Bio based fertilisers from vegetable and fruit waste: processes, characterisation and validation

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Presented by: Fien Amery

RUSTICA

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

RUSTICA

Grant Agreement No. 101000527

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RUSTICA in a nutshell

- foster the technical validation, demonstration and implementation
- focusing on waste from the fruit and vegetable agro-food system
- to close nutrient cycles on a regional level
- development of economically viable and environmentally sustainable alternatives

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Bundling academic and non-academic expertise across Europe

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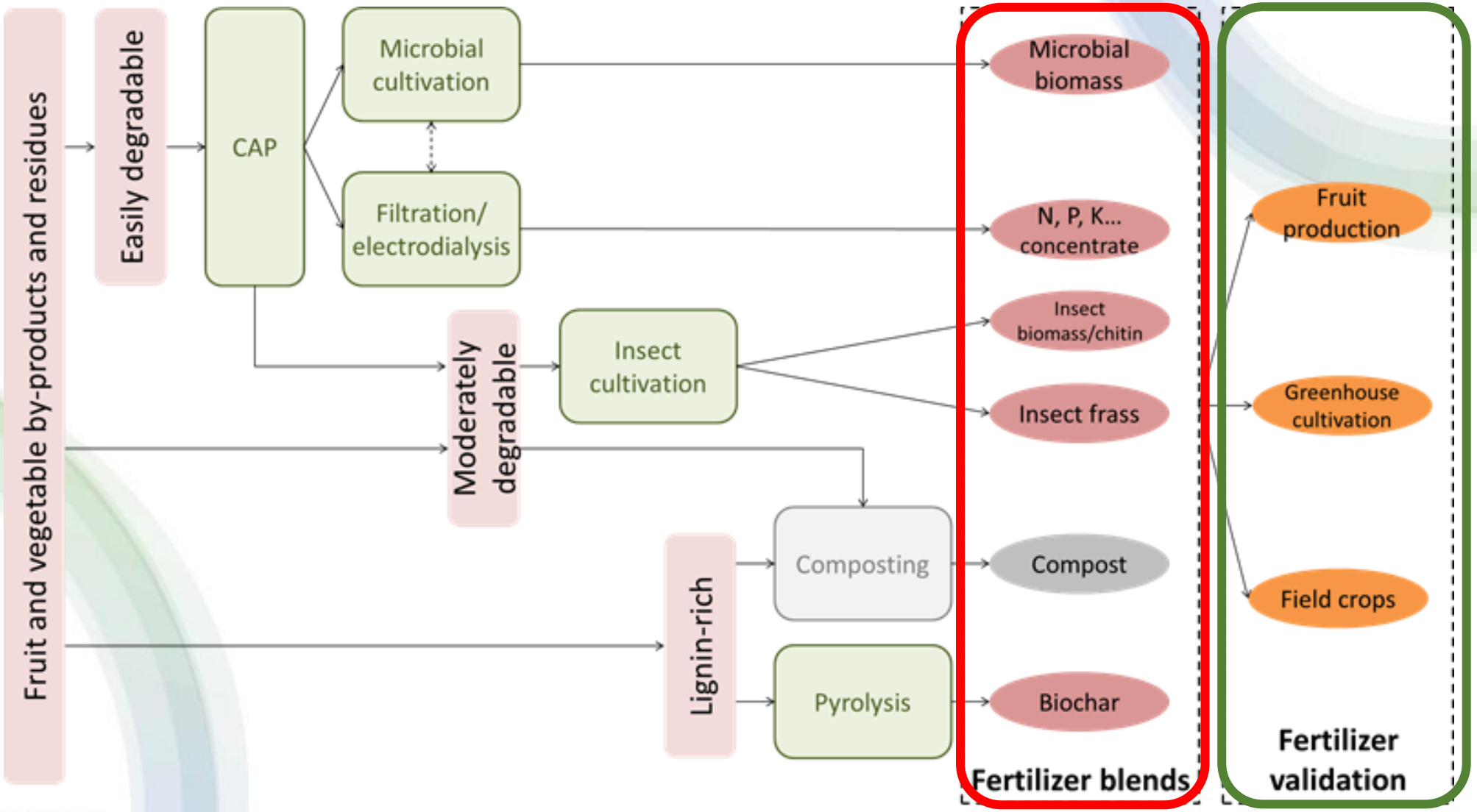
From waste to building block to fertilizer



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Building block analysis

- Microbial biomass:
  - Very nutrient rich, available N
  - High organic matter content, very easily biodegradable: boost for microbial life
- Insect biomass:
  - Nutrient rich
  - High organic matter content, easily biodegradable: boost for microbial life
- Insect frass:
  - Variable composition, depending on feedstock
  - Low to high biodegradable organic matter
  - Nutrient rich, less total N but more available NO_3^- and NH_4^+

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Building block analysis

- Biochar:
  - High organic matter content (if not ‘contaminated’ with soil), not degradable
  - High pH
  - Rather low nutrient content (depending on feedstock), no available N
- NPK concentrate:
  - Rather high salt content
  - High K content
  - rather low N (but available) and P content

    -> Searching for more suitable nutrient contents for fertigation

    -> To include in solid fertilizers by ‘loading’ concentrate on biochar?

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Loading of NPK concentrate on biochar?

- Experiment: are nutrients from NPK concentrate still available after loading on biochar?
  - Adding concentrate to biochar, 6 days equilibrium
  - Extraction with 1) water and 2) ammonium acetate
- Results:
  - Not available after loading: NO_3^-, Ca
  - Rather not available: NH_4^+, P
  - Intermediate available: SO_4^{2-}, Cl
  - Well available: Na, Mg, K
- Conclusion: useful for increasing the K content of circular fertilizers with biochar

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Defining blends for regions

- 5 test regions:
  - Flanders (Belgium)
  - Pays de la Loire (France)
  - Almeria (Spain)
  - Friuli-Venezia Giulia (Italy)
  - Valle del Cauca (Colombia)
- Defining local demand
- Formulating different blends of building blocks to match local demands
  - E.g. 20% biochar, 50% insect frass, 30% microbial biomass

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Validation of the blends

- Making blends in the lab
- Lab validation (Sep 2022):
  - mixing with soil, 30 days of incubation
  - Follow-up breakdown, greenhouse gas emissions
  - Follow-up microbial biomass
  - Follow-up enzymatic activity
  - Follow-up nutrient availability
- Adaptations of blends
- Greenhouse and field validation in different regions: 2023-2024

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Rustica Project Consortium

(KU LEUVEN) University of Leuven
(DRA) Dranco
(CRAPDL) Chambre Régionale d'Agricultures des Pays de la Loire
(BIO) BioSabor, S.A.T.
(CREA) Consiglio per la Ricerca in Agricoltura e l'Analisi dell'Economia Agraria
(TEC) Fundacion para las Tecnologias Auxiliares de la Agricultura
(AVE) Avecom NV
(ENT) Entomo Consulting S.L.
(PAR) Particula Group d.o.o.
(WIED) Wiedemann GmbH
(IDC) IDConsortium SL
(CROP) Stichting CropEye
(EVILVO) Eigen Vermogen van het Instituut voor Landbouw, Visserij en Voedingsonderzoek
(TNO) The Netherland's Organisation of Applied Scientific Research
(UGENT) Universiteit Gent
(CIAT) Centro Internacional de Agricultura Tropical

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