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Sustainable techno-economic solutions for the agricultural value chain

AGROCYCLE

for a circular economy

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The AgroCycle Project

- Led by the School of Biosystems & Food Engineering, University College Dublin
- EC funded H2O2O in collaboration with the Government of the People's Republic of China and the Hong Kong Government
- 3 year project (2016-19), 26 partners: EU, China, Hong Kong
- €7 million from EC plus ca. €1 million from Government of the People's Republic of China and the Hong Kong Government and direct resources inputs from the Chinese and HK partners (CAU, NJIT; and RESET Carbon from HK)



- 8 EU Countries
 - $_{\circ}$ Ireland
 - $_{\circ}$ Spain
 - $_{\circ}$ United Kingdom
 - 。Germany
 - 。Belgium
 - $_{\circ}\,$ Italy
 - $_{\circ}$ Greece
 - Croatia



Sel . Other Countries China Ireland United Kingdom **(*)**(2)() S Germany Belgium Ē (Ψſ) Greece 💟 Dairy Fertilisers Biocompounds W Nutraceuticals Grass Poultry Bioplastics Animal Feedstock Pharmaceuticals Grapes Fruits, vegetables & Juice Bioenergy Biofibres Pigs Purified water Kice



The Project Partners





AgroCycle Objective

- To deliver sustainable waste valorisation
- Address European policy target of reducing food waste by 50% by 2030
- Contribute to the change occurring in China in relation to sustainability





AgroCycle Approach

- A full systems approach
- Developing a 'Circular Economy' around the agri-food chain:
 - Pre- and post-farm gate
 - Food and agri-products processing sector
 - Wholesale and retail
 - Waste processing valorisation incl. bio-fuels, high value-added biopolymers, energy & micro fuel cells.
 - Consumer



Work Plan

Project Work Packages

- Agricultural waste value chain assessment
- Biofuels production
- Fertiliser production
- Agricultural wastewater exploitation & treatment
- Biowaste valorisation into high value products
- Life Cycle Assessment and Life Cycle Costing
- Knowledge platform and training
- Sustainable value chains and business models
- Innovation impacts





Agricultural value chain mapping

- Selected 26 commodities (grass and forest excluded)
- Commodities and project Report are divided into four groups: Animals, Cereals, Fruits, Vegetables
- > Time period for data coverage: 2010 2014, in some cases 2015 2016
- Value chain for each commodity is created and AWCB is analysed and calculated
- > Example animal value chain



Total quantities of the AWCB's for EU28 are calculated and presented in diagrams and tables on a country level



- Potato pulp fibres up to 20 wt% were added to Poly(lactic acid) (PLA) and Polyhydroxyalkanoate (PHA) based matrices
- PLA and PHA based biocomposites with potato pulp fibres can be used for industrial production of pots or rigid containers for applications in packaging and agriculture











 Soil improver from pruning waste material tested by AXEB (Spain) and University of Gent (Belgium). Experiments ongoing.

 It helped AXEB to improve product development strategy.



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Potato protein based food packaging films produced on industrial scale pilot plant:

- PET 12µm Hostaphan RNK 12 / Potato protein / Novacote ASL 120 / PE 10µm defa *Conventional multi layer film*
- **Paper** B5B TDM / **Potato protein** / Novacote ASL 120 / **PLA** 30µm Nativa *Fully biobased renewable film*



 DEMETER developed an innovative formula for Rice Bran Biofertilizer (RBBf) consisted of 74% rice industry residues. The RBBf can replace any fertilizer in low input of organic rice or wheat farming systems (tested). Furthermore, needs to be tested in vegetable crops.

RBB 1 CTRL CTRL RBB 3 RBB 2 RBB 1
RBB 2 RBB 3 RBB 2 RBB 3
RBB 2 RBB 1 CTRL RBB 3
Development of novel Bread and Digestive Biscuits fortified with rice bran, rich in dietary fibres and antioxidant content. The

Biscuits fortified with rice bran, rich in dietary fibres and antioxidant content. The rice bran was stabilized using an innovative infrared stabilization technique developed in DEMETER.



Drone image showing the different RBBf treatments













- Design and construction of a hybrid anaerobic SBR/aerobic MBR for fruit processing wastewater treatment.
- Pilot demonstration in a fruit processing industry during 2018 production period.

• Main Results: reduced energy consumption, biogas recovery and high quality effluent.



Joint Stakeholders Platform including Waste Marketplace and Children's School Curriculum



AGROCYCLE Commodities Community Marketplace Events News

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AgroCycle partner wins #ThinkBiobasedChallenge Effect of the Addition of Natural Rice Bran C Thermal, Mechanical, Morphological and Vis Properties of Poly(Lactic Acid)

Maria Cristina Righetti ^{1,4}, Patrizia Cinelli ^{1,2}, Norma Mallegni ¹, Carlo Andrea Massa ¹, Maria Irakli ³ and Andrea Lazzeri ^{1,2}

CNR-012, National Research Council—institute for Chemical and Physical Processes, via Moruzzi L. 66124 Pios, Bitty partiriski.endibilionijiali (PC): Fromta mallegridipijace/entii (NA); cardiondrea massailiji jee/entii (CANU; andrea lazzeribioniji id (AL). Desartment of Civil and Industrial Engineerine. Universitive of Piasa. Lareo Lucio Lazzarino 1.56122 Pias. Ital

New AgroCycle paper published





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