

RESOURCE USE (Adaptation and Mitigation)

Resource efficiency
Water and energy
Circular economy
Fertilization



Parallel Thematic Session

RESOURCE USE (Adaptation and Mitigation)

Resource efficiency / water and energy / circular economy / fertilization

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Supported by:

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 690142



Start: June/2016
End: May/2019

Budget: 7.650.050 €

Horizon 2020:

AgroCycle: Sustainable techno-economic solutions for the agricultural value chain

Practical problem

Europe has an agricultural waste problem: it generates 700 million tonnes of waste annually. There is an urgent need & huge opportunity to address the efficient use of agricultural waste, co-products and by-products (AWCB), seeking to build sustainable value chains in the farming & processing sectors.

Partners

Names:

NUID University College Dublin (IE); Universiteit Gent (BE); Harper Adams University (UK); Fraunhofer IVV (DE); Consiglio Nazionale delle Ricerche (IT); CERTH (GR); sdewes (HR); Hellenic Agricultural Organization-"DEMETER" (GR); CREA Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria (IT); NNFCC (UK); China Agricultural University (CN); Nanjing Tech University (CN); IRIS (ES); TOMSA DESTIL (ES); EXERGY (UK); Axeb Biotech (ES); Agrii; RESET Carbon (HK); Manor Farm; NUI Maynooth University (IE); EUBIA (BE); CEMA European Agricultural Machinery (BE); CIBE (BE); EKO Kvarner (HR); ITACyL(ES); IFA Innovation for Agriculture (UK)

Project

Objectives:

To achieve a 10% increase in the recycling and valorisation of agricultural waste by 2020, the main objective of the AGROCYCLE project is to further develop, demonstrate & validate novel processes, practices & products for the sustainable use of agricultural waste, co-products and by-products (AWCB).

Expected results:

Agrocycle will improve knowledge on waste streams and pilot a key number of waste valorisation pathways. AgroCycle will develop sustainable green business opportunities and jobs surrounding the recovery, reuse and valorisation of agricultural waste, co-products and by-products (AWCB) leading to measurable environmental, societal and economic benefits for Europe and worldwide.

Results so far/first lessons:

The project has been running for only one third its total timeframe. The major outputs are scheduled for the second half of the project. Results are expected to emerge next year, in particular those focusing on the quantification of waste stream feedstocks across Europe and China, and on the valorisation options associated with these. Follow the project here: <http://www.agrocycle.eu/>

Who will benefit:

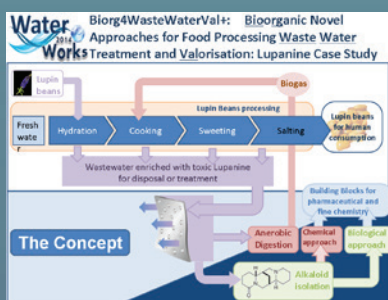
Producers, suppliers, buyers, manufacturers, processing facilities, retail outlets, as well as related service providers.



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Supported by:



The Consortium

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Michalis Koutinas (Cyprus University of Technology)

Dina Bastos (A Tremoceira Estrela da Piedade Lda)

Nuno Maulide (University of Vienna)

Water Works Water JPI

A. PROJECT MOTIVATION:
The Case study: Lupine bean production.
• Original production of lupine beans in ca 100 000 tons (2016).
• Lupine beans are rich in toxic alkaloids, which need to be removed before being used as human or animal food. Requires approx. 34 m³ fresh water / ton of seed/beans.
Part of a larger problem:
• The food processing industry uses a large volume of fresh water to deliver safe food.
• Complexes in w of water/ton of food: 34.77 (green beans), 34.5-37.5 (soybean), 34.2-37 (soybean and peanut).
Industry organization and needs:
• Absence of established factors for the choice of suitable technological solutions of quick implementation at the companies' site.
• Competitor wastewater is treated with in-site recycling.

B. APPROACH TAKEN AND INNOVATION TARGET:
Revert business models with 3rd parties able to:
• water detoxification in-situ facts.
• produce and commercialize the added value products.
A compact modular water detoxification process:
• First membrane stage to retain carbon rich fraction for energy production.
• Second nanofiltration membrane stage to:
• re-use 80% of the water to recycle in food processing.
• deliver a highly concentrated solution of alkaloids.
Improved sustainability and downstream separations:
• Biogas production for energy sustainability and waste minimization.
• New DNA-aptamer and MIPs for alkaloids separations.
• New downstream resolution of alkaloids.
New routes for process sustainability and alkaloid valorisation:
• Alkaloid resistant microorganisms for biogas production, alkaline mineralisation or conversion.
• Non degradative biotransformation of alkaloid into new structural motifs for organic synthesis transformations.
• Chemical transformation into added value compounds.

Start: May/2016
End: April/2019

Budget: 827.855 €

Cooperation supported by FCT, I.P.:

BIORG4WASTEWATERVAL+ - Bioorganic novel approaches for food processing waste water treatment and valorisation: Lupanine case study

Practical Problem

Food processing industry uses a large volume of fresh water to deliver safe food for humanity, which is obtained from public water providers or ground and spring water sources. The resulting brackish wastewater is often disposed of in public sewers or treated using different suboptimal solutions.

Partners

Type:

Research/ Teaching

Name:

Instituto de Investigação do Medicamento, Associação da Faculdade de Farmácia para a Investigação e Desenvolvimento, Faculdade de Farmácia, Universidade de Lisboa, (iMed/FARM-ID/FF/UL), Portugal; Institute for Bioengineering and Biosciences, Associação do Instituto Superior Técnico para a Investigação e Desenvolvimento, Instituto Superior Técnico, Universidade de Lisboa, (iBB/IST-ID/IST/UL), Portugal; Politecnico di Milano (POLIMI), Italy; Basque Centre for Macromolecular Design & Engineering, POLYMAT (BCMDE-POLYMAT), Spain; Cyprus University of Technology (CUT), Cyprus; University of Vienna (UV), Austria

Other company

A Tremoceira Estrela da Piedade Lda, (TEP), Portugal

Project

Objectives:

New separation processes will be developed based on novel membrane processes able of purifying the water for in-situ recycling. A far reaching concept is suggested in which alkaloids are isolated and converted into valuable building blocks, compensating for water detoxification costs.

Expected results:

Development of new separation processes able to detoxify wastewaters enriched in alkaloids providing fresh water for food processing companies and isolation of alkaloids. Chemical and bioconversion of alkaloids into molecules suitable for further valorisation. Maximize impact of the current project within the lupin beans detoxification industry.

Results so far/first lessons:

Efficient process for the isolation of the alkaloid lupanine from wastewater of lupin beans processing based on membrane processes. Resolution of racemic lupanine to each enantiomer and chemical transformation to the alkaloid sparteine as a valuable chiral ligand to fine chemical industry. Successfully production of biogas from the organic components present in the wastewater.

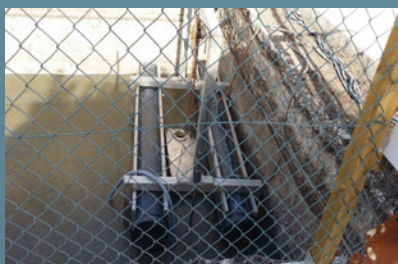
Who will benefit:

Lupin food processing industries and other industries that generates potential valuable organic molecules.

Contact: Carlos A. M. Afonso
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Supported by:



Start: 01/10/2015
End: 30/09/2017

Budget: 270.967 €

Operational Group:

Development of a concentration system to manage the pig slurry in order to obtain two phases: concentrated and diluted

Projecte pel desenvolupament d'un concentrador de purins amb l'obtenció de dades en continu del contingut de nitrogen total, fòsfor i matèria orgànica de les dues fases obtingudes

Practical problem

The most common action to manage pig slurries in Catalonia is their application on soil. However, to avoid the proliferation of NVZ, their application is limited up to 170 kgN/ha. This increases the distances of transportation of slurries, composed mainly by water, and thus, the management costs.

Partners

Type:

Farmers organisations

Name:

Cooperativa Plana de Vic
Federació de cooperatives agràries de Catalunya

Private company

Grup Solucions Manresa, SLUP

Research Center

Centre Tecnològic BETA, Universitat de Vic-Universitat Central de Catalunya

Project

Objectives:

The main objective of the project is to develop a cost-effective technology to concentrate the nutrients of the pig slurry in a liquid phase while obtaining a second clarified/low nutrient concentration liquid phase.

Expected results:

The physical characteristics of the concentrated phase (liquid state) will permit the use of one single vehicle to catch, transport and apply to soil the high nutrient concentration effluent. It will allow the reduction of costs of long distance transportation and land disposal (as fertilizer) of the concentrated effluent while the diluted will be applied to agricultural soils near the farms.

Results so far/first lessons:

An industrial prototype has been designed, built and operated during the project. The design incorporates a system to have a real-time nitrogen content monitoring in both phases. The physico-chemical analyses have shown the concentration capacity of the system. With this equipment, it was possible to reduce up to 70% of the initial volume of slurry.

Who will benefit:

The technology designed will have impact in pig farms located in areas with N excess in the soils.

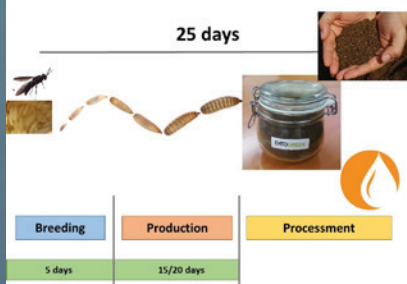
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Fundo Europeu
de Desenvolvimento Regional



Start: September/2016
End: December/2019

Budget: 750.000 €

Colaborative Business R&TD Projects:

EntoValor - Insects as an opportunity in organic residue valorisation

EntoValor - Insetos como uma oportunidade na valorização de resíduos

Practical problem

The Circular Economy is the basis of this project. We will develop the knowledge and processes that will allow organic residues to be reintroduced in the value chain as a nutrient source. The linkage that allows this connection is the Black Soldier Fly larvae (*Hermetia illucens*).

Partners

Type:

Research/Teaching
Agri enterprise
Consultant

Name:

INIAV-Instituto Nacional de Investigação Agrária e Veterinária IP
Ingredient Odyssey; AgroMaisPlus; Rações Zêzere
Consulai

Project

Objectives:

Reduce food waste;
Reintroduce the nutrients in the value chain;
Contribute to the establishment of quality and biosafety standards for secondary raw materials originated by waste recovery;
Present new products and services originated by waste valorization and insect meal production.

Expected results:

Development of the best production conditions and processment methods that will allow the industrialization of insect rearing and organic residue valorization;
Creation of novel protein sources, such as insect meal and insect protein extract and new soil fertilizers;
Introduction of new sustainable and competitive products and services in the international market.

Results so far/first lessons:

We have already developed the insect rearing methods that allow the sustainable and economic large scale production.
So far we have determined that the soil fertilizer has the required properties that will allow its use in agriculture and that the use of live larvae in chicken feed may allow the increase of animal welfare and growth.

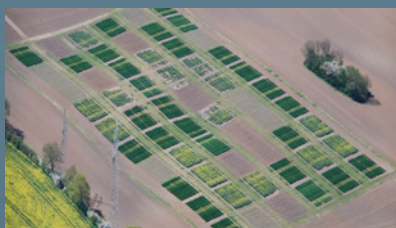
Who will benefit:

Insect producers and processors;
Animal feed producers;
Farmers.

Contact: Daniel Murta
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Supported by:



Start: 01/08/2016
End: 01/08/2018

Budget: 670.000 €

Operational Group:

Increase of N-efficiency in arable crop rotations

N-Effizienzsteigerung im Ackerbau

Practical problem

N-efficiency is often low in the most common crop rotation (winter oilseed rape/winter wheat/winter barley) in Schleswig-Holstein, Germany. Field trials to improve the N-efficiency with innovative crop rotations and computer-model-based N fertilisation recommendations are still missing.

Partners

Type:

Farmers

Name:

Sönke Huesmann; Ralf Hartmann Paulsen; Karl-Volkert Meyer; Thies Burmeister; Kai Kühlmann

Agricultural consultants

Joachim Hülsen; Ulrich Henne

Farmers organisations

Chamber of agriculture; Landwirtschaftskammer Schleswig-Holstein; Bauernverband

Research institutes

Christian-Albrechts-Universität zu Kiel; Institut für Pflanzenbau und Pflanzenzüchtung

Project

Objectives:

The aim of the innovation project is to contribute to the reduction of nutrient losses from agriculture. The focus of the project is to optimise the influence of crop rotation on N-transfer between crops and the use of model-based adapted N fertilization recommendations.

Expected results:

Practical testing, at different locations, of different crop rotations which lead to an optimised crop rotation with higher N-efficiency (due to reduction of N-loss). Adaptation and testing of a computer-model-based fertilization recommendation which leads to lower N-inputs on farms.

Results so far/first lessons:

Second year of field trials shows practical problems in some crop rotations like late sowing date. Higher N-efficiency is possible in some crop rotations, but depends on the location. Computer-model-based fertilisation recommendations can reduce the total amount of N used by farmers.

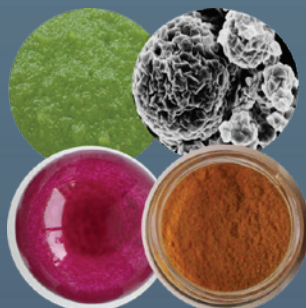
Who will benefit:

Farmers, consumers and the environment in general.

Contact: Helge Stephan
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Supported by:



Start: October/2017
End: September/2020

Budget: 371.394 €

Operational Group:

ProEnergy - New food products and bioenergy from fruits of low commercial value and agroindustrial wastes.

ProEnergy - Novos produtos alimentares e bioenergia a partir de frutos de baixo valor comercial e resíduos agroindustriais.

Practical problem

Post-harvest handling generates a large amount of by products (10 %). Minimal processing of fruits and vegetables produces high volumes of wastes (40%). Materials although very perishable have high nutritional and functional value. Traditional approaches are cost requiring and not effective.

Partners

Type:

Research /Teaching

Agri Enterprise

Agri Association

Name:

ISA - Instituto Superior de Agronomia; FCUL - Faculdade de Ciências da Universidade de Lisboa; INIAV – Inst. Nacional de Investigação Agrária e Veterinária

CAMPOTEC - Conservação e Transformação de Hortofrutícolas, SA; GRANFER - Produtores de Fruta, CRL; FRUBAÇA - Cooperativa de Hortofruticultores, CrI; COOPERFRUTAS - Cooperativa de Produtores de Frutas e Produtos Hortícolas de Alcobaça, CRL

APMA - Associação de Produtores de Maça de Alcobaça

Project

Objectives:

To promote a sustainable approach to support fruits & vegetables industries, taking into account nexus "byproduct-food-energy". The main objectives are:
-To implement new technologies for obtaining novel products and ingredients;
-To produce bioenergy through the optimization of anaerobic co-digestion.

Expected results:

Implementation of the "circular economy" concept; quantification & classification from the by-products and waste of industrial units; functional foods formulation and stabilization; microencapsulated functional ingredients; bioenergy production and its use for thermal treatments; bio fertilizers production

Results so far/first lessons:

Results from previous partners' projects:
-Prototypes of fruit pulps (apple and pear base) and vegetables with high bioactivity, validated on laboratory scale;
-The ISA team also has expertise in the production of bioenergy from industrial wastes. National Patent No. 103676 In Bulletin INPI 38/2008.

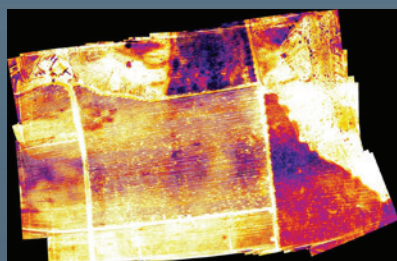
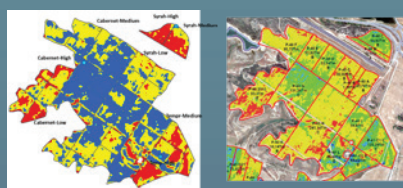
Who will benefit:

People - Consumers focused on health and wellness
Profit -The industrial units, which core business is post-harvest handling and fruits and vegetables processing.
Planet

Contact: Margarida Moldão
Email: mmoldao@isa.ulisboa.pt



Supported by:



Start: 01/02/2016
End: 30/09/2017

Budget: 203.000 €

Operational Group:

Profitability of new technology application to enhance irrigation efficiency in a conventional and organic vineyard

Rendibilitat de l'aplicació de noves tecnologies per a la consecució d'un reg amb màxim d'eficiència hídrica en una finca pilot de 100 ha de vinya ecològica i convencional

Practical problem

Grapegrowers need tools to manage the spatial variability of the vineyards in order to obtain high yields and berry composition. Irrigation is probably the most important instrument to achieve it. However, the key is to know, for each variety, how much water should be applied, when and where.

Partners

Type:	Name:
Research Institute	Institute of Agri food Research and Technology (IRTA)
Winery	Codorniu winery
State organisation	Raimat Irrigation District

Project

Objectives: Improve irrigation water use efficiency in a commercial organic vineyard to enhance water productivity (kg/m³ water) and improve berry composition. To develop and implement a Variable Rate Irrigation (VRI) system integrating remote sensing, crop simulation models and vine physiology.

Expected results: One of the main goals of organic farmers is to reduce the vineyard inputs. Thus, by applying this VRI system, they can know the exact amount of water to be applied in each irrigation sector considering the variety and phenology. This VRI system will increase water savings and have an impact on vegetative vine growth, and therefore reducing labour costs.

Results so far/first lessons: With precision irrigation, we saved 25% of water in comparison with previous years. Also, yield productivity and berry composition improved. The analysis within-field spatial variability (using spectral vegetation indices obtained with satellite multispectral images) showed a significant reduction in the within-irrigation sector vegetative growth from 2015 (when VRI was not applied) to 2016.

Who will benefit: This technology will benefit winegrowers by increasing water-use efficiency, and improving yield and berry composition.

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Supported by:

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 691402



Start: February/2016
End: July/2018

Budget: 2.101.711 €

Horizon 2020:

RichWater - Market introduction of combined wastewater treatment and reuse technology in agriculture.

Practical problem

Water scarcity is hindering economic prospects in the agricultural sector. Concerns on the need of reusing wastewater and nutrients are growing, nevertheless there is a lack of adapted technologies to provide effective control of nutrients supply and thus optimize the use of water and fertilizers.

Partners

Names:

BIOAZUL(ES), ISITEC(DE), PESSL(AT), TTZ-Bremerhaven (DE), CSIC-IHSM (ES), Soil Moisture Sense (UK)

Project

Objectives:

- Demonstration of an innovative and competitive technology for reusing wastewater in agriculture
- Integration of water treatment and irrigation in a single system
- Tailor-made treatment according to crop demands and high rates of water and nutrient recycling
- Agri-assessment to guarantee safe irrigation

Expected results:

- Final marketable system for wastewater reuse consisting of 4 modules: wastewater treatment, mixing unit, fertigation and control and monitoring RichWater 150m³/ day plant is running in South Spain for irrigation of sub-tropical crops and tomatoes. Safety concerns like pathogens removal are fully addressed, with guarantees for crop consumption. RichWater tailor-made treatment shows high level of nitrates
- Demonstrated savings of water and fertilizers for practitioners and farmers - Low O&M requirements: low energy consumption (ca. 1.5 kwh/m³) and highly automation
- Demonstrated safe and optimized production of irrigated tomatoes, mangos and avocados

Results so far/first lessons:

RichWater 150m³/ day plant is running in South Spain for irrigation of sub-tropical crops and tomatoes. Safety concerns like pathogens removal are fully addressed, with guarantees for crop consumption. RichWater tailor-made treatment shows high level of nitrates, phosphates and potassium and therefore high rates of nutrient recycling. The system is adapted to work with high conductivity waters. <http://richwater.eu/>

Who will benefit:

Farmers and irrigation communities, wastewater treatment operators, public administrations and civil society (consumers)



Contact: Antonia Lorenzo
E-mail: alorenzo@bioazul.com





Supported by:



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UNION EUROPEA
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de Desenvolvimento Rural
A Europa investe nas zonas rurais



Start: October/2017
End: December/2021

Budget: 437.385 €

Operational Group:

SustentOlive - Improvement of irrigation and fertilization practices at olive farms in Trás-os-Montes for its sustainability.

SustentOlive - *Melhoria das práticas de rega e fertilização do olival nas explorações olivícolas em Trás-os-Montes para a sustentabilidade do olival.*

Practical problem

Although the importance of irrigation to increase productivity, it reduces unproductive time and mitigates the effect of alternate bearing. In this region, there is a lack of information of irrigation needs and the response of regional cultivars to deficit strategies to ensure rational use of water.

Partners

Type:

Research/ Teaching

Name:

UTAD - Universidade de Trás os Montes e Alto Douro; Instituto Politécnico de Bragança

Agri enterprise

Luís Miguel Ferreira Afonso; Sá Morais Castro Lda; Manuel Fernando Cunha Vaz Pinto; Almira dos Anjos Lopes Robalo Cordeiro; Casa de Vilarelhos - Sociedade Agrícola Lda

Agri association

Appitad- Associação de Produtores em Protecção Integrada de Trás-os-Montes; Associação de Beneficiários do Vale da Vilariça.

Project

Objectives:

Improve irrigation practices for a more efficient water management, by adopting different deficit irrigation strategies and by improving the performance of irrigation systems that maximize irrigation efficiency and optimize water productivity, ensuring the Eco - Sustainability of olive cultivation.

Expected results:

They will allow assessing the response of different Cvs. to diverse strategies of deficit irrigation, based either on the efficiency of water use, increasing productivity and olive oil quality. This, will allow an advance on economic yield of olive groves as a result of a cut in irrigation costs, increasing the competitiveness of the regional olive sector, both at national and international level.

Results so far/first lessons:

In cv. Cobrançosa, irrigation increased oil yield up to 0.35 kg (dw) m⁻³ of water transpired. Sustained deficit irrigation (SDI) with 30% of 100%ETc (FI) increased oil yield to more than double of rainfed (RF) and yield is reduced only 25% in relation to FI, saving 60% of applied water. Sensory attributes, pungent and bitter, are more noticeable in olive oils from RF and SDI.

Who will benefit:

Farmers, technicians from farmers organizations, researchers and agents involved in the olive sector decision.

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E-mail: anaaf@utad.pt



Supported by:



Start: October/2017
End: September/2020

Budget: 418.466 €

Operational Group:

Waste2Value - Valuation of agricultural by-products for animal feed, biodegradable plastics and treatment of animal effluents.

Waste2Value - Integração da valorização de subprodutos da atividade agrícola com a produção de alimentos compostos para animais, plásticos biodegradáveis e tratamento de efluentes animais.

Practical problem

There is a need to reduce antibiotics in animal feed, as well as a strategy for mitigation of by-products in the agricultural sector in Portugal. Waste2Value creates alternatives and novel products answering both problems by adding value and minimizing the use of antibiotics and resources

Partners

Type:

Research/ Teaching
Agri Association
LAG Association
Agri Enterprise

Other Company

Name:

Instituto Politécnico de Viseu; Universidade de Aveiro
ANCOSE - A. N. de Criadores de Ovinos da Serra da Estrela
ADDLAP - Assoc. de Desenvolvimento Dão, Lafões e Alto Paiva
Ervital - Plantas Aromáticas e Medicinais,Lda; Indumape - Industrialização de Fruta,S.A.; Ovargado,S.A.; Vasco Pinto & Agostinho Sousa,Lda - Agricultura Biológica
Silvex - Indústria de Plásticos e Papéis, S.A.

Project

Objectives:

Employ agricultural by-products to:

- obtain value-added compounds and apply them as feed ingredients;
- reduce/eliminate antibiotics in feed;
- use biopolymeric materials for agricultural biodegradable plastic films;
- obtain carbonaceous materials for treating animal effluents.

Expected results:

- Characterization of plant by-products and animal effluents;
- Holistic separation of by-products according to nutritional, phytobiotic and prebiotic profile;
- Valuable compounds incorporated into animal feed formulations; reduction/elimination of antibiotics;
- Preparation of biopolymers for biodegradable films for agricultural applications;
- Treatment of animal effluents.

Results so far/first lessons:

Farmers and agro-industries are willing to contribute to the valuation of their by-products and waste but often do not have the required know-how or experience. In some cases the awareness of the value of waste needs to be sharpened. Collecting by-products and waste from agriculture activity needs planning and a suitable infrastructure, e.g. to enable small producers to design new applications.

Who will benefit:

Horticultural producers, including agro-industry, livestock sector and animal feed industry

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