FACULTY OF BIOSCIENCE ENGINEERING

The Chancellor of Ghent University has the honour of inviting you to attend the public defense of the doctoral dissertation of

Francesca Magnolo

Title of the doctoral dissertation:

Biorefineries in agricultural settings:
financial sustainability at farm level and exploring their role in a transformative bioeconomy

The public defence will take place on 22nd April 2025 at 5 PM (CET) in the Room A0.1 Azalea, at Campus Coupure, Coupure links 653, 9000 Gent. The defence can also be followed online: click here for the link.

There will be a contiguous reception to which you are heartily invited.
Please confirm your attendance before 16th April by filling this form or sending an email to: Francesca.magnolo@ugent.be

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Abstract of the doctoral research

In the push to phase out fossil fuels and develop renewable materials and energy, biorefinery systems have emerged as key technologies, designed to process biomass into energy and a wide range of bio-based products. This thesis investigates how such systems can be integrated into agricultural settings, focusing on their financial viability and their potential role in advancing a more transformative bioeconomy. Despite most biomass originates in the agricultural sector, it is processors, bioengineering companies, and research clusters that have the financial means to invest in biorefineries, and therefore capture much of the value they generate. Farmers, in contrast, tend to remain raw material providers. In this thesis, the focus on farm-level implementation of biorefineries, directly managed by farmers, was to investigate the potential role these systems could play in shifting the current imbalanced value distribution in bio-based value chains.

Through techno-economic assessments of two on-farm biorefinery models, microalgae production using grass juice and lactic acid production from fermented grass, this research shows that economic viability is possible but highly dependent on context. High capital costs and limited biomass availability are key constraints. While microalgae production can be profitable depending on product valorization and market conditions, lactic acid production is only viable when multiple farms collaborate and co-invest. Beyond economic feasibility, the dissertation critically examines the policy frameworks shaping biorefinery development in Europe, with a focus on biomethane targets under RePowerEU and the Renewable Energy Directive. These policies largely follow a narrative centered on technological innovation and economic growth, often overlooking ecological integrity and social justice, including when planning for biorefinery upscaling. Interviews to farmers in Community Supported Agriculture (CSA) were conducted to present a different vision of agriculture and the bioeconomy, rooted in sufficiency, cooperation, and care. These perspectives were used in this dissertation as a foundation for rethinking how biorefinery systems might align with post-growth agricultural models.

The thesis concludes that, while current biorefinery systems can support diversification of production for farmers and renewable energy goals, they remain limited, under existing framings, in their ability to drive deeper transformation of the bioeconomy and meaningfully include farmers in bio-based value chains. Expanding the concept of biorefineries to reflect diverse value systems and more accessible, farmer-led technologies could strengthen their potential as tools for a more transformative bioeconomic transition.

Brief Curriculum Vitae

Francesca Magnolo holds a Bachelor's degree in Civil and Environmental Engineering from Sapienza University of Rome, and a Master's degree in Industrial Ecology obtained at Chalmers University of Technology in Gothenburg, Sweden. She then received a scholarship from the European Commission's Marie Skłodowska-Curie program to join the European Training Network AgRefine. In February 2020, she joined the Agricultural Economics Department at UGent to start her PhD. Her research has focused on the link between agri-food and energy systems, in particular the relationship of biogas and biomethane production with agriculture, from resource management to policy implications. She has also worked as research consultant for FeedbackEU, an NGO focused on food justice, and she currently works as a researcher at the Research Institute for Nature and Forest (INBO) of the Flemish government.