

### 3.4./B. Waste-to-Product (Convenors: Dr. Antoni Sánchez, Teresa Gea)

#### *GLOCAL – An ecosystem-based business model*

*Gea T., Bautista R., Domen T., Knowles H., Sánchez A., Theeuwes E., Wahl D., Warrington A. (Universitat Autònoma de Barcelona)*

**Text:** A potentially game-changing business model is currently being trialled on the island of Mallorca. Ecover, Forum for the Future, GICOM, Daniel Wahl, the University of the Balearic Islands, the local industry Clusters and several local entrepreneurs are working together to pilot a distributed manufacturing model that: • produces locally but draws on the global R&D knowledge held by Ecover • uses local bio-based resources that would otherwise be considered as waste The GLOCAL project is: • Exploring the potential of using local resources and manufacturing capacity together with Ecover expertise. • Understanding the possible business models for open innovation and distributed manufacture that would ensure local agents and Ecover benefit appropriately. • Understanding the conditions for success for GLOCAL in terms of relationships, resources, formulation and infrastructure required. • Using the learning from the prototype to identify next steps in scaling GLOCAL to use as a model for other regions. As part of the ORBIT 2014 conference we would like to share our experience of understanding the waste streams available through local investigations and satellite mapping, and then transforming these ‘wastes’ into ingredients for Ecover quality products to be made on Mallorca for the Mallorcan market.

#### *Protease production from organic residues by SSF and their potential uses*

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**Text:** An environmental-friendly process is proposed in this work to reduce the negative impact of the increasing agro industrial residues due to the faster growth of the world population. It consists on the valorization of nitrogen-rich local residues, such as soya fiber, hair waste and coffee husk, by solid-state fermentation (SSF) to obtain proteases. SSF experiments were undertaken in 0.5, 4.5, 10 and 55 L reactors throughout 1, 2 and 3 weeks. It was not necessary to sterilize the materials and no inoculation of pure microorganisms was needed for the development of the process. Besides, aeration was provided to ensure the prevalence of aerobic conditions during the assay. Alkaline proteases were produced as a consequence of the degradation of these materials, formerly considered residues. The highest activity of the alkaline proteases in crude extracts was determined at 3, 7 or 14 days of the process according to the nature of the resources assayed. The yields obtained are higher than reported values in literature. Biochemical characterization of the crude extracts was also carried out. The final organic product obtained in the SSF presented a stability degree similar to that of compost, meaning low rate of oxygen consumption. Potential application of the extracted proteases has been successfully studied on dehairing cow hides, representing a significant advantage over the chemical process. Also, a preliminary study on kinetically controlled synthesis of peptides has been performed. In conclusion, the use of SSF with organic residues avoids consuming natural resources to produce enzymes of high value.

#### *Recovery of nutrients from Organic Fraction of Municipal Sólid Waste (OFMSW) in the Ecoparc 2 of Montcada i Reixac, Barcelona: alternatives to the current process*

*Mena M.J., Bonmatí A., Pujolà M., Tarraga J., Comas J. (IRTA)*

**Text:** Recovery of nutrients from the OFMSW is a relevant topic as evidenced by the European initiative ‘End of Waste’. Following this guideline, the Ecoparc 2 of Montcada i Reixac, belonging to the Metropolitan Area of Barcelona, submits the OFMSW to anaerobic digestion and then the digestate is separated mechanically, first by pressing and then by centrifugation. The solid of press (Sp) and the solid of centrifugation (Sc) are composted together (CSp+Sc) and used as organic fertilizer. There are alternatives to the current treatment of the OFMSW as: (1) direct use of Sc as fertilizer, (2) composting of Sc (CSc) and (3) composting of Sp (CSp). This paper focuses on analyzing the recovery of nutrients. During the treatment of the OFMSW an important proportion of nutrients is lost in the impurities that are sent to landfill, another part is lost in the leachate that are sent to the wastewater treatment plant. In the composting of the Sc the carbon losses were very

low compared to the current process, this suggests a high degree of stability of the Sc. The average nutrients recovery in the Sc was 17% higher than the current process. Due to the content of heavy metals in the products studied these are classified in category B of fertilizers according to the Royal Decree 824/2005. The results suggest that the direct use of Sc could decrease time, energy and costs of treatment of the OFMSW compared to the current process.

### ***Design and validation of an Action Plan to produce animal feed vegetable flour from food waste***

*Martin D. San, Zufia J. (AZTI-Tecnalia)*

**Text:** Almost three quarters of vegetable by-products generated from food industry and retail trade end up in dumps. However, they can be valued as raw material for animal feed, if they are managed under appropriate conditions. The Clean-Feed project ([www.cleanfeed.org](http://www.cleanfeed.org)) is funded by European LIFE+ program and Basque Government. The aim of this study is to reduce up to 70% of vegetable wastes generated in the Basque Country. The first stage was to determine the feasibility of using vegetable waste for animal feed. Food retailing, cider, wine, potato, bread, coffee and vegetable transformation sectors produce about 25,000 tons / year. These vegetable by-products were nutritionally and sanitarily appropriated based on analytical results. Once these targets were guaranteed, a drying methodology was developed to adequate them to animal feed market. The technologies tested were Pulse Combustion Drying, Oven and Microwave. Three flour prototypes were obtained and all of them fulfilled all requirements of animal feed market. Then, a theoretical Action Plan was defined in agreement with stakeholders. This plan was validated in a real scale demonstration trial. Finally, technical, economic and environmental feasibility was performed. This study demonstrated that vegetable byproducts can be used for animal feed due to the favorable quantities and characterization results. However, a suitable Action Plan is a key factor to make profitable this option for animal feed companies.