborative projects. Despite these difficulties, Agrotecnio followed the rules for CERCA centers, and a Scientific Advisory Board (SAB) was constituted in 2013 (with meetings in April 2013, April 2014, November 2017 and most recently May 2022). The SAB meetings monitor Agrotecnio activities, providing recommendations that guided the development of its first Strategic Plan in 2015.

The achievements of Agrotecnio since its activities commenced in 2014 were positively evaluated by an external CERCA panel in 2018, which awarded a mark of B+, but there were major discrepancies among the panel members because half of them strongly believed that Agrotecnio deserved a higher evaluation: *“The EC acknowledged that much progress had been achieved especially in terms of center management and leadership, excellent scientific production and several international scientific collaborations as well as establishing collaboration with the food industry sector... it is the view of the EC that future progress towards possibly becoming a top international performing institute also depends on securing funding for core operations and strategy implementation”*.

The track record of Agrotecnio since its foundation in 2013 together with the positive evaluation finally persuaded the Government of Catalonia, via the General Directorate of Research (DGR), to provide core funding of €70 000 in the years 2020, 2021 and 2022. This increased to €274 000 in 2023 (**Table 1**). Similarly, the Department of Climatic Action, Food and Rural Agenda (DACC) contributed €40 000 to the center budget in 2019, increasing to €265 000 in 2023 for the development of a set of projects and activities.



**Table 1** – Base funding received by Agrotecnio 2014–2023.

Year	Base funding (€)	Contributors*
2014	40 000	UdL
2015	25 000	UdL
2016	25 000	UdL
2017	125 000	UdL
2018	150 000	UdL
2019	157 548	UdL + DACC
2020	150 000	UdL + DGR
2021	140 000	UdL + DGR
2022	201 283	UdL + DGR
2023	539 386**	DACC + DGR

\*UdL (University of Lleida), DGR (Directorate of Research), DACC (Department of Climate Action, Food and Rural Agenda). In kind contributions are not included.

\*\*Core funding was 274 051 € + 265 331 € of project funding

The contribution of the Government of Catalonia to Agrotecnio during recent years was also parallel to their interest in taking part of the Board of Trustees of the center, which could herald a new exciting stage of consolidation for Agrotecnio.

## b. New structure and composition

Agrotecnio is the research center run by the Agrotecnio Foundation as a legal structure. The current statutes of the Agrotecnio Foundation comprise 41 articles that govern the operation of the center. The statutes set out the organizational structure, legal framework, mission, vision, and activities of the Agrotecnio Center, including its economic basis, labor regimes, governing and advisory boards, and operational principles.

The current Agrotecnio governing body (Patronat) comprises four members each representing UdL and IRTA. The Agrotecnio President and Vice President are the UdL Rector and IRTA Director, respectively. IRTA cedes one of its seats to the General Director of Research (Government of Catalonia) thus ensuring direct representation of the Government of Catalonia in the decision-making board.

The Generalitat de Catalunya is likely to play a more prominent role beginning in 2024.

Specifically, DACC has expressed interest in taking a role on the Board of Trustees, together with the General Directorate of Research. This will require a change of the current Agrotecnio statutes, increasing the number of Patronat members to 12 (six each from UdL and the Government of Catalonia, the latter comprising three representatives of DACC, two of DGR and one of IRTA). The presidency will remain with the Rector of the UdL while the vice-president of the Board will be a member of DACC.

This change in the structure of Agrotecnio also responds to the requirement of the Catalan Science Law, which obliges the Department of the Generalitat to be incorporated into its management bodies. In any case, the new Agrotecnio statutes with the involvement of the Government of Catalonia will embed the center more firmly in the regional agrifood research ecosystem.

### c. Mission and activities of the center

**The current Agrotecnio statutes state that the mission is to carry out high-impact agrifood research for the benefit of an array of stakeholders. Specifically, article No. 5 of the statutes focuses activity on the promotion, development, transfer, training, and management of agrifood research.** Such general objectives are concretized in eight non-exclusive activities:

- To identify and promote research in the agrifood sector, contributing to the technological progress and knowledge transfer.
- To stimulate interdisciplinary cooperation between the research groups and other public and private institutions in the field of sciences, the environment, health and agrifood technologies.
- To attract research funds for the development and delivery of the Agrotecnio mission, with efficient management of human and economic resources.
- To disseminate research outcomes to society and to support innovation and technology transfer to the productive agrifood sector.
- To promote education and the specialized training of researchers, technicians, support staff and professors.
- To allocate scholarships and other economic funds for research studies, national and international research internships, and for the acquisition of infrastructure and facilities.
- To support researchers in Lleida, helping to maximize their impact.
- To participate in the coordination of research policies and derived activities of the agrifood sector in Catalonia.

### 3. SWOT analysis

#### a. Succinct SWOT

The strengths, weaknesses, opportunities and threats pertinent to the Agrotecnio Center are summarized in **Table 2**, and are explained in more detail in **Section 3.2**.

**Table 2** – Succinct SWOT analysis of the Agrotecnio Center

STRENGTHS	WEAKNESSES
<ol style="list-style-type: none"> <li>1. Nationally and internationally recognized research groups and individuals</li> <li>2. Coverage of the entire value chain, from production to processing and delivery to the consumer by leveraging Agrotecnio’s excellent underpinning science</li> <li>3. Unique expertise and demonstrated ability to conduct research under real field conditions</li> <li>4. Strong track record in providing professional consultation and advice, and high-quality training to diverse stakeholders</li> </ol>	<ol style="list-style-type: none"> <li>1. Limited core funding impedes growth and long-term planning</li> <li>2. The mean age of permanent staff is high</li> <li>3. Insufficient infrastructure of laboratory equipment and experimental fields/farms/pilot plants</li> <li>4. Inadequate recognition of research activity by the UdL</li> <li>5. Poor visibility of the Agrotecnio brand and the impact of its research</li> </ol>
OPPORTUNITIES	THREATS
<ol style="list-style-type: none"> <li>1. Increasing societal concern about the environment and healthy food</li> <li>2. New sources of public funding</li> <li>3. Availability of new technological tools</li> <li>4. Need of stakeholders to keep pace with the changing legal and economic landscape</li> </ol>	<ol style="list-style-type: none"> <li>1. Perceived/real overlap of activities in the Catalan research sector</li> <li>2. Public funding opportunities declining in the agrifood sector and companies are not proactive in funding research</li> <li>3. Regulatory uncertainty affecting agrifood products and inputs</li> <li>4. Difficulties in recruiting young national and international staff</li> </ol>

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## **b. Detailed SWOT**

### **STRENGTHS**

#### **S1. Nationally and internationally recognized research groups and individuals**

Many Agrotecnio research activities enjoy exceptional national and international recognition at the group and individual researcher levels, representing substantial contributions in the fields of agriculture, forestry, animal and food sciences. Agrotecnio researchers achieve a profound impact through prolific academic research outputs, active participation in collaborative projects, hosting visiting scientists, and serving on international committees. Most Agrotecnio research groups are located on the same university agrifood campus, a unique arrangement in Catalan and Spanish universities (which generally have separated disciplinary campuses). Agrotecnio has expertise and excellent infrastructure for the hosting of scientific events. Agrotecnio also benefits from an extensive network of national and international collaborations. Agrotecnio's research groups are respected members of the Catalan R&D ecosystem, contributing to international panels and decision-making bodies, showcasing their influence on a broader scale. Furthermore, many Agrotecnio groups develop and use cutting-edge technology, advanced simulation tools, state-of-the-art facilities, and have a robust infrastructure. This conducive environment for research underscores Agrotecnio's dedication to facilitating groundbreaking discoveries and maintaining a position at the forefront of scientific innovation.

#### **S2. Coverage of the entire value chain, from production to processing and delivery to the consumer by leveraging Agrotecnio's excellent underpinning science**

Agrotecnio research programs offer comprehensive coverage of the entire agricultural and food production value chain, spanning fundamental science and production to processing and delivery to the consumer. Within the CERCA network of research centers, Agrotecnio has a diverse portfolio of research projects and funding sources that ensures broad coverage of the value chain as well as financial resilience. All research groups collectively identify and pursue translational activity areas and strategic research actions, fostering a synergistic environment. Importantly, Agrotecnio's strategic objectives align groups and research projects with the SDGs, unlocking additional funding opportunities and reinforcing the commitment to addressing societal and environmental challenges. The inclusion of well-funded industry projects underscores the practical application of research findings, emphasizing a forward-looking approach to innovation within the agricultural and food production sectors.

### **S3. Unique expertise and demonstrated ability to conduct research under real field conditions**

Agrotecnio research programs offer expertise and a demonstrated ability in conducting research under authentic field conditions. A number of Agrotecnio research groups have the ability to harness cutting-edge technology, often spearheading advancements within their own domains to reach challenging applied and translational objectives. Their proficiency extends to the development and implementation of long-term experiments, illustrating a commitment to in-depth and durable investigations. Notably, Agrotecnio has a strong track record in delivering high-quality research directly applicable to the agrifood sector. By prioritizing industrially-relevant topics over model systems, Agrotecnio positions itself as an appealing collaborator for industry stakeholders, emphasizing a practical and results-oriented approach that aligns with the needs of the broader industrial landscape.

### **S4. Strong track record in providing professional consultation and advice, and high-quality training to diverse stakeholders**

Agrotecnio has built a robust reputation for its top-tier students and technicians, meeting the demands of various stakeholders through tailored training programs. These programs are strategically designed to align with the evolving needs of the agrifood industry, ensuring that graduates are well-prepared for future employment opportunities. Agrotecnio provides high-quality academic teaching and training programs that encompass the agrifood technology sector, spanning undergraduate and graduate levels, and technicians and professionals in the sector. Moreover, it goes beyond traditional academic boundaries to address the requirements of policymakers and regulatory bodies. This commitment is delivered by utilizing extensive scientific dissemination and communication channels, including mainstream and social media, as well as targeted outreach and engagement. By adopting a multi-channel approach, Agrotecnio effectively engages with audiences of all age groups, facilitating a comprehensive and inclusive dialogue with stakeholders, including the general public.

## **WEAKNESSES**

### **W1. Limited core funding impedes growth and long-term planning**

The absence of substantial core funding is a major obstacle that hinders the growth and long-term planning capabilities of the Agrotecnio Center. Unlike other research centers in Catalonia, which have long enjoyed the stability of core funding, Agrotecnio only received a modest amount of such funding, for the first time since its foundation, in the fourth quarter of 2023. The prospect of funding continuing at this level or even increasing in the future provides reason for optimism. The historical lack of core funding has had cascading effects, particularly in talent retention. Without a stable financial foundation, it is difficult to offer long-term positions to senior staff, resulting in the loss of invaluable expertise and competences. The prospect of insufficient funding and limited career prospects in turn dissuades both students and mid-level researchers

(R2/R3) from pursuing agrifood research, making it very challenging for Agrotecnio to attract and retain talented individuals, thus negatively impacting succession planning. Only a very limited number of early-stage researchers are currently in Agrotecnio research groups.

## **W2. The mean age of permanent staff is high**

The lack core funding until late 2023 combined with the imminent retirement of a number of senior principal investigators makes succession planning within Agrotecnio research groups a very difficult task. The replacement of retired members in many groups is currently decided according to teaching needs at the university rather than research needs. The limited replacement of retired researchers may result in the loss of scientific and technical capacities.

## **W3. Insufficient infrastructure of laboratory equipment and experimental fields/farms/pilot plants**

Despite the remarkable growth of Agrotecnio's laboratory infrastructure in recent years, current experimental fields/farms/pilot plants are not sufficient to carry out experiments on a commercial scale and such experiments must be carried out in the premises of commercial companies with little technical support. This is particularly limiting when working in natural systems. In some cases, the availability of facilities with upgraded capacities would strengthen collaborations with stakeholders.

## **W4. Inadequate recognition of research activity by the UdL**

Stronger research groups are not positively supported by UdL in the form of PhD fellowships, technicians, spaces and other resources. Furthermore, the lack of a career path leading to permanent research positions (rather than teaching positions) at UdL reduces the impetus to intensify research. Currently, the distribution of resources at UdL is exclusively based on the teaching load.

## **W5. Poor visibility of the Agrotecnio brand and the impact of its research**

Agrotecnio has identified three major bottlenecks that currently hinder the valorization of its research outputs: the regulatory environment, public acceptance, and the translation of research to the market. The effect of these bottlenecks can be illustrated here with two examples: (1) the lack of advertising campaigns on services that are or can be provided to companies, and (2) the low valorization capacity of research, with only five patents registered and only one licensed. Agrotecnio also lacks a communication plan to determine the key messages and channels that are most suitable for the engagement of particular stakeholders.

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## **OPPORTUNITIES**

### **O1. Increasing societal concern about the environment and healthy food**

The public is increasingly aware of the importance of measures to protect the environment and ensure food is safe and healthy, particularly with regard to policy development in the areas of sustainability, sustainable intensification, climate change, biodiversity protection, decarbonization, alternative protein sources, and the One Health Initiative. There is also growing interest in food security, food safety and food quality in general. All these topics fall within the scope of Agrotecnio's research.

### **O2. New sources of public funding**

New funding sources are being made available to bridge research gaps and develop sustainable solutions for the agrifood industry, including many national projects as well as Horizon Europe and other European instruments. Funding is offered not only for projects directly related to the agrifood industry, but also to indirectly relevant topics such as fertilizer production, integrated pest management and energy conservation. Funding bodies are expanding their calls for industry-research partnerships. New projects (particularly from industry) may become available as Spain participates in the development of genome edited crops in Europe.

### **O3. Availability of new technological tools**

Technologies such as artificial intelligence/machine learning, remote sensing, the Internet of Things, digital twins, precision agriculture and robotics are increasingly being applied in agriculture. When leveraged effectively, such technologies can enhance the efficiency of agricultural production and the agrifood industry in general.

### **O4. Need of stakeholders to keep pace with the changing legal and economic landscape**

The agrifood industry is more resilient than most sectors and should lead the recovery by supporting research. In this context, agrifood producers and companies will require tailor-made solutions from researchers and experts with a deep knowledge of the social and economic context, as well as the legal and regulatory landscape. Similarly, policymakers can benefit from Agrotecnio expertise. Agrotecnio can take a leading role in knowledge transfer to the sector in terms of long-life training opportunities for the local and international agrifood community, as well as policymakers and regulators, by hosting international events (scientific meetings and training sessions).

## **THREATS**

### **T1. Perceived/real overlap of activities in Catalan research sector**

Historically, different actors in the Catalan research sector have faced real or perceived conflicts of interest that threaten to impede collaboration and hinder progress. This has diverted attention and limited resources, negatively impacting the future income of Agrotecnio and leading to redundant research. The situation has the potential to compromise the development of coherent research programs, hindering progress toward shared goals. To overcome these challenges, it is necessary to recognize the risks of conflict and pursue collaboration to unlock the full potential of our collective expertise in the agrifood research value chain.

### **T2. Public funding opportunities declining in the agrifood sector and companies are not proactive in funding research**

Although new public funding sources are becoming available in the agrifood sector and indirectly related areas (see Opportunity O2), the volume and scope of funding is declining and becoming more targeted (often in the pursuit of political agendas rather than scientific endeavor). Historically, Agrotecnio has relied predominantly on EU funding for its key initiatives. The agenda-driven retargeting of EU funding is a significant threat to the financial stability of Agrotecnio. The threat will increase if Spanish and Catalan funding programs align with the EU trend. Simultaneously, agrifood companies (particularly in Spain and Catalonia) do not have a strong tradition of supporting research programs, a tendency exacerbated in large multinational corporations. Both public funding bodies and industry tend to favor shorter-term programs, typically 2–3 years, making it difficult to support long-term research projects, such as field experiments. Complicating matters further, industrially supported applied research is often difficult to publish in higher-tier, peer-reviewed journals, limiting the visibility and dissemination of valuable insights gained through such activities.

### **T3. Regulatory uncertainty affecting agrifood products and inputs**

Several Agrotecnio groups face challenges based on the uncertain regulatory framework governing agrifood products, inputs and enabling technologies. The threat is exacerbated by the stringent, non-science-based regulations imposed at the EU level. The affected technologies include genetically modified (GM) and genome-edited crops, as well as pest control chemicals, innovative food additives and novel food processing enzymes. The regulatory uncertainty introduces a layer of complexity, hindering the advancement of Agrotecnio research initiatives and potentially impeding the translation of groundbreaking discoveries into tangible solutions for the agrifood sector. The delicate balance between innovation and regulatory compliance underscores the need for strategic navigation and advocacy to ensure the viability and societal benefit of Agrotecnio endeavors in the face of evolving regulatory landscapes.

### **T4. Difficulties in recruiting young national and international staff**



The low salary for PhD students and postdoctoral fellows in Spain and Catalonia makes it difficult to attract high-quality international researchers and incorporate them into the organization. Accordingly, the Agrotecnio brand is not yet well known. Moreover, Lleida competes with Barcelona and other major cities that are better known for their research. Finally, bureaucracy at different levels makes it difficult to host international PhD students.

### **c. General recommendations derived from the SWOT analysis**

The following recommendations were derived from the SWOT analysis by combining information from different quadrants. They are named according to these quadrants – for example, SO combines strengths and opportunities, ST strengths and threats, etc.

- SO1 – Ensure principal investigators are made aware of new opportunities for grant applications.
- SO2 – Provide support for grant application preparation, project management and reporting, and technology transfer.
- SO3 – Promote interdisciplinary/transdisciplinary links between research groups (within Agrotecnio and with external groups), and establish an internal call for Agrotecnio seed funding.
- SO4 – Offer science-based policy advice for policymakers and public authorities to raise awareness and to influence future funding calls.
- SO5 – Design an impact strategy to leverage Agrotecnio scientific achievements.
  
- ST1 – Promote cooperation internally and externally with stakeholders to encourage translational science in response to global challenges.
- ST2 – Implement a mentoring system for PhD students, postdocs and new permanent staff
- ST3 – Engage stakeholders in the agrifood sector by involving them in joint research programs within Agrotecnio
  
- WT1 – Take advantage of the industrial doctorates program to raise awareness of research and innovation benefits for industries (T3) and move part of the research to commercial facilities (W3).
- WT2 – Develop joint applications with external groups for large infrastructure or equipment calls.
- WT3 – Consider succession planning to achieve long-term viability by designing an appropriate open recruitment system.
- WT4 – Develop and implement a communication plan.
  
- WO1 – Procure funding from philanthropic entities or private donors.

## 4. Strategic Objectives

The Agrotecnio statutes articulate the center's mission and five **strategic objectives** to drive progress in research, technology transfer, good governance, impact creation and communication activities, respectively. The comprehensive SWOT analysis discussed in **Section 3** sets out the internal and external factors that will either impede or facilitate progress towards these objectives, which are listed below.

- **Strategic objective 1** – Harness Agrotecnio's fundamental science outcomes as a basis for high-impact **translational research** in the agrifood sector. Agrotecnio will draw on its diverse expertise spanning crop, environmental, animal, food and nutritional sciences. This multidisciplinary approach will address the varied interests of a diverse range of stakeholders. For example, Agrotecnio's research will advance the implementation of the **One Health Initiative**, emphasizing an integrated approach that harmonizes and optimizes the health of individuals, animals, plants, and the environment.
- **Strategic objective 2** – Establish a robust **knowledge and technology transfer system** ensuring the seamless dissemination of research outcomes to Agrotecnio's stakeholders. The center will develop a suite of approaches that address the specific needs of stakeholders across the agrifood value chain at the national and international levels.
- **Strategic objective 3** – Streamline the **governance of the center** to support its research and non-research activities. The management of the center will be guided by principles of efficiency and transparency, with organizational structures and management bodies that are responsive to the specific requirements of the research groups while meeting the highest ethical standards.
- **Strategic objective 4** – Communicate Agrotecnio's research and non-research achievements to society by formulating and implementing an **outreach and communication strategy** that ensures the effective dissemination of all Agrotecnio activities to its broad spectrum of stakeholders.
- **Strategic objective 5** – Optimize the **impact of Agrotecnio activities** to maximize the cost-benefit return to society. The center will strategically design its portfolio of activities to match the needs of its target stakeholders.

## 5. Research

### a. General concept

The EU has introduced initiatives such as the European Green Deal and its Farm to Fork strategy to promote a gradual and irreversible change in agrifood production, making it more sustainable, minimizing its environmental footprint, and ensuring greater

resilience to climate change. The Farm to Fork strategy aims to protect the environment and associated ecosystems. However, implementation of the Green Deal is constrained by lack of appropriate and effective instruments and the concomitant financial burden call for sustained and long-term investments in R&D and innovation in the agrifood sector.

A recent consensus report from the United States National Academies of Sciences, Engineering and Medicine proposed that the following technological goals should be pursued by agrifood R&D and innovation to ensure that farmers continue to provide high-quality and sustainable products at the local and global scales: prioritize transdisciplinary approaches, develop new electronic sensors throughout the agrifood chain, strengthen data science and artificial intelligence, exploit the use of genomics and genetics, and increase the understanding of animal, soil and plant microbiomes. The report arrives at five specific conclusions about the R&D system of the North American agrifood sector: (a) material and human capital investments are needed to carry out cutting-edge research in the agrifood system, (b) the extension system deserves continued support because it is essential to effectively translate research in the agrifood sector, (c) current public and private funding for agrifood research is insufficient to address critical areas of advancement over the next decade, (d) renewed interest in food and agriculture will be necessary to engage non-farm professionals and excite the next generation of students, and (e) a better understanding of the links between the biophysical and socioeconomic sciences is necessary to support more effective policy design.

The Agrotecnio research strategy is fully embedded in this philosophy, reflecting the most recent trends and developments in the agrifood sector. This is reflected in Strategic Objective 1 of the current Agrotecnio Strategic Plan:

*“Harness Agrotecnio’s fundamental science outcomes as a basis for high-impact translational research in the agrifood sector. Agrotecnio will draw on its diverse expertise spanning crop, environmental, animal, food and nutritional sciences. This multidisciplinary approach will address the varied interests of a diverse range of stakeholders. For example, Agrotecnio’s research will advance the implementation of the One Health Initiative, emphasizing an integrated approach that harmonizes and optimizes the health of individuals, animals, plants, and the environment”.*

However, the delivery of this strategic objective is dependent on two key underpinning activities:

1. **Development of fundamental knowledge:** Advance understanding of crop, forest, animal and food sciences and their interactions with the environment, integrating this knowledge into systems biology approaches.
2. **Application of knowledge for comprehensive agricultural and food chain improvement, nurturing quality, sustainability, and health:** Utilize insights to

develop new crop varieties, animal breeds and holistic practices that enhance production, quality, sustainability, safety and health-related attributes throughout the agrifood supply chain.

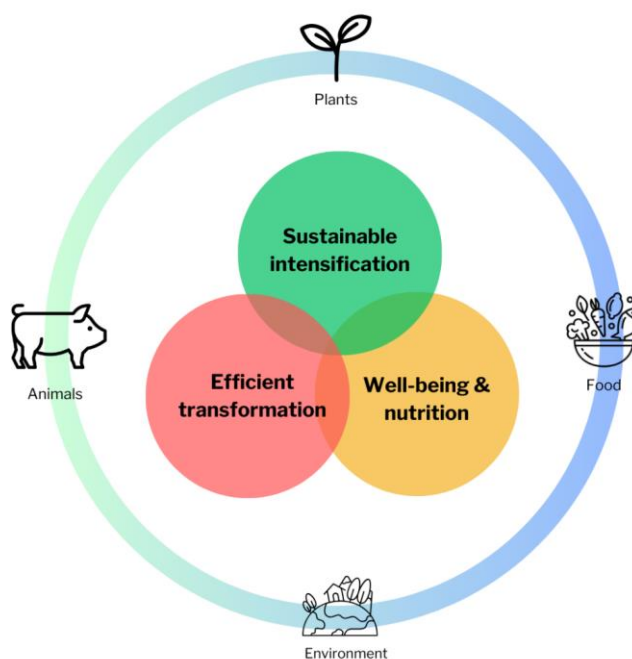
In practical terms, Agrotecnio's first strategic research objective will be implemented by establishing a cutting-edge research program underpinned by its outstanding fundamental science, and importantly Agrotecnio's ability to excel in translational research. In moving forward, Agrotecnio will utilize new tools to explore relationships between plants and environment by (1) acquiring data that has been difficult or impossible to access, (2) improving production and breeding efficiency by environmental monitoring and modelling, (3) developing strategies for optimal processing, preservation and distribution to ensure the delivery of high-quality, safe, and sustainable products, and (4) training future generations in new technological solutions.

Agrotecnio's research programs will be integrated into one of its 13 **Research Lines**, which are summarized below:

1. **Crop Improvement:** The development and management of crops to achieve higher and more sustainable yields, resilience to biotic and abiotic stresses with enhanced nutritional value.
2. **Livestock Improvement:** The development of tools and methods to support livestock selection, production and management, thus increasing productivity, sustainability, product quality and disease and stress resistance.
3. **Monitoring and preservation of Water and Soil Health:** The development of quality assessment tools, remediation methods and predictive models to ensure the protection of soils, sediments, surface water and groundwater from any potential anthropogenic environmental impacts arising from agrifood activities, as well as the analysis of plant-microbe relations in the soil to achieve greener agriculture and better environmental management.
4. **Host-Microbiome Interactions:** The analysis of microbes associated with livestock to improve nutrient mobilization and animal health and productivity.
5. **Phenotyping and Monitoring:** The development of advanced phenotyping and monitoring technologies to generate more efficient cultivars and more sustainable agricultural and livestock practices, also relying on Agrotecnio's expertise in precision agriculture and livestock farming. Developing and testing suitability of surrogates from relevant plant- crop- and animal-physiology and -production traits to be tested with high-throughput phenotyping technologies.
6. **Climate Change Mitigation/Resilience:** The analysis of carbon sequestration, water-use efficiency, temperature resilience, reproduction capacity, and seed production to develop climate-resilient crop and livestock varieties, and resilient forests.
7. **Plant Biotechnology Tools and Applications:** The development of new tools, including transgenesis and genome editing to leverage plant-based biofactories for value-added products and applications and contribute towards crop and environmental sustainability.

8. **Genetic Resources Management:** The characterization of existing diversity for agronomic and forest applications and climate adaptation, to exploit genetic resources to improve sustainability.
9. **Digital Data Management and Exploitation:** The standardization and management of digital data for interpretation, ensuring secure storage and accessibility and promote the use and development of techniques related to Big Data, Artificial Intelligence, Spatio-temporal analysis and Computer Vision for more efficient and sustainable agriculture, forestry and livestock farming.
10. **Invasive Species:** The development of strategies to prevent the entrance and establishment of invasive (micro)organisms and to facilitate the diagnosis and detection of allochthonous organisms.
11. **Food Safety, Food Security and Food Quality:** The development of strategies and technologies to ensure food security, quality and safety, in the context of climate change by introducing measures to prevent food hazards in the food production environment, thus safeguarding the integrity of food systems.
12. **Enhanced Food Processing Technologies:** The exploration of advanced processing technologies for the sustainable improvement of food quality, safety, and preservation, incorporating the latest innovations in food science and technology.
13. **Novel foods:** The development of novel food products with improved nutritional properties aligning with health and dietary requirements, focusing on functional foods that contribute to overall health and well-being.

The 13 Research Lines are related to the four main Agrotecnio R&D domains (Agriculture, Environment, Food, and Health) and three thematic areas (Sustainable intensification, Efficient transformation, and Nutrition & Wellbeing) as shown in **Figure 1**.



**Figure 1** - The Agrotecnio research strategy.

**Table 3. Key capacities of the 15 Agrotecnio research groups. The table shows the contribution of each group to the 13 Research Lines**

	A	AB	AM	ANE	APB	CPro	CPhy	BR	EPC	FBC	FM	GRAP	NTFP	PBT	PP
RL 1	Plant & Environmental Sciences				Plant & Environmental Sciences	Plant & Environmental Sciences	Plant & Environmental Sciences		Plant & Environmental Sciences			Plant & Environmental Sciences			Plant & Environmental Sciences
RL 2		Animal Production & Environmental Sciences						Animal Production & Environmental Sciences				Plant & Environmental Sciences			
RL 3	Plant & Environmental Sciences								Plant & Environmental Sciences		Plant & Environmental Sciences				
RL 4		Animal Production & Environmental Sciences		Animal Production & Environmental Sciences											
RL 5						Plant & Environmental Sciences	Plant & Environmental Sciences					Plant & Environmental Sciences			Plant & Environmental Sciences
RL 6	Plant & Environmental Sciences	Animal Production & Environmental Sciences		Animal Production & Environmental Sciences			Plant & Environmental Sciences		Plant & Environmental Sciences		Plant & Environmental Sciences				Plant & Environmental Sciences
RL 7					Plant & Environmental Sciences										
RL 8						Plant & Environmental Sciences	Plant & Environmental Sciences				Plant & Environmental Sciences				Plant & Environmental Sciences
RL 9												Plant & Environmental Sciences			
RL 10						Plant & Environmental Sciences									
RL 11		Animal Production & Environmental Sciences	Food Sciences		Plant & Environmental Sciences			Animal Production & Environmental Sciences				Plant & Environmental Sciences	Food Sciences	Food Sciences	
RL 12			Food Sciences							Food Sciences			Food Sciences	Food Sciences	
RL 13										Food Sciences			Food Sciences	Food Sciences	



A - Agronomy; AB - Animal Breeding; AM - Applied Mycology; ANE - Animal Nutrition and Environment; APB - Applied Plant Biotechnology; CPro - Crop Protection; CPhy - Crop Physiology; BR - Bovine Reproduction; EPC - Environmental Physical Chemistry; FBC - Food Bioactive Compounds; FM - Forest Management; GRAP - AgroICT and Precision Agriculture; NTFP - New Technologies for Food Processing; PBT - Post-harvest Biology and Technology; PP - Plant Phenomics.

The COVID-19 pandemic has tragically shown us the fragility of our society, as well as the importance of international action to find a solution to a global problem. However, it also reinforced the social recognition of the importance of food production, transformation and distribution, which could not stop even during the strictest lockdowns. In this context, society may be more responsive in the future to the demands of agriculture which we have been unable to meet in the past few decades.

## b. Operational objectives

Agrotecnio's first strategic objective will be driven by a cutting-edge research program involving our 13 Research Lines that are embedded in four R&D domains (Agriculture, Environment, Food, and Health) based on three thematic areas (Sustainable intensification, Efficient transformation, and Nutrition & Wellbeing). This will require positive actions to recruit and retain skilled personnel with the potential to increase the value of research by exploiting synergies between the 13 Research Lines and by developing external collaborations. These positive actions will be consolidated into four operational objectives, which are practical actions to ensure that the 13 Research Lines operate at maximum efficiency to fulfil Strategic Objective 1.

**Operational objective 1.1** – Recruit highly-qualified personnel and offer a nurturing environment with good career advancement prospects to retain the best talent within the Agrotecnio Center. The recruitment policy will prioritize deficit research areas conditioned to the economic growth of the center.

**Operational objective 1.2** – Provide incentives for interdisciplinary cooperation across the 13 Research Lines to explore and leverage synergies.

**Operational objective 1.3** – Gain added value by promoting external collaborations to reinforce the 13 Research Lines.

**Operational objective 1.4** – Develop a policy of collaborations and alliances to fill gaps in competence (such as expertise in economics or sociology) to expand the 13 Research Lines, thus increasing the breadth and scope of Agrotecnio's activities and resulting impact.

## 6. Enabling Activities

### a. Knowledge and technology transfer

**Strategic objective 2** seeks to establish a robust knowledge and technology transfer system ensuring the seamless dissemination of research outcomes to Agrotecnio's stakeholders. Agrotecnio researchers and stakeholders will select research objectives



with a translational focus to promote the rapid transfer of research results to industry and society at large. They will also promote post-graduate and technical education for scientists, entrepreneurs, farmers and technicians. Because the Agrotecnio Center embraces many fields of expertise covering the agrifood value chain, it is in a unique position to implement holistic technology transfer that realizes benefits for the general public and specific stakeholders.

Knowledge mobilization is the process by which Agrotecnio research reaches end users and other stakeholders, and it is therefore necessary to generate research impact. Knowledge mobilization through teaching and training undergraduate and graduate students may also help stakeholders and end users to develop skills for more efficient knowledge application.

### **b. Services and extension**

The goals of extension include the transfer of knowledge from researchers to stakeholders, as well as decision making support and education. Extension services have significant public-good attributes and 80% of the world’s extension services are therefore publicly-funded and delivered by civil servants. In Catalonia, most extension workers belong to the DACC or are subsidized by the government. Agrotecnio researchers are usually connected to both public and private extension workers, most of whom have been educated at UdL by Agrotecnio researchers.

By providing diverse extension services, the Agrotecnio Center establishes links and relationships with companies and other research organizations and increases the visibility of the center. Moreover, extension and service provision activities provide a two-way channel for knowledge mobilization and therefore benefit both stakeholders and researchers by keeping them up to date with trends in food production, transformation, sales, and consumption. Agrotecnio Center research groups have the broad expertise and resources needed to provide several extension services to companies and public administration bodies (**Table 4**). Service provision not only includes routine tests but often further consultation and recommendations to address complex challenges using non-routine analysis. Services are particularly valued by SMEs that often lack their own research and/or testing facilities. It is therefore increasingly necessary that these activities and personnel are adequately funded.

**Table 4** – Agrotecnio Center provision of services

Service type	Details of services provided
Animal services	Epidemiological studies (fertility, pregnancy loss, reproductive disorders) Genotyping, molecular markers and genetic evaluation for selection Analysis of milk and dairy product quality Environmental impact studies



Plant services	<p>Soil and plant quality analysis</p> <p>Genotyping, molecular markers and genetic evaluation for selection</p> <p>Epidemiological studies (plant diseases, disease vectors)</p> <p>Pest identification and diagnostics</p> <p>Field trials and assistance with the development of new crop varieties, including GM crops</p>
Services to the food industry	<p>Microbiology, including general microbial counts in foods, salmonella research, water analysis and mycotoxin analysis</p> <p>Analysis of food composition, nutrient bioavailability, antioxidant capacity, stability of food and sensory evaluation</p> <p>Development and testing of food processing technology</p> <p>Quality testing of food products including post-harvest shelf-life</p>
Consultancy service	<p>Technical assistance (experimental design and evaluation, analytics, technological evaluation)</p> <p>Patents, licensing and exploitation, technology transfer</p> <p>Policy advice, regulatory compliance</p> <p>Quality control</p> <p>Product certification and qualification</p>
Product development	<p>Market studies, competition analysis, freedom to operate, industry liaison</p>
Training	<p>Academic training, specialized training, courses industry placements</p>

### c. Intellectual property

The identification, protection and exploitation of intellectual property have been engrained in Agrotecnio since the establishment of the center, reflecting the drive towards knowledge creation, scholarship and learning, and the application and exploitation of that knowledge. Agrotecnio has a core commitment to the continuous development of policies and actions that create the best possible environment to generate intellectual property and put it to practical use. The center also recognizes that it is increasingly more challenging to protect intellectual property because of the substantial financial burden this entails. Therefore, Agrotecnio must navigate cautiously between its core commitment to protect novel Agrotecnio IP and the necessity to commit limited financial resources in a prudent and thoughtful way. The central features of this philosophy and responsibility are listed in **Table 5**.

Agrotecnio is mindful of the financial benefits of intellectual property for itself, as well as third-party collaborators and the staff who generate the intellectual property. In formulating its policy, Agrotecnio takes the view that the most important benefits will

not arise principally from specific royalties, payments or sales of spin-out companies associated with particular cases of intellectual property commercialization, at least in the short to medium term. Instead, Agrotecnio recognizes that, by adopting a policy which is explicitly generous to the originators of intellectual property, key benefits (including financial gains) will arise from the ability of the center to demonstrate consistently excellent and forward-looking intellectual property management in all dimensions of research and teaching across Agrotecnio and its wider business development activities. However, Agrotecnio is also mindful that its reputation as a professional and successful developer of research will depend in part on the extent to which the specific projects it supports are financially successful in their own right. Agrotecnio therefore seeks to ensure that direct financial gains from commercialization activities cover all the associated costs of maintaining or accessing a professional technology transfer infrastructure from external grants, funding and business successes, and that wherever possible a surplus should be generated for the center over and above the recovery of those costs, to be reinvested in further intellectual property protection and commercial technology transfer activities.

**Table 5** - Central tenets of the Agrotecnio Center philosophy on intellectual property

Mission	Application
Incentivize	Clear incentives to staff to create intellectual property beyond those normally offered by universities
Actualize	Effective, efficient, transparent and user-friendly services which can evaluate and protect the intellectual property, and then decide on the most appropriate arrangements for its transfer into use
Valorize	Arrangements for sharing any returns from the commercialization of intellectual property which provide for rewards to inventors, based on an approach which is entirely compatible with academic freedom and career development

The protection of intellectual property ensures that inventions and other tangible or non-tangible property generated through research and other activities involving Agrotecnio are appropriately documented and protected through the relevant legal frameworks. Agrotecnio aims to balance these reputational and value benefits by articulating a policy to ensure that it (1) receives recognition as a thought-leader in (commercial) technology transfer, (2) develops translational research opportunities to a significant level, (3) covers the costs of technology transfer through business successes and external funding, and (4) enforces the policy described herein by binding all personnel to accept the corresponding principles and arrangements. Agrotecnio will therefore develop an intellectual property policy which will embrace internationally accepted best practices, related international agreements and instruments consistent

with the notion that the protection of intellectual property rights is essential to maintaining economic growth. The principles of this commitment are summarized in **Table 6** and will be the foundation of an in-depth and detailed document describing Agrotecnio's IP policy in the future.

**Table 6** - Agrotecnio Center intellectual property policy commitments

#### **Commitment**

Optimize the creation of intellectual property by facilitating fundamental research and discovery.

Optimize the development of intellectual property and the practical application of new knowledge by encouraging innovation and providing incentives for commercialization.

Maximize the competitive advantages of the center as a workplace for outstandingly creative researchers by adopting intellectual property policies geared to the interests of inventors.

Promote success in recruiting, developing and retaining outstanding people who wish to engage in and commit to the commercialization of intellectual property by creating generous and flexible financial incentives.

Generate revenues through the commercialization of intellectual property and thereby gain a reputation for business success, technology transfer and a positive impact on society.

Agrotecnio currently lacks the financial resources to hire a full-time appropriately qualified individual to manage its intellectual property activities and instead relies on the UdL Technology Transfer Office for such support. The UdL strategy for intellectual property protection is also constrained by a severely limited budget. In moving forward, Agrotecnio needs to establish its own intellectual property management capabilities and modus operandi to maximize the protection and exploitation of its intellectual property portfolio.

#### **d. Teaching and training**

Most of the Agrotecnio Center principal investigators are also UdL personnel with a track record of research, teaching and technology transfer of up to 30 years. They are involved in UdL training activities at all levels, including Bachelor's, Master's, PhD and specific training programs focusing on particular agrifood disciplines. Students often stay in the Agrotecnio Center to begin research careers there, or take posts at other research centers, or in industrial or governmental roles, thus providing strong support and further developing our extensive network of collaborative research in the agrifood sector. A

complete list of UdL teaching courses can be found on the university website (<https://www.udl.cat/ca/en/>). Agrotecnio researchers associated with the University of Barcelona also have permanent teaching positions in the same framework. Most technicians operating in the Catalan agrifood sector have been educated by Agrotecnio researchers and this favors knowledge mobilization and technology transfer. Specialized education and technical courses are also commissioned by companies and cooperatives. Such advanced training offers an excellent cost/benefit ratio and increases the visibility of Agrotecnio and the prominence of its research activities.

Agrotecnio PhD programs have been awarded Official Excellence accreditation by the Spanish Ministry of Education. This is the highest accreditation that can be granted and thus recognizes the exceptional quality of the PhD program as defined by the Ministry of Education and Science Order EDU/3429/2010. Under the quality statutes that govern all UdL PhD programs, Agrotecnio training activities are subjected to *ex ante* assessment by one of two official agencies recognized by the European Association for Quality Assurance in Higher Education (ENQA): ANECA (National Agency for Quality Assessment and Accreditation of Spain) and AQU (Catalan University Quality Assurance Agency). Our educational programs are also subjected to *ex post* evaluation by high-level external committees selected by AQU. These committees include national and international experts from the public and private sectors. The Agrotecnio Center also has internal benchmarking and evaluation procedures which are used to monitor its teaching activities.

These training programs offer a high degree of international visibility because they are supported by Agrotecnio Center principal investigators with strong international profiles, extensive national and international collaborative networks, and active research programs and leadership in their specialized fields. **Table 7** summarizes the educational and training programs in which Agrotecnio researchers participate under the umbrella of UdL, ETSEAFIV, CIHEAM-IAMZ or together with other universities in interuniversity doctoral programs under the umbrella of campus Iberus.

**Table 7** – Agrotecnio Center educational and training programs offered in collaboration with UdL, ETSEAFIV, CIHEAM-IAMZ and campus Iberus.

Degree level	Topic
Bachelor’s	Agronomy, Forestry, Food Technology, Biotechnology, Veterinary Medicine, Nature Conservation.
Master’s	Agrifood Production Systems, Integrated Pest Management, Innovation in the Food Industry, Plant Genetics, Genomics and Breeding, Soil & Water Management, Forest Fire Prevention, Pork Production & Health, Spatial & Ecological Modeling in European Forestry, Mediterranean Forestry and Natural Resources Management, Biomedicine.
PhD	Agrifood Sciences & Technologies, Multifunctional Management of

Forestry Surfaces, Animal Production & Health, Efficient Systems of Production and Agrifood Quality (Iberus Program).

### e. Policy advice and consulting

The services provided by Agrotecnio researchers include advice to international, national and regional governments needing to prepare legislation governing the agrifood sector. Several processes in the agrifood value chain are closely related to the environment, food commercialization and/or food consumption. Food marketing and consumption are therefore under constant scrutiny by organizations that influence legislators. Under this pressure, scientific advice is particularly necessary for appropriate decision making. Several international organizations play this role, such as EFSA and EPPO. Agrotecnio cooperates with such organizations by leveraging the scientific expertise and track record of its researchers.

### f. Stakeholder engagement and Societal Outreach

Stakeholder engagement can be defined as a combination of listening to, collaborating with and/or informing stakeholders (individuals or entities that can potentially benefit from Agrotecnio research). This process begins by identifying, mapping and prioritizing stakeholders to determine the best tactics for effective communication while making the best use of available resources. Stakeholder engagement can mitigate potential risks and conflicts with stakeholder groups.

It is important that stakeholders understand why Agrotecnio exists, its mission and its strategic objectives. The key Agrotecnio stakeholders, as set out in the Impact Strategy Document, must therefore align with the strategic direction of Agrotecnio so they can become advocates for its mission and facilitate the achievement of these objectives.

### g. Operational objectives

Agrotecnio's second strategic objective is to develop a robust **knowledge and technology transfer system** that ensures the seamless dissemination of research outcomes to Agrotecnio's stakeholders. This will involve the implementation of five operational objectives:

**Operational objective 2.1** – Support research groups in their knowledge and technology transfer activities by hiring professional and qualified supporting staff to oversee this process.

**Operational objective 2.2** – Develop an intellectual property policy for Agrotecnio congruent with its statutes and by-laws.

**Operational objective 2.3** – Cooperate with tertiary education institutions to deliver high-quality teaching and training programs.

**Operational objective 2.4** – Offer science-based policy advice to policymakers and public authorities.

**Operational objective 2.5** – Assemble a comprehensive database of stakeholders to facilitate our communication activities (Section 8).

## 7. Governance and management of the center

### a. Overview

As the Agrotecnio Foundation commences its latest phase of strategic development, the anticipated involvement of Generalitat de Catalunya will require the statutes governing the center to be revised. The increase in core funding allocated by Generalitat will allow the center to reinforce its research and non-research activities and consolidate its position in the map of the CERCA centers in Catalonia. The governance and management system of the center must therefore adapt to the new strategy in order to maximize the return on investment and the outcomes of Agrotecnio research. Specifically, the Agrotecnio research team is growing but the management team still comprises only two individuals. Currently, UdL provides support with basic management services but it is necessary for Agrotecnio to progressively develop and enlarge its own management system.

The fourth Agrotecnio strategic objective is to streamline the **governance of the center** in order to support its research and non-research activities while upholding the principles of transparency, efficiency and high ethical standards. We have defined several areas with operation objectives to ensure that the management of the Agrotecnio Center meets these requirements: (1) governance structure, (2) financial management, (3) human resources, (4) support services, and (5) infrastructure and facilities.

### b. Governance structure

The new governance structure of the Agrotecnio Center will involve a transition from the governance structure set out in the current statutes (Section 2b) and shown in the top part of **Table 8** to a new governance structure involving the full set of decision-making bodies and persons described in the bottom part of the same table.

**Table 8** – Agrotecnio decision-making bodies and individuals, with detailed roles

Decision-making body or person	Role
<i>Existing bodies/personnel</i>	
Board of Trustees	Representative body, meets annually, responsible for approving the strategic plan, the annual budget, investments and overall organization of the center. Empowered to appoint the Director, the

	General Manager, the chairs of the Scientific Advisory Board and other governing bodies.
President	Chair of Board of Trustees with casting vote.
Secretary	Calls meetings of the Board of Trustees and certifies agreements
Scientific Advisory Board	Steers the scientific direction of the Agrotecnio Center. Comprises 5-10 external members, meets every 2 years (plus extraordinary meetings at the request of the President)
Executive Director	Head of the Agrotecnio Center. Appointed by the Board of Trustees after an open international call. In post for a period of 4-5 years.
Internal Scientific Committee	Chaired by the Executive Director, comprising 3-20 principal investigators, non-executive role to provide advice to the Executive Director.
Associate units	Associate institutions and research groups that can complement/support the research groups of the center to accomplish with the research objectives. Current unit with CSIC Zaragoza, others to be incentivized.
<i>Bodies/personnel to be convened/instituted under the new statutes</i>	
Executive Committee	Comprises representatives of UdL and DACC plus one Agrotecnio researcher and its director (committee chair). Supports the director and executes the decisions of the Board of Trustees.
Management Committee	Composed of two principal investigators (R4), two senior researchers (R3), one post-doc (R2), one PhD student (R1) and a representative of non-research staff, chaired by the General Manager to provide advice on running the Agrotecnio Center.

General Manager	Responsible for the day-to-day running of the Agrotecnio Center. Appointed by the Board of Trustees.
Business Committee	Panel of stakeholders with Agrotecnio contracts. Role to provide commercial advice, indeterminate number of members each appointed for a period of 2 years.

The transition to the new governance structure will involve the following operational objectives:

**Operational objective 3.1** – Update the current Agrotecnio by-laws (developed in 2014) to the new statutes and the new directives of the new operating model

**Operational objective 3.2** – Appoint the Executive Committee once the new statutes are approved by the Generalitat de Catalunya

**Operational objective 3.3** – Appoint a General Manager

**Operational objective 3.4** – Invite external experts to serve on the Scientific Advisory Board and invite stakeholders to sit on the Business Committee

**Operational objective 3.5** – Convene the Management Committee

### c. Financial management

The Agrotecnio Center is funded in part by research grants and non-research activity but largely from subsidies provided by the Government of Catalonia and in-kind contributions from UdL. The more generous funding now provided by the Generalitat de Catalunya (contingent on their presence on the Board of Trustees) will allow the center to increase its operational activities, but there is still a need to diversify income streams. Accordingly, the Scientific Advisory Board made the following recommendations following their meeting in 2022: to increase research income, consider the coordination of EU projects, communicate open calls within the Agrotecnio Center, consider the provision of expert training services, try to increase industry participation/funding in research projects, and consider setting targets for the submission of proposals in each research group. Furthermore, the SWOT analysis described above led to two further recommendations: WO1, Procure funding from philanthropic entities or private donors; SO4, Offer science-based policy advice for policymakers and public authorities to raise awareness to influence future funding calls.

Therefore, Agrotecnio needs to ensure a more diverse, multi-year income stream, by inviting additional partners onto the Board of Trustees (e.g., territorial institutions such



as Diputació de Lleida), optimizing its services in non-research activities and be developing new policies in the context of philanthropy.

The financial management of Agrotecnio is currently the joint responsibility of the Head of Administration and Executive Director. The financial management of the center will become increasingly complex as it grows, so according to the statutes we also intend to recruit a financial manager dedicated to this role.

The transition to the financial management structure will involve the following operational objectives:

**Operational objective 3.6** – Develop a framework program with the Generalitat de Catalunya that guarantees multi-year funding according to fixed operational research lines and derived activities

**Operational objective 3.7** – Develop a fundraising policy that includes philanthropy and expert training opportunities (as recommended by the Scientific Advisory Board)

**Operational objective 3.8** – Expand the Board of Trustees to support the base funding of Agrotecnio

**Operational objective 3.9** – Recruit a dedicated financial manager for the Agrotecnio Center

#### d. Human resources

The Agrotecnio statutes declare that the pool of human resources at the center can include Agrotecnio personnel, associate researchers representing other public or private institutions, and various temporary posts for visiting scientists and other experts. All current Agrotecnio principal investigators are associate researchers at UdL or the University of Barcelona (i.e. there are none employed directly by Agrotecnio). These principal investigators have a high mean age, and there is not robust strategy for succession planning to ensure suitable replacements can be brought on board. CERCA and the Scientific Advisory Board have made several recommendations in relation to human resources, including the consideration of succession planning to ensure long-term viability, an open recruitment plan to attract and retain new talent, and a mentoring system to encourage career progression. These issues were also raised during the SWOT analysis (WT3). The priorities of Agrotecnio in terms of human resources therefore include the recruitment of new researchers (particularly early career researchers) and management staff using an open international call procedure inspired by the principles of meritocracy, transparency and ethics, and the encouragement of cooperation between Agrotecnio researchers and personnel at the UdL and elsewhere. This will be facilitated by establishing a nurturing environment (e.g., flexible working, career mentoring and support, an equality plan that ensures diversity and gender balance) to be incorporated directly into Agrotecnio statutes and by-laws.

The growth of the research and non-research activity of the center should be matched to the growth of the management team that facilitates such activities. Agrotecnio should

also strengthen its value chain approach and better align itself with the growing concept of “Food system research and innovation” by establishing new collaborations that provide access to external competences and expertise. However, there should be permanent professional Agrotecnio staff devoted to technology transfer.

The development of human resources at the Agrotecnio Center will involve the following operational objectives:

**Operational objective 3.10** – Recruit management staff to support the activity growth of the Agrotecnio Center.

**Operational objective 3.11** – Develop an Agrotecnio salary scheme to be integrated into the center’s by-laws, including a policy of incentives for associated researchers.

**Operational objective 3.12** – Guarantee the equity, diversity and inclusivity of the center by developing and implementing a diversity action plan.

**Operational objective 3.13** – Implement a mentoring system for PhD students, postdocs and early-career researchers with permanent positions.

In addition, closely related operational objectives are found in Section 5 relating to the recruitment of research personnel.

**Operational objective 1.1** – Recruit highly-qualified and skilled personnel and offer a nurturing environment with good career advancement prospects in order to retain the best talent within the Agrotecnio Center. The recruitment policy will prioritize deficit research areas conditioned to the economic growth of the center.

### e. Other support services

The growing Agrotecnio Center will soon require centralized support services to complement basic administration and management, including information technology (IT) support, a Data Protection Officer, EU liaison and project management support, legal counsel, specialized contract lawyers to oversee material transfer agreements and services, and ethical panels to provide guidance on experimental procedures. Currently Agrotecnio relies on UdL to provide these services and will continue to do so until the final volume scope of work and financial resources justifies the development of in-house support facilities. For specialized, one-off service requirements, the Agrotecnio Center can also sign contracts with third-party providers. The development of in-house services at the Agrotecnio Center will involve the following operational objectives:

**Operational objective 3.14** – Update the agreement with UdL for the maintenance of the support services.

## f. Infrastructure and facilities

The SWOT analysis in Section 3 identified the lack of Agrotecnio research infrastructure and facilities as a significant weakness that limits the scope of the research lines. Agrotecnio research groups are currently hosted UdL (and University of Barcelona) facilities, sharing laboratories, office space and equipment. The universities do not receive core funding for equipment acquisition/renewal which could restrict the growth of Agrotecnio groups in the future. The Agrotecnio Center must therefore establish a policy of joint infrastructure and equipment acquisition applications with other CERCA centers to benefit from their position as a member of the CERCA network. This will involve an additional two operational objectives:

**Operational objective 3.15** – Establish a prioritized list of infrastructure and facilities to be acquired by Agrotecnio.

**Operational objective 3.16** – Promote a policy of cooperation with other centers, prioritizing CERCA centers, to share infrastructure and facilities.

## 8. Communication

### a. Communication Plan

The strategic development of the Agrotecnio Center requires effective communication. Therefore, the components of this Strategic Plan must be reflected in all Agrotecnio future communication activities. Accordingly, a Communication Plan will be developed and implemented covering the 4-year period following the approval of this Strategic Plan. This will ensure that we maximize the impact of Agrotecnio's research, increase its visibility, and ensure that research outputs reach the relevant stakeholders.

Communication actions will evolve together with the center, so the Communication Plan will be a flexible and responsive document that will incorporate any future revisions, updates or additions to the current Strategic Plan. The initial version will include the following key components.

1. Communication objectives, aligned with Agrotecnio's strategic objectives
2. Target audiences and stakeholders
3. Key messages per target audience/stakeholder category
4. Most effective communication channels, tools and key actions per target audience/stakeholder category
5. Guidelines for external communications and integration with knowledge management
6. Communication matrix
7. Timeline and planning
8. Allocation of resources to communication activities

## 9. Monitoring and improvement

The SWOT analysis of our communication objectives (Section 3) will be incorporated into the Communication Plan, allowing us to address the following issues:

- **Improve awareness and visibility of the Agrotecnio brand**, starting from the center's research groups and the UdL, but then extending to other audiences such as local and international scientists, public institutions, policymakers, and the general public. (Threats 1, 4; Opportunity 2; Weaknesses 4, 5)
- **Disseminate the impact of Agrotecnio's research** to boost its recognition and relevance, as well as attracting new stakeholders, funding and collaboration partners. (Strengths 1, 2, 3; Weakness 5; Opportunity 1 and 2)
- **Promote and lobby for the importance of the agrifood sector**, leveraging public awareness of healthy food and the role of the environment. (Strengths 3, 4; Opportunity 1; Threat 3)
- **Encourage scientific careers for young people** and raise awareness of Agrotecnio's work and impact among pre-university students in the region through participation in events and the organization of visits. (Threat 4; Weaknesses 4, 5; Opportunity 1; Strength 1).
- **Spread the benefits of knowledge and technology transfer** in order to develop the center's link to the business world. (Strength 4, threat 2, opportunity 4).

Agrotecnio will develop its corporate communication strategy following the key principles of transparency, clarity and trustworthiness, based on the concept of *science communication* as the "practice of informing, raising awareness of science-related topics, and also getting involved with audiences that include, at least in part, people from outside the science community"<sup>2</sup>.

In order to expand future communication actions, the communication department will explore participation in ongoing initiatives such as communication campaigns and actions led by international organizations like the FAO, United Nations, European Commission, European Parliament, CERCA, Fundació Catalana per la Recerca, and Fundación Española para la Ciencia y la Tecnología (FECYT).

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<sup>2</sup>Science Communication definition by Science Europe: <https://scienceeurope.org/our-priorities/science-communication/#:~:text=Science%20communication%20is%20the%20practice,from%20outside%20the%20science%20community>

## b. Operational objectives

Agrotecnio's fourth strategic objective is to communicate Agrotecnio's research and non-research achievements to society by formulating and implementing an **outreach and communication strategy** that ensures the effective dissemination of all Agrotecnio activities to its broad spectrum of stakeholders. This requires a single operational objective:

**Operational objective 4.1** – Creation and implementation of Agrotecnio's Communication Plan

## 9. Impact

### a. Impact strategy

Impact defines and measures the way in which research contributes to, influences and ultimately benefits society, the environment and the economy by engaging with a broad range of stakeholders, including policymakers, organizations, industry and the general public. **Agrotecnio recognizes that all its members must participate in impact-related activities and has developed a well thought out strategy to achieve and maintain a high level of impact throughout its community.** This is presented in a separate **Impact Strategy Document**<sup>3</sup> that addresses the need to define impact, the fit with the United Nations SDGs, the types of impact, measures to maximize impact, and how to assess it with specific key performance indicators (KPIs).

Agrotecnio's impact strategy will allow the center to:

- Tailor the definition of impact specifically to Agrotecnio to ensure impact aligns with this Strategic Plan.
- Align Agrotecnio's future research strategy with national and international grand challenges and goals, thus making it relevant, useful, competitive and timely.
- Identify and include all stakeholders who stand to benefit from Agrotecnio's anticipated impacts.
- Maximize funding opportunities and increase Agrotecnio's national and international standing as a leader in translational agrifood research.
- Measure the success, relevance and durability of Agrotecnio's research outcomes.

The Impact Strategy Document identifies and discusses eight categories of impact as follows:

- Scientific and technical knowledge impact

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<sup>3</sup> [Insert URL here]

- Environmental impact
- Impact on policy
- Impact on climate change
- Commercial and economic impacts
- Social impact
- Impact on health and well-being
- Educational and cultural impact

The document also identifies and discusses three barriers to impact: regulation, public acceptance and the translation of research.

The **regulation** of the agrifood sector ensures that consumers are presented with safe, authentic and traceable products that have been manufactured using approved and (where specified) environmentally sustainable processes. Regulations governing the safety, efficacy, sustainability and authenticity of products should therefore be fit for purpose, evidence-based and divorced from political and economic expediency, focusing on the rights of consumers. Regulations that affect the work of particular Agrotecnio groups have been identified, including regulations governing GMOs/genome editing, food safety, novel foods, chemicals, animal welfare, and product traceability, sustainability and authenticity.

The **public acceptance** of agrifood products is tightly linked with the acceptance of new technologies. This is because the general public is a major stakeholder and can exert pressure on legislators. Acceptance issues are complex and often reflect ideological, economic or political positions or perceptions rather than purely scientific evidence. It is important to recognize that public acceptance of new technologies is critical to maximize the impact of Agrotecnio's innovations.

Finally, in order to ensure the effective **translation** of Agrotecnio's research, the successful exploitation of scientific innovations (the "technology push") requires a matching demand (the "market pull") and also sufficient financing to progress from proof of concept and prototypes to marketable products. The market pull is often intrinsic to the research concept because applied and translational research is carried out with the specific aim to address a problem or challenge, such as the need for crops with higher yields and greater resilience, or the need for better nutrition. The market pull or market demand can be undermined by issues regarding public acceptance (see above) but the greater challenge in the transition from R&D to the market is usually financial.

## **b. Operational objectives**

Agrotecnio's final strategic objective is to optimize the **impact of Agrotecnio activities** to maximize the cost-benefit return to society. The center will strategically design its portfolio of activities to match the needs of its target stakeholders. This will be achieved by implementing the following operational objectives:

**Operational objective 5.1** – Finalization and approval of Agrotecnio’s Impact Strategy Document.

**Operational objective 5.2** – Monitoring of Agrotecnio’s impact via quantitative performance monitoring using the most appropriate KPIs

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## APPENDICES

### List of operational objectives, calendar and KPIs:

#### Research

- **Operational objective 1.1** – Recruit highly-qualified personnel and offer a nurturing environment with good career advancement prospects to retain the best talent within the Agrotecnio Center. The recruitment policy will prioritize deficit research areas conditioned to the economic growth of the center.
- **Operational objective 1.2** – Provide incentives for interdisciplinary cooperation across the 13 Research Lines to explore and leverage synergies.
- **Operational objective 1.3** – Gain added value by promoting external collaborations to reinforce the 13 Research Lines.
- **Operational objective 1.4** – Develop a policy of collaborations and alliances to fill gaps in competence (such as expertise in economics or sociology) to expand the 13 Research Lines, thus increasing the breadth and scope of Agrotecnio’s activities and resulting impact.

#### Non-Research Activities

- **Operational objective 2.1** – Support research groups in their knowledge and technology transfer activities by hiring professional and qualified supporting staff to oversee this process.
- **Operational objective 2.2** – Develop an intellectual property policy for Agrotecnio congruent with its statutes and by-laws.
- **Operational objective 2.3** – Cooperate with tertiary education institutions to deliver high-quality teaching and training programs.
- **Operational objective 2.4** – Offer science-based policy advice to policymakers and public authorities.
- **Operational objective 2.5** – Assemble a comprehensive database of stakeholders to facilitate our communication activities.

#### Governance and Management of the Center

- **Operational objective 3.1** – Update the current Agrotecnio by-laws (developed in 2014) to the new statutes and the new directives of the new operating model
- **Operational objective 3.2** – Appoint the Executive Committee once the new statutes are approved by the Generalitat de Catalunya
- **Operational objective 3.3** – Appoint a General Manager
- **Operational objective 3.4** – Invite external experts to serve on the Scientific Advisory Board and invite stakeholders to sit on the Business Committee



- **Operational objective 3.5** – Convene the Management Committee
- **Operational objective 3.6** – Develop a framework program with the Generalitat de Catalunya that guarantees multi-year funding according to fixed operational research lines and derived activities
- **Operational objective 3.7** – Develop a fundraising policy that includes philanthropy and expert training opportunities (as recommended by the Scientific Advisory Board)
- **Operational objective 3.8** – Expand the Board of Trustees to support the base funding of Agrotecnio
- **Operational objective 3.9** – Recruit a dedicated financial manager for the Agrotecnio Center
- **Operational objective 3.10** – Recruit management staff to support the economic growth of the Agrotecnio Center
- **Operational objective 3.11** – Develop an Agrotecnio salary scheme to be integrated into the center’s by-laws, including a policy of incentives for associated researchers
- **Operational objective 3.12** – Guarantee the equity, diversity and inclusivity of the center by developing and implementing a diversity action plan
- **Operational objective 3.13** – Implement a mentoring system for PhD students, postdocs and early-career researchers with permanent positions
- **Operational objective 3.14** – Update the agreement with UdL for the maintenance of the support services
- **Operational objective 3.15** – Establish a prioritized list of infrastructure and facilities to be acquired by Agrotecnio
- **Operational objective 3.16** – Promote a policy of cooperation with other centers, prioritizing CERCA centers, to share infrastructure and facilities

## Communication

- **Operational objective 4.1** – Create and implement Agrotecnio’s Communication Plan

## Impact

- **Operational objective 5.1** – Finalize and approve Agrotecnio’s impact strategy
- **Operational objective 5.2** – Monitoring of Agrotecnio’s impact via quantitative performance monitoring using the most appropriate KPIs

**Table 9 – Operational objectives calendar**

<b>Strategic Objectives</b>	<b>Operational objectives</b>	<b>Short term (&lt; 2 years)</b>	<b>Medium term (2 - 4 years)</b>	<b>Long term (&gt; 4 years)</b>
1	1.1 Recruit highly-qualified personnel and offer a nurturing environment with good career advancement prospects to retain the best talent within the Agrotecnio Center.	X	X	X
1	1.2 Provide incentives for interdisciplinary cooperation across the 13 Research Lines to explore and leverage synergies.	X	X	X
1	1.3 Gain added value by promoting external collaborations to reinforce the 13 Research Lines.	X	X	X
1	1.4 Develop a policy of collaborations and alliances to fill gaps in competence to expand the 13 Research Lines.	X	X	X
2	2.1 Support research groups in their knowledge and technology transfer activities by hiring professional and qualified supporting staff to oversee this process.	X		
2	2.2 Develop an intellectual property policy for Agrotecnio congruent with its statutes and by-laws.	X		
2	2.3 Cooperate with tertiary education institutions to deliver high-quality teaching and training programs.	X	X	X
2	2.4 Offer science-based policy advice to policymakers and public authorities.	X	X	X
2	2.5 Assemble a comprehensive database of stakeholders to facilitate our communication activities.	X		
3	3.1 Update the current Agrotecnio by-laws (developed in 2014) to the new statutes and the new directives of the new operating model	X		
3	3.2 Appoint the Executive Committee once the new statutes are approved by the Generalitat de Catalunya	X		
3	3.3 Appoint a General Manager		X	

Strategic Objectives	Operational objectives	Short term (<2 years)	Medium term (2-4 years)	Long term (> 4 years)
3	3.4 Invite external experts to serve on the Scientific Advisory Board and invite stakeholders to sit on the Business Committee		X	X
3	3.5 Convene the Management Committee		X	X
3	3.6 Develop a framework program with the Generalitat de Catalunya that guarantees multi-year funding according to fixed operational research lines and derived activities	X		
3	3.7 Develop a fundraising policy that includes philanthropy and expert training opportunities (as recommended by the Scientific Advisory Board)		X	X
3	3.8 Expand the Board of Trustees to support the base funding of Agrotecnio		X	X
3	3.9 Recruit a dedicated financial manager for the Agrotecnio Center	X		
3	3.10 Recruit management staff to support the economic growth of the Agrotecnio Center	X	X	X
3	3.11 Develop an Agrotecnio salary scheme to be integrated into the center's by-laws, including a policy of incentives for associated researchers	X		
3	3.12 Guarantee the equity, diversity and inclusivity of the center by developing and implementing a diversity action plan	X	X	X
3	3.13 Implement a mentoring system for PhD students, postdocs and early-career researchers with permanent positions		X	X
3	3.14 Update the agreement with UdL for the maintenance of the support services	X		
3	3.15 Establish a prioritized list of infrastructure and facilities to be acquired by Agrotecnio	X		
3	3.16 Promote a policy of cooperation with other centers, prioritizing CERCA centers, to share infrastructure and facilities	X	X	X

Strategic Objectives	Operational objectives	Short term (<2 years)	Medium term (2-5 years)	Long term (> 5 years)
4	4.1 Create and implement Agrotecnio’s Communication Plan	X		
5	5.1 Finalize and approve Agrotecnio’s impact strategy	X		
5	5.2 Monitoring of Agrotecnio’s impact via quantitative performance monitoring using the most appropriate KPIs	X	X	X

**Table 10** – Operational objectives KPIs

Strategic Objectives	Operational objectives	KPIs
1	<b>1.1</b> Recruit highly-qualified personnel and offer a nurturing environment with good career advancement prospects to retain the best talent within the Agrotecnio Center.	- Number of recruited personnel
1	<b>1.2</b> Provide incentives for interdisciplinary cooperation across the 13 Research Lines to exploit and leverage synergies.	- Number of interdisciplinary projects promoted and funding secured.
1	<b>1.3</b> Gain added value by promoting external collaborations to reinforce the 13 Research Lines.	- Number of agreements & alliances
1	<b>1.4</b> Develop a policy of collaborations and alliances to fill gaps in competence to expand the 13 Research Lines.	- Number of recruited personnel
2	<b>2.1</b> Support research groups in their knowledge and technology transfer activities by hiring professional and qualified supporting staff to oversee this process.	- Recruitment of the KTT expert - Number of in-house KTT trainings and activities
2	<b>2.2</b> Develop an intellectual property policy for Agrotecnio congruent with its statutes and by-laws.	- Creation of the Intellectual Property policy
2	<b>2.3</b> Cooperate with tertiary education institutions to deliver high-quality teaching and training programs.	- Nº of institutions with which AT cooperates  - Nº of teaching and training programs Agrotecnio participated in.
2	<b>2.4</b> Offer science-based policy advice to policymakers and public authorities.	- Number of meetings or policymaking activities in which AT personnel participates. - Number of directives, strategies or any other document derived from AT’s policy advice

Strategic Objective	Operational objective	KPIs
2	2.5 Assemble a comprehensive database of stakeholders to facilitate our communication activities.	- Creation of a stakeholders list
3	3.1 Update the current Agrotecnio by-laws (developed in 2014) to the new statutes and the new directives of the new operating model	- Update Agrotecnio by-laws
3	3.2 Appoint the Executive Committee once the new statutes are approved by the Generalitat de Catalunya	- Constitution of the Executive Committee
3	3.3 Appoint a General Manager	- Appointment of the General Manager
3	3.4 Invite external experts to serve on the Scientific Advisory Board and invite stakeholders to sit on the Business Committee	- Number of invited experts - Number and affiliation of SAB members
3	3.5 Convene the Management Committee	- Convention of the Management Committee
3	3.6 Develop a framework program with the Generalitat de Catalunya that guarantees multi-year funding according to fixed operational research lines and derived activities	- Creation of the framework program
3	3.7 Develop a fundraising policy that includes philanthropy and expert training opportunities (as recommended by the Scientific Advisory Board)	- Creation and implementation of the fundraising policy - Amount of philanthropic resources secured
3	3.8 Expand the Board of Trustees to support the base funding of Agrotecnio	- Nº of Board of Trustees components increased - Funding secured from institutions represented on the Board of Trustees
3	3.9 Recruit a dedicated financial manager for the Agrotecnio Center	- Recruitment of the financial manager
3	3.10 Recruit management staff to support the economic growth of the Agrotecnio Center	- Recruitment of the management staff

Strategic Objectives	Operational objectives	KPIs
3	<b>3.11</b> Develop an Agrotecnio salary scheme to be integrated into the center's by-laws, including a policy of incentives for associated researchers	- Development of AT's salary scheme
3	<b>3.12</b> Guarantee the equity, diversity and inclusivity of the center by developing and implementing a diversity action plan	- Creation and implementation of the Equal Opportunities plan
3	<b>3.13</b> Implement a mentoring system for PhD students, postdocs and early-career researchers with permanent positions	- Creation of a mentoring plan
3	<b>3.14</b> Update the agreement with UdL for the maintenance of the support services	- Updated agreement with the UdL
3	<b>3.15</b> Establish a prioritized list of infrastructure and facilities to be acquired by Agrotecnio	- Creation of the list of infrastructure and facilities - Number of facilities established
3	<b>3.16</b> Promote a policy of cooperation with other centers, prioritizing CERCA centers, to share infrastructure and facilities	- Nº of meetings with other centers - Drafting the cooperation policy
4	<b>4.1</b> Create and implement Agrotecnio's communication plan	- Creation of AT's communication plan
5	<b>5.1</b> Finalize and approve Agrotecnio's impact strategy	- Finalization of AT's impact strategy
5	<b>5.2</b> Monitoring of Agrotecnio's impact via quantitative performance monitoring using the most appropriate KPIs	- Annual quantitative performance monitoring