# RUSTICA WEBINAR

*You're invited!*

## Converting Organic waste streams into suitable starting materials for the chemical and biochemical industries

The RUSTICA project (H2020) provides a technical solution to convert organic residues from the fruit and vegetable sector into novel bio-based fertiliser products of high quality that address the needs of modern (organic) agriculture. The project's ambition goes beyond the simple recovery of nutrients, and also includes the developments of economically viable and environmentally sustainable alternatives to mineral fertilisers with the same or improved agronomic value. The technical solution consists of 5 conversion processes (carboxylic acid platform, microbial biomass production, electrodialysis, insect breeding and biochar production) which can be combined depending on the available waste streams, and integrated with state-of-the-art technologies such as composting. The resulting ingredients (microbial biomass, mineral nutrient concentrates, insect biomass, insect frass, insect chitin, biochar) will be combined to obtain tailor made fertiliser products adapted to specific crop needs.

The webinar will focus on technical aspects and details of the 5 different technologies used in RUSTICA project to transform biowaste into an innovative bio-based fertiliser with high value added.

The language of of the webinar will be English.

**June 20th (2 - 5 pm)**

**Compensation**

**Location**

**Registration**

**Contact info regional knowledge broker**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N. 101000527

Demonstration of circular bio-based fertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

# AGENDA

## 14:00 RUSTICA in general

**Introduction of the RUSTICA project and partners**
Laura Perez (CAPDL)

## PART 1 RUSTICA TECHNOLOGIES & PROCESS

**14:10** **The Carboxylic Acid Platform**
Nathan Deman (DRANCO)

DRANCO nv is a company specialized in the engineering and building of biogas installations using dry reactor types. DRANCO also offers mechanical and biological consultancy services to all biogas installations. Besides engineering and consulting, DRANCO is continuously searching for to further innovate the usage of anaerobic digestion technology. Therefore, DRANCO is a member of multiple research projects, funded by both the EU as well as Flanders.. Almost all research projects aim for the development of the Carboxylic Acid Platform (CAP). The goal of this platform is the valorization of organic waste streams by converting them into nutrient and carboxylic acid rich solutions.
The CAP solution itself has many possible applications in a wide variety of industries. CAP is rich in nutrients and carbon and can therefore be used as a feeding source for microbial processes. CAP solution is valuable because it contains a wide spectrum of short chain fatty acids. Furthermore, by working with different parameters, this spectrum can be steered to produce medium chain fatty acids (C6-C10). When combined with suitable extraction or purification technologies, pure carboxylic acids can be produced out of this CAP solution. The carboxylic acids itself have many applications as e.g., feed- or food additives, perfumes, biofuels, ….

In the RUSTICA project, CAP allows for the release and modification of nutrients still present in the agricultural waste streams. These nutrients are then recycled, using other RUSTICA technologies, into a bio-based fertilizer. Hence, closing the nutrient cycle in the agriculture and countering the depletion of production soils.

**14:30** **Q&A**

**14:40** **Microbial Biomass as the sustainable protein source for the future**
Mariane Van Wambeke (AVECOM)

In this current era, we are facing global challenges on both environmental and social levels. One of those challenges is the increasing world population, which among others will lead to an increase in the food demand. To keep up with this demand without damaging our planet even more, it is clear that we both need sustainable fertilizers ánd sustainable feed and food protein. This protein, which we and all living creatures around us need to survive and flourish, currently comes mostly from 2 sources: plant protein and animal protein. However, both have their well-known shortcomings in terms of sustainability, especially when keeping in mind that the demand for these products on the market will continue to grow. In this webinar, we will delve into a third possible source of protein: protein stemming from microorganisms, also known as single cell protein or microbial protein (MP). MP is a protein source which can be produced from waste, thereby giving the opportunity to valorize waste streams. It is a powder-like blend of microorganisms with a protein content up to 70% on dry matter, bound in organic matter with applications in the fertilizer, feed and food industry. A product that we, during the RUSTICA project, are trying to produce in collaboration with Dranco from CAP waters, thereby turning waste into a protein-rich stream.

**15:00** **Q&A**

**15:10** **Coupling electrodialysis with soprtion-diffusion membrane technology: a key approach to recovring NPKs and WFAs from food wastes**
Francis Kotoka (University of Ghent)

The rapid depletion of fossil fuels and mineral reserves, together with their adverse environmental effects during their recovery and processing, impact global economic and environmental sustainability. To tackle this worldwide issue, efficient technologies to sustainably recover NPKs and VFAs from food wastes and other bio-based streams are essential for creating a circular economy. Coupling electrodialysis (ED) with sorption-diffusion membrane technology (SDMT) is a key approach to recovering NPKs and VFAs from food wastes. Because electrodialysis separates species mainly based on their ionic charges, it produces relatively purer, higher concentration, and lower water-content products, which are cumbersome to achieve through Nanofiltration (NF) and Reverse Osmosis (RO). In the RUSTICA project, a concentrated solution containing 8.40g/L, 14.53g/L, 0.28g/L, 0.73g/L, and 0.59g/L of K+, NH4+, NO3-, SO42-, PO43- respectively, corresponding to 94.7%, 98%, 94.8%, 98.0%, 89.2% recovery, and concentration factor of 1.56-1.74, has been achieved through electrodialysis. Likewise, 75-80% VFAs, and 95.8% lactate have been recovered through ED, with acetate and lactate concentrations reaching 8.1g/L and 74g/L (i.e., concentration factors of 1.4-1.68), respectively. The sorption-diffusion membrane technology is coupled with ED to boost the separation of VFAs from electrodialysis feed and permeate, thus, recovering more than 70% of the VFAs from the electrodialysis permeate, with over 80% purity. Nevertheless, the operational parameters, feed conditions, and configurations greatly influence the process performance; therefore, these impactful factors are continuously tested to enhance the selectivity, recovery, purity, and concentration factor of the NPKs, and VFAs.

**15:30** **Q&A**

**15:40** **COFFEE BREAK**

PART 2 **RUSTICA TECHNOLOGIES & PROCESS**

**15:50** **Insects : a nutrient recovery from agricultural biowaste**
Juan Antonio Cortés Ortiz (ENTOMO)

The new green revolution will lead to a more efficient use of natural resources and at the same time it will create new business opportunities. Insects are playing a key role in this new era shooting two problems at once. The insects can be feed with a variety of organic by-products such as agricultural waste while being in high production. On the other hand, those waste raw materials can be reduced and converted into fertilizers that can be used in agriculture again. From this activity several products can be obtained, such as proteins for food and feeds; oils for animal feeds and industrial purposes; and chitosan to be used in agriculture, pharma and animal nutrition. In this way, what used to be a problem (waste) can converted in new economic activities. Furthermore, thanks to the scalability and replicability, the process can be applied in places where it is needed and especially in rural areas. The role of ENTOMO in the RUSTICA project is to apply the process to the agricultural environment, taking the crops remains, treating them with the larvae and having as output proteins, fertilizers and biopesticides to be used again in the agricultural closing the loop in production.

**16:10** **Q&A**

**16:20** **Biochar**
TNO

**16:10** **Q&A**

**16:50** **CONCLUSION AND END OF THE WEBINAR**

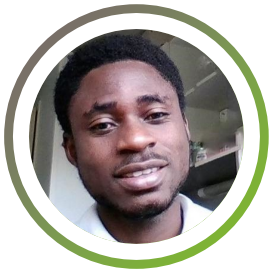
# SPEAKERS

## Nathan Deman
DRANCO

Nathan Deman graduated as a Master of Science in Biochemistry and Biotechnology at the Ghent University, with a major in the Plant Biotechnology and a minor in the Microbial Biotechnology. After 4 years of working experience in R&D and consultancy, he joined the Biogas Consulting and Support (BCS) team of DRANCO-nv in 2021, where he will participate in R&D projects concerning the Carboxylic platform. For the RUSTICA project, He is the technical project manager.

## Mariane Van Wambeke
AVECOM

Project manager, Mariane Van Wambeke has been involved in R&D projects, supervised by prof Dr ir Willy Verstraete (UGhent) for more than 35 years, among more than 20 years at Avecom. She has become an expert in the domain of wastewater treatment, anaerobic digestion and fermentation processes focussing on the production of microbial protein and PHB.



## Francis Kotoka
UNIVERSITY OF GHENT

Francis Kotoka is a Bioscience Engineering PhD student of Ghent University. He attained his Erasmus Mundus MSc. Membrane Engineering degree at University of Montpelier(France), University of Toulouse III(France), University of Chemical Technology( Czech Republic), and Nova University of Lisbon(Portugal) in 2020. His current research area explores electrodialysis (ED) for selective separation of nutrients (NPK) and carboxylic acids from bio-based streams. This aims at closing the loop of circular economy targeting recovery, and valorization o wastes.

## Juan Antonio Cortés Ortiz
ENTOMO

Project manager, with a background in Agriculture engineering and business, Juan has been working as R&D manager in insect production for industrial proposes for more than a decade. Experience producing insects and mites for biological pest control, bumble bees for pollination, insect for proteins and prawns. Involved in international projects including developing and develop countries for private and governmental institutions as FAO.

## Rianne Visser
TNO

Senior scientist at TNO has a track record of 25 years in R&D work, first at ECN (Energy research centre of the Netherlands) which then merged into TNO in 2018. Although originally the focus was on inorganic problems in thermal installations, such as melting phenomena, fouling and corrosions, the last ten years have been dedicated to the production and quality research on biochar. The latter was mosty in cooperation with agro-partners to test the application of biochar as peat-replacement in horti-culture and as part of the soil- and fertilizer improvement options.

Biochar is produced from hemicellulosic residues, i.e. woody type of residues that may include not only wood but also e.g. reeds, straws, hulls and shells from food products. The bio-feedstock is stabilized by thermal heating in the absence of oxygen. The carbon-rich porous product can be added to the fertilizer mix and serves more than one function. It can hold some water, adsorb organic matter and prevents nutrients from leaching to the groundwater and on top of that it will store carbon in soil as one of the few carbon negative measures fighting climate change. The production process co-produces bio-energy as well.

Within the Rustica project, TNO has produced many different biochars from a wide range of feedstock on a relatively small scale (3 kg/h input material). The analyses results will be presented. The ambition, however, is to quickjly bring a technology to the market that can produce biochar on a large scale and under economically viable conditions. The pilot that has been constructed at TNO in the past few years serves the larger volume production to provide material for the regional agro-pilots and to optimize the technology for market introduction in the short term.