LIVING LAB: Effluents and Coproducts of the Livestock Activity

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Co-Creation Workshop: Waste-to-value food and feed ingredients
Future skills and actions to enhance their uptake
Polo de Inovação da Fonte Boa, 21st june 2024

3 Extraction of food & feed

FULL RECO4US

PRR Plano de Recuperação e Resiliência
REPÚBLICA PORTUGUESA
Financiado pela União Europeia NextGenerationEU
iniav Instituto Nacional de Investigação Agrária e Veterinária, I.P.

Future perspetives
Innovation Agenda Terra Futura

TERRA FUTURA

Making agriculture grow, innovating and delivering it to the next generation.

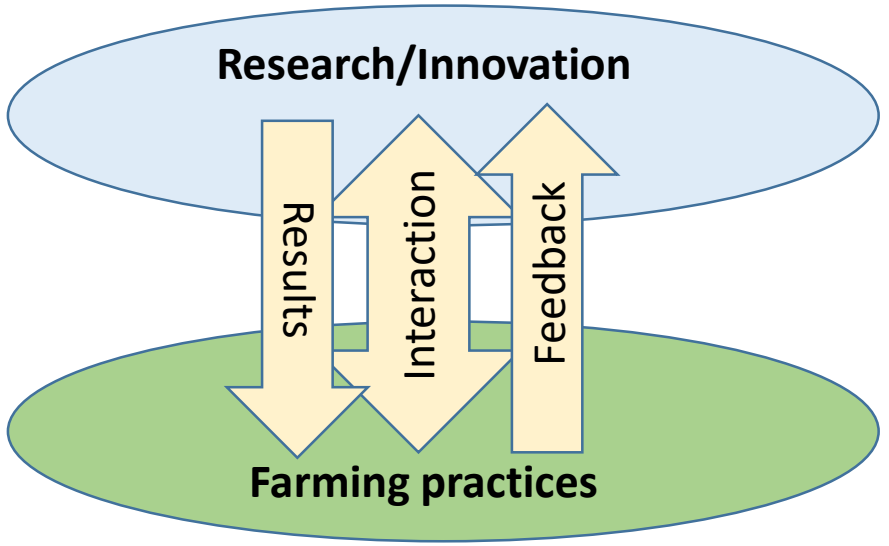
Circular Agriculture Initiative

Actions

- ✓ Integrated animal and agricultural production systems
- ✓ Valorization of agro-industrial co-products
- ✓ Organic fertilizers
- ✓ Manure management
- ✓ Transition to bio refineries

GoEFFLUENTS vs LIVING LAB vs TERRA FUTURA

- ✓ ***'Living Labs' (LL),*** are dynamic initiatives, adapted to local, regional or national needs.
- ✓ The innovation paradigm is a priority geared towards the sustainable application of resources, with multidisciplinary and co-creative approaches.
- ✓ They are relevant innovation agents in the context of the **Circular Economy, digital transformation and self-sufficiency.**



LIVING LAB: Effluents and Coproducts of the Livestock Activity

STARTING SITUATION

PEPAC Diagnosis

- Contribute to **adapting to climate change** and mitigating its effects, as well as sustainable energy
- Improve the **management of livestock effluents** by promoting **agricultural recovery** and through other purposes, prioritizing **organic fertilization** with a reduction in the use of inorganic fertilizers
- **Mitigate GHG emissions**, increase atmospheric carbon storage capacity and improve soil organic matter content
- Boosting the **expansion of the circular bioeconomy** through the use of natural biomass, sludge, manure, and by-products from agro-industry and forestry

The **valorization of flows generated in agricultural activities** was evaluated in the **GOEffluents Operational Group** and in the **Nutri2cycle European Project**.

The need for **scale testing** of some of the new processes developed and their respective products was recognized

Operationalization at **scale** through the implementation of a **Living Lab**

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Objectives

- Implementation of a centralized LL at the Fonte Boa Experimental Station (Experimental Station for the Circular Agriculture Initiative), and development of Pilot Experimental Development and Demonstration Units (decentralized LL hubs) that respond to specific issues of effluent and co-product management.
- **Scale-up** approach for the valorization of effluents and co-products from agricultural activities (TRL 6-7).
- Evaluation of the impact of emerging solutions on the different processes to be developed and at different levels.
- Evaluation of substrate quality scenarios vs. developed technologies vs. valorization of resulting by-products and impacts on the value chain.

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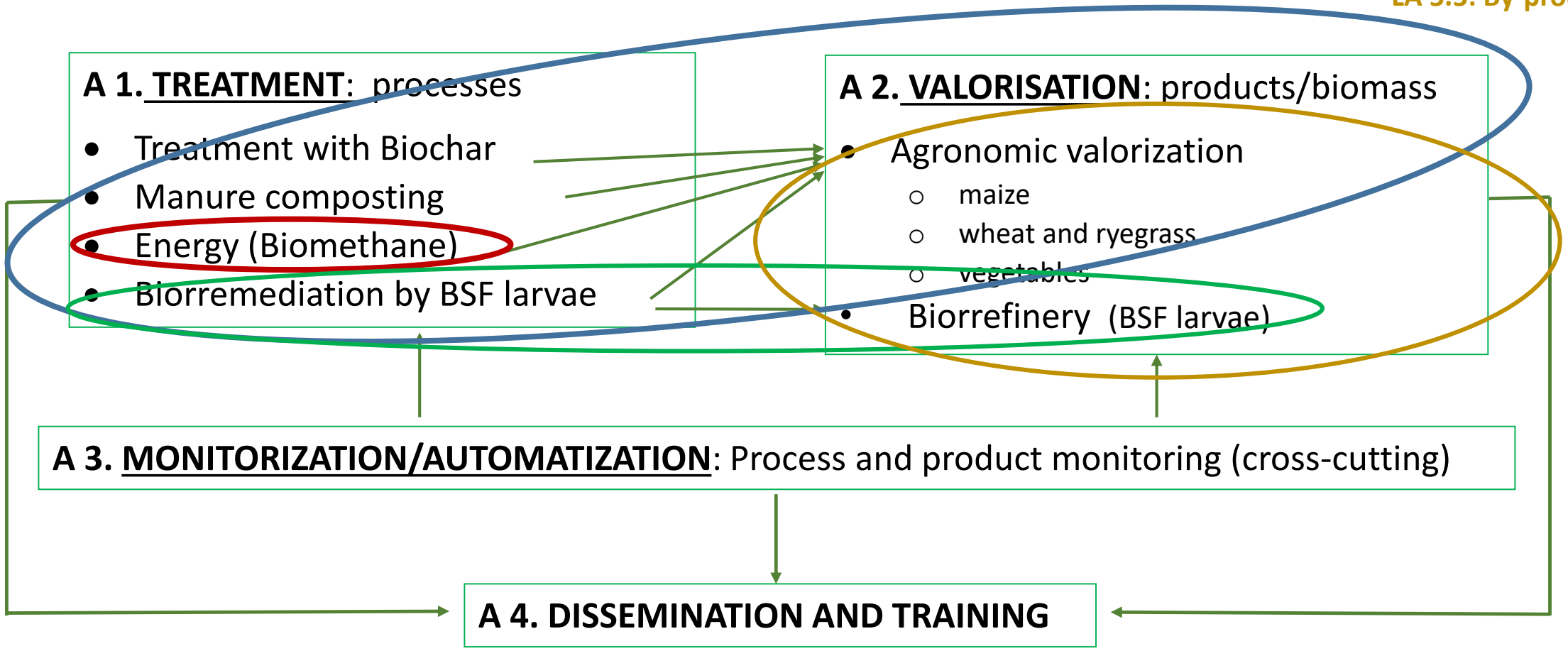
COORDINATION - INIAV

LA 5.1: Biofertilizers
LA 5.3: Biogas
LA 5.4: Biorrefinery
LA 5.5: By-produtos



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LA 5.1 Organic fertilizers: promote the development of organic fertilizers, local composting, increase fertility, structure, microbiome, resilience, carbon sequestration, reduction of air pollution, management and protection of water quality and ecosystems.

T 5.1.1 - Manure composting
T 5.1.2 - Treatment with BIOCHAR: Studies of production inhibitors and emission control of N2O, NH3, CH4
T 5.1.3 - Changing the pH of the effluent to sanitize and/or reduce ammonia emissions
T 5.1.4 - Bioremediation of livestock effluents by BSF larvae
T 5.1.5 - Agronomic valorization of new products as organic fertilizers

LA 5.3. Biogas: Promoting integrated solutions for the treatment of agricultural effluents associated with the recovery of biogas for energy production.

T 5.3.1 - Anaerobic digestion of livestock effluents
T 5.3.2 - Biogas recovery through on-site storage

LA 5.4. Biorefineries and small biomass plants: implement rural/regional biorefineries aimed at obtaining bioproducts, optimize the use of agro-biomass not competing with the food chain (human and animal), develop new processes and new products with higher added value, invest in digitalization, and in small energy production plants (heat/electricity).

T 5.4.1 - Bio-refinery for hydrolysis extraction of larvae by-products from bio-remediation and biomass from treatments

LA 5.5. By-products: explore the valorization of by-products in a logic of value cascade and integrated approach to production systems, promote the integration of activities such as by-products in animal feed and ecosystem services.

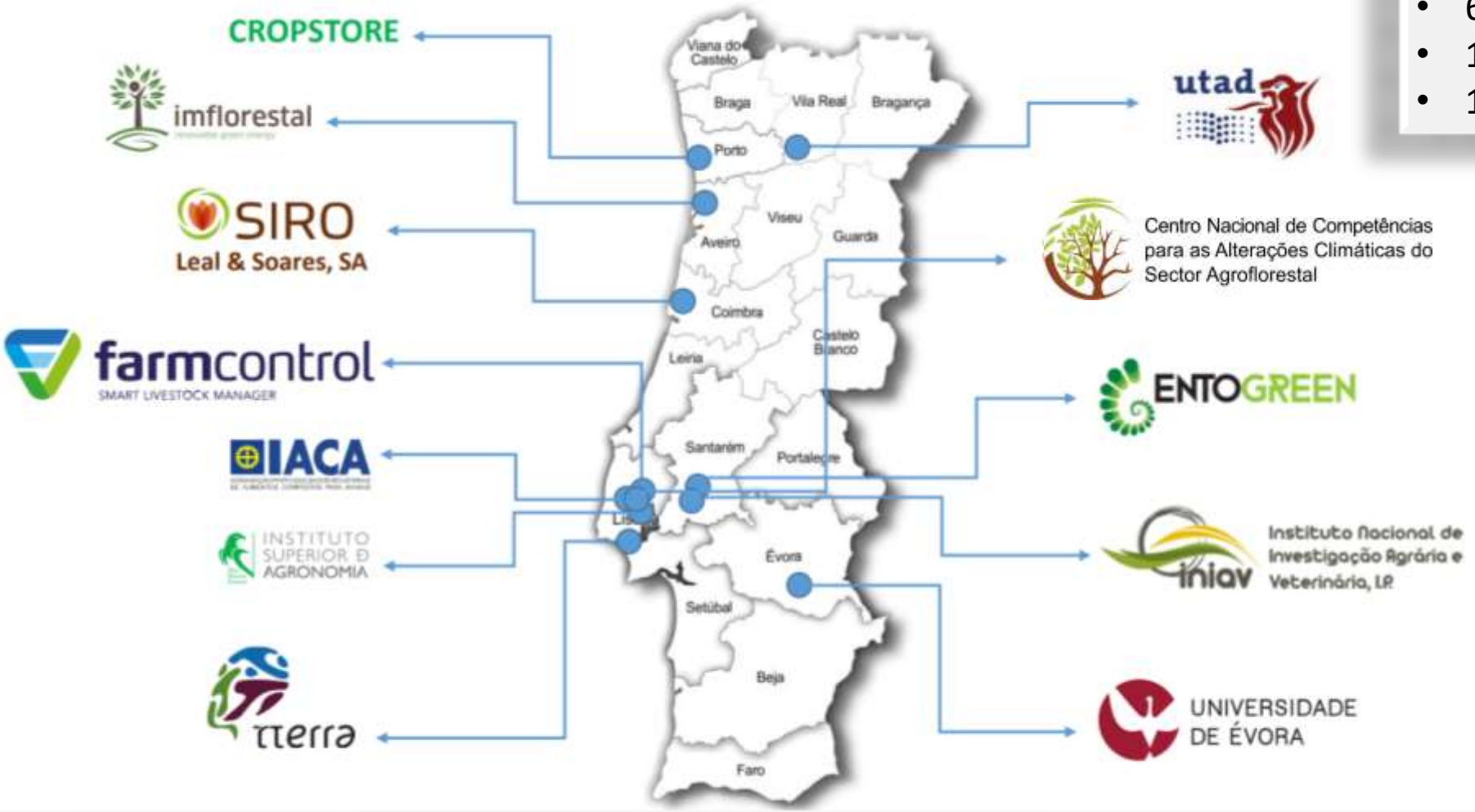
T 5.5.1 - Assessment of the feasibility of reintroducing the products obtained into the value chain in a cascade logic
T 5.5.2 - Provision of technical, innovation and development services in the area of comprehensive management of effluent flows and co-products and their integration into agricultural production systems

5.1 5.3 5.4: Process and product monitoring/automation | **Dissemination / Training** | **Action coordination and task management**

Geographical distribution of partners

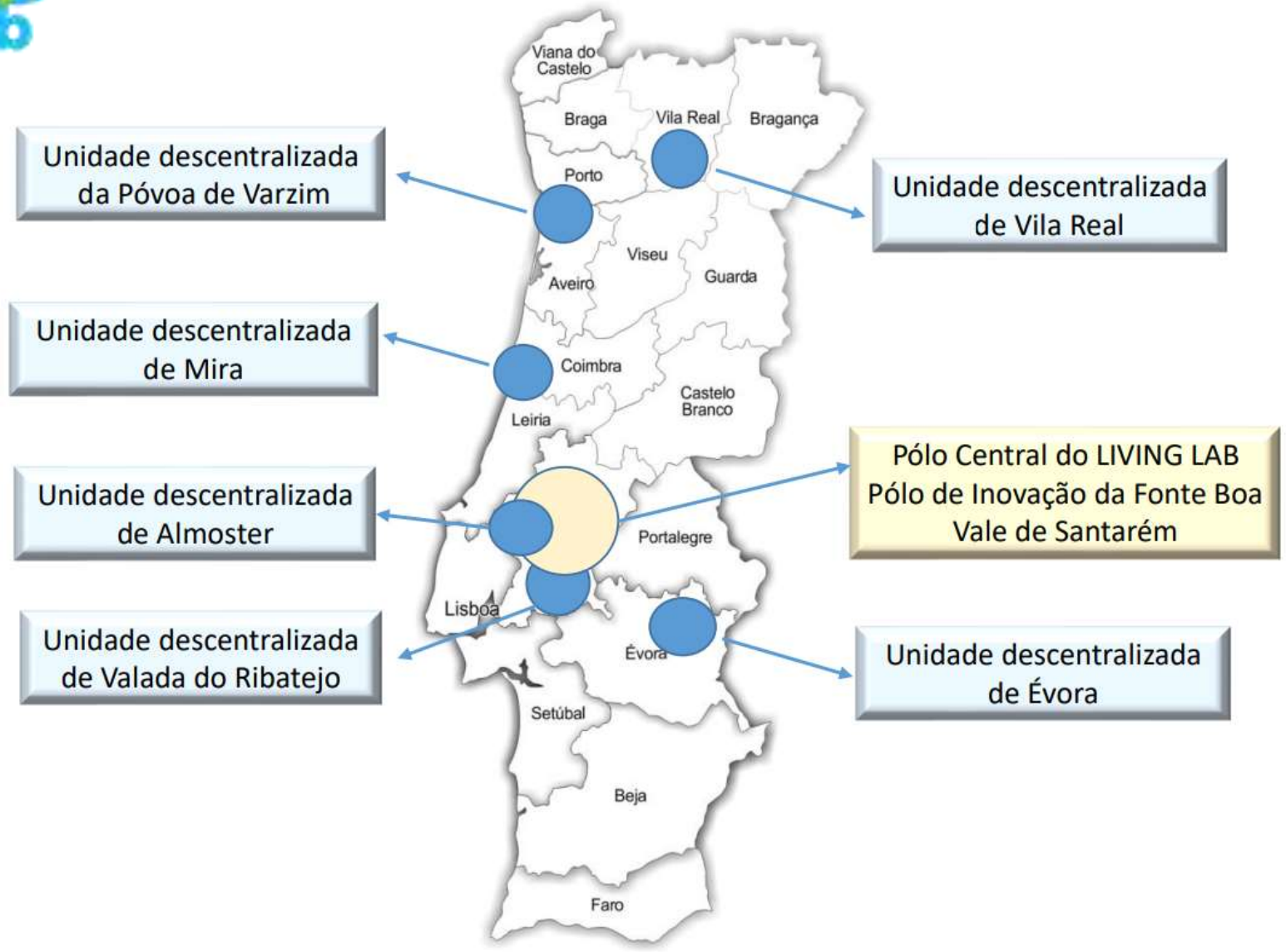
PARTNERSHIP:

- 4 NSTS entities
- 6 SMEs
- 1 Industry association
- 1 Competence Center



- 4 national cooperation entities (INTERSUÍNOS, VALINVESTE, ANCORME, HERCULANO): Process and product demonstrations
- 1 transnational cooperation entity (UNITED EXPERT): Socio-Economic Consulting

Geographical distribution of partners



LIVING LAB: Effluents and Coproducts - **LA 5.1 Biofertilisers**

T 5.1.1 - Manure composting

Composting piles - 230 m^3

Batch A:
- 30% horse manure
- 70% cattle manure

Batch B:
- 30% horse manure
- 70% cattle manure
- 5 ton biochar (about 22,5 kg/m3 of manure)

T 5.1.5 - Agronomic valorisation of new products as organic fertilisers

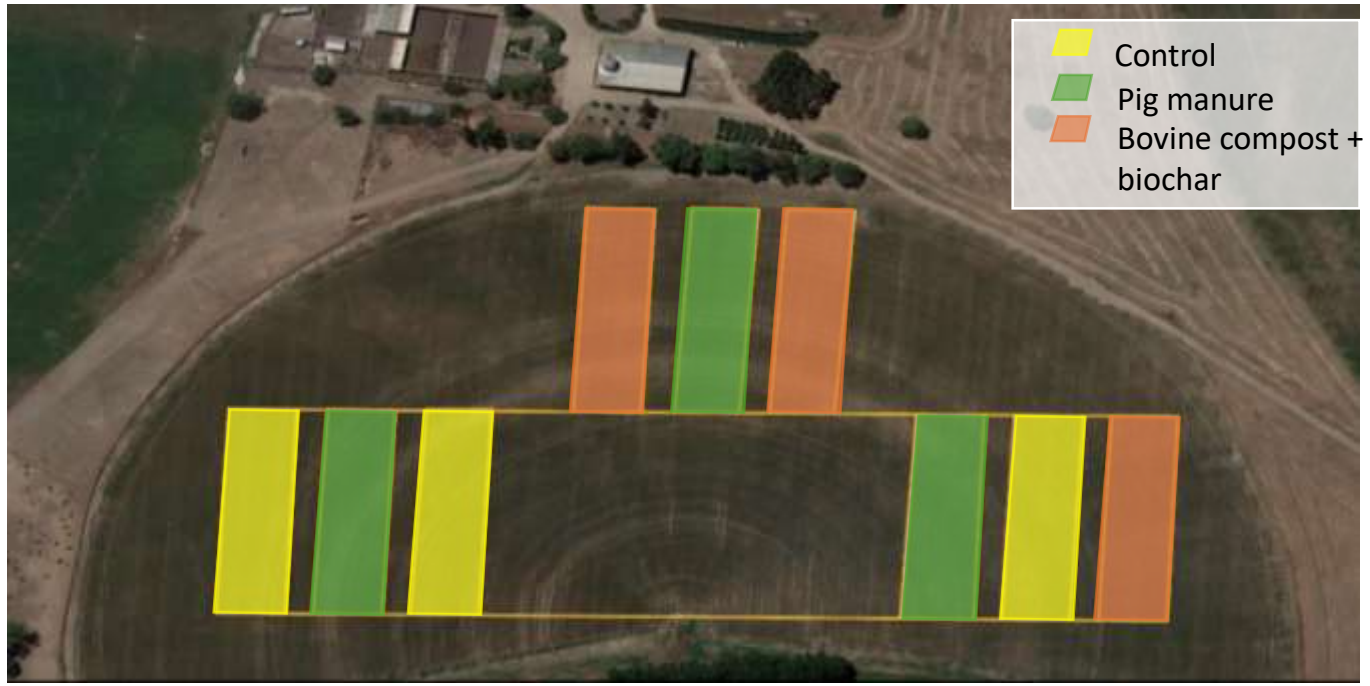
Maize pivot 8 ha

Modality (3 replicates each):

- Control - Mineral fertilisation
- Pig manure
- bovine compost + biochar

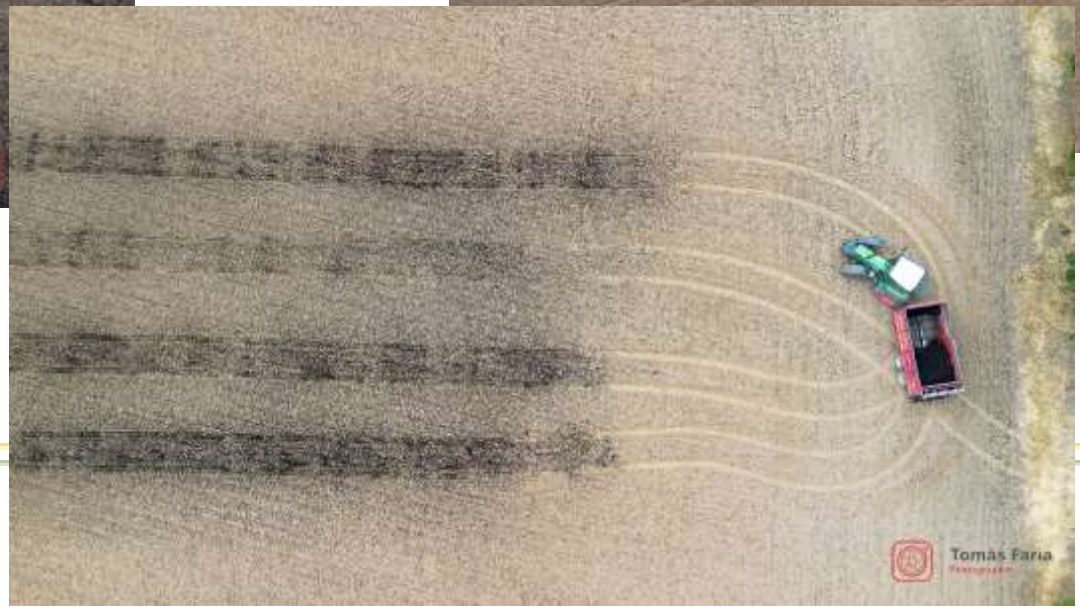
1/3 organic matter (deep)
+
2/3 fertigation with mineral fertiliser

Objectives: to evaluate the effects on maize production, quality and soil fertility.



T 5.1.5 - Agronomic valorisation of new products as organic fertilisers

Maize pivot 8 ha



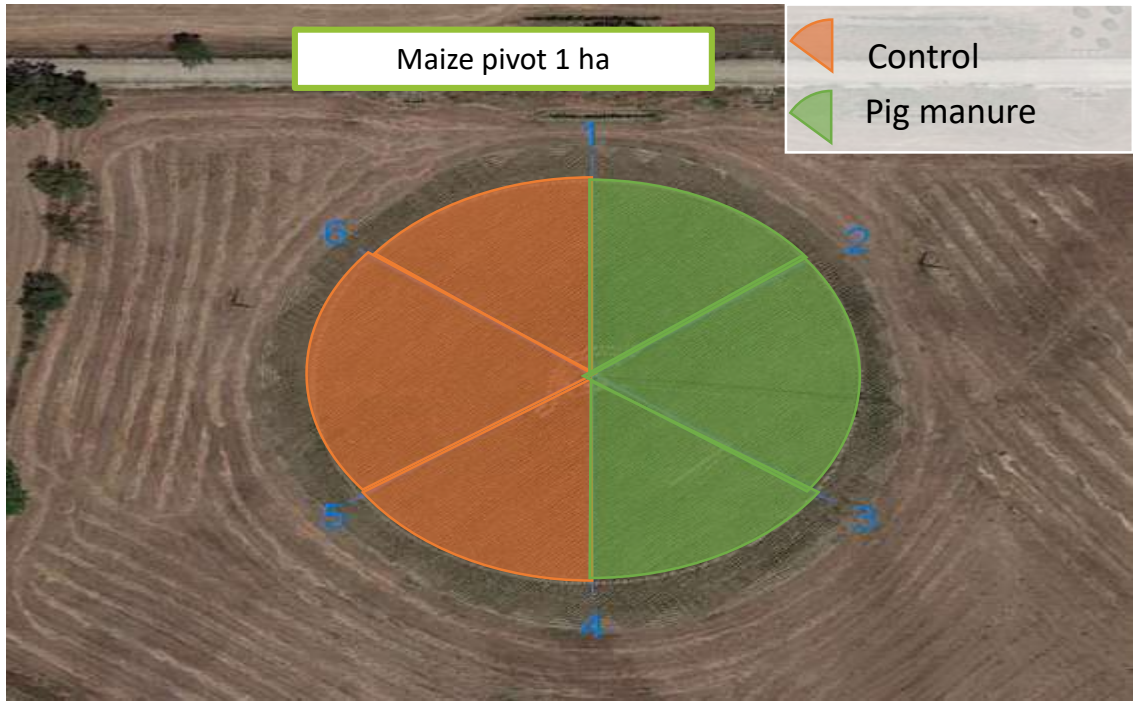
T 5.1.5 - Agronomic valorisation of new products as organic fertilisers

Maize pivot 1 ha

Modality (3 replicates each):

- Control - 100% mineral fertiliser
- Pig manure- 1/3 manure (em fundo)
  2/3 mineral fertiliser

Objectives: to evaluate the effects on maize production, quality and soil fertility.



T 5.1.5 - Agronomic valorisation of new products as organic fertilisers

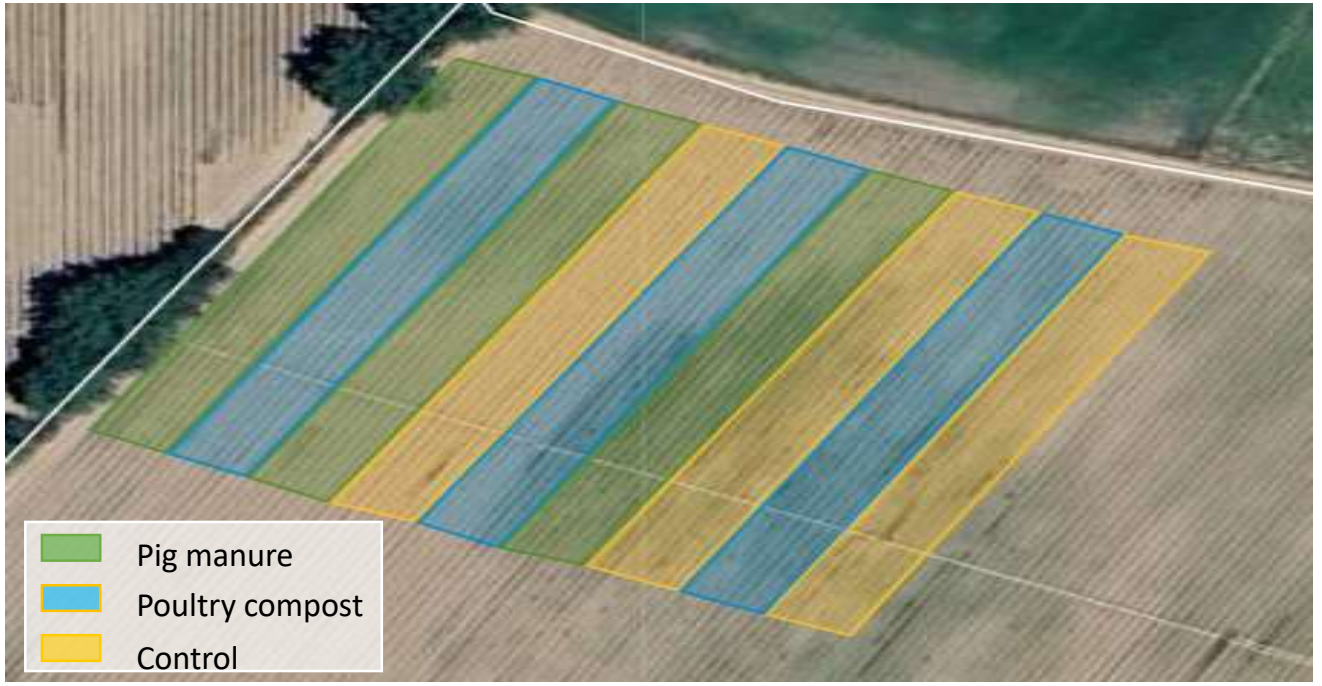
Tomato

Modalidades (3 replicates each):

- Control - 100% mineral fertiliser
- Pig manure
- Poultry compost

Mineral fertiliser
+
45 unites of N

Objetives: to evaluate the effects on maize production, quality and soil fertility.



T 5.1.5 - Agronomic valorisation of new products as organic fertilisers

Mini orchards

Modalities (3 replicates each):

- Control - without fertilisation
- Pig manure- 25 kg N/ha

Orchards:
A – Pear
C – Vineyard (wine)
D – Vineyard (fruit)
G – Olive grove
H – Almond grove

Objectives: to evaluate the rooting (biomass and biodiversity), organic matter in the soil and productivity.

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What the contribution?

Demonstration Units - promoting sustainable processes and products at different levels:

- Evaluation of **biogas potential** through the development of anaerobic digestion processes and demonstration of the agronomic value of the digested co-product;
- Valorisation of agricultural effluents and co-products for the **production of agricultural compost** to **improve soil quality**;
- Technical support for the **development of studies on a pre-industrial scale** in a pilot plant;
- Support for the implementation of **efficient water utilisation measures** and their relationship with the quality of material flows to be circulated;
- **Assessment and mitigation of pollutant emissions** and their relationship with animal welfare;
- **Real-time monitoring and control solutions** (Farmcontrol cloud software available for user dashboards);
- **Support for the development of public policies and the promotion of commercial partnerships and co-operation** between different players with the promotion of **synergies within the Public Administration;**
- **Increasing the rate of adoption of good agricultural practices** in the farming sector, promoting sustainable development and the protection of natural resources, reducing the loss of nutrients to the environment, the use of fertilisers and the management of livestock effluents.

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INDICATORS		MILESTONES
1	Use of biofertilisers on different crops;	2 biofertilisers evaluated on maize and ryegrass
2	Bioconversion of effluents and co-products by BSF larvae	1 Bioremediation Demonstration Unit
3	Production of new biofertilisers	2 new biofertilisers
4	Reusing recovered biogas as an energy source	1 biogas storage system
5	Recovering biogas by covering pits on pig farms	1 biogas recovery plant
6	Development of sensors for biogas quantification	2 sensors
7	Extracting insect oil for use as biodiesel	1 experimental protocol
8	Extraction of products from BSF larvae and biomass in biorefineries	1 Biorefinery Unit
9	New products obtained through chemical biorefinery processes	2 new products (with potential bioactivity)
10	Guidance on how to use the by-products obtained	2 Technical handbooks
11	Socio-economic evaluation of processes and products	1 Booklet
12	Evaluation and validation of the Living Lab as an Innovation Unit	1 Final Publication

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Communication plan for technical training with the valorisation and dissemination of knowledge

1 - Training/Visit to LL's Central Hub and decentralised Pilot Units

- ✓ demonstration of the technical solutions developed
- ✓ theoretical and practical training activities.
- ✓ promotion of the valorisation of effluents or other innovative good environmental management practices
- ✓ promotion/demonstration of sustainable livestock production

2 - Dissemination and transfer of technology

- ✓ technical and scientific meetings
- ✓ publication of dissemination leaflets and videos
- ✓ publications in dissemination magazines
- ✓ Project portal (https://projects.iniav.pt/LivingLAB/index.php?option=com_sppagebuilder&view=page&id=1) and the portals of Federations, Associations or producer groups as well as the SCTN organisations involved and/or others
- ✓ Interactive system between the partners, as information providers, aimed at students, farmers and producers, technicians, local authorities and economic agents.
- ✓ specific publications to disseminate the results obtained during the project dissemination activities for those involved in providing technical advice on this subject.

LIVING LAB: Effluents and Coproducts of the Livestock Activity - **Divulgation**

https://youtu.be/HIBZ8HTV8GM

https://youtu.be/JmgdG0Zq3I

https://youtu.be/E-Cn7w-zdo

https://youtu.be/8MtGsH9NMUw

Thank you!

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