



## BUSINESS MODEL 1 - FLANDERS

Business model based on microbial fertiliser development in Flanders

### SHORT SUMMARY FOR PRACTITIONERS

EN version

The RUSTICA project aims to develop and implement bio-based fertiliser (BBF) technologies and business models using waste from the fruit and vegetable sectors. In Flanders, one of the business models centers on a start-up company collaborating with established players like fruit and vegetable processors, to convert their waste into microbial protein paste, a key component for BBF production. This model showcases a streamlined process where the waste undergoes treatment via the carboxylic acid platform technology, extracting valuable substrates for microbial biomass production. The microbial protein paste is produced and can be used as a liquid BBF. The remaining solid waste, rich in energy, can be sent to intermunicipal companies for further processing, such as anaerobic digestion or composting. However, high gate fees for waste disposal pose a challenge. An alternative would be integrating pyrolysis to convert the waste into biochar, offering higher economic and environmental value. While this business model demonstrates significant promise, it faces economic challenges. The current production costs for microbial protein paste are high, but scaling up operations could reduce these costs and improve financial viability. Collaboration with intermunicipal companies to manage waste streams efficiently, along with exploring advanced technologies such as pyrolysis, can create a mutually beneficial partnership.

### SHORT SUMMARY FOR PRACTITIONERS

NATIVE version

Het RUSTICA-project is gericht op het ontwikkelen en implementeren van biogebaseerde meststoffen (BBF) technologieën en bedrijfsmodellen met behulp van afval uit de fruit- en groentesector. In Vlaanderen is een van de bedrijfsmodellen gericht op een start-upbedrijf dat samenwerkt met gevestigde spelers zoals fruit- en groenteverwerkers om hun afval om te zetten in microbiële proteïnepasta, een belangrijk onderdeel voor BBF-productie. Dit model toont een gestroomlijnd proces waarbij het afval wordt behandeld via de carbonzuurplatformtechnologie, waarbij waardevolle substraten worden gewonnen voor microbiële biomassaproductie. De microbiële proteïnepasta wordt geproduceerd en kan worden gebruikt als een vloeibare BBF. Het resterende vaste afval, rijk aan energie, kan naar intercommunales worden gestuurd voor verdere verwerking, zoals anaërobe vergisting of compostering. Hoge toegangsprijzen voor afvalverwerking vormen echter een uitdaging. Een alternatief zou zijn om pyrolyse te integreren om het afval om te zetten in biochar, wat een hogere economische en ecologische waarde biedt. Hoewel dit bedrijfsmodel veelbelovend is, kent het economische uitdagingen. De huidige productiekosten voor microbiële proteïnepasta zijn hoog, maar opschaling van de activiteiten zou deze kosten kunnen verlagen en de financiële haalbaarheid kunnen verbeteren. Samenwerking met intergemeentelijke bedrijven om afvalstromen efficiënt te beheren, samen met het verkennen van geavanceerde technologieën zoals pyrolyse, kan een wederzijds voordelig partnerschap creëren.



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### CONTEXT

In addition to providing a technical solution to convert organic residue streams from the fruit and vegetable sector into novel bio-based fertilisers (BBFs), the RUSTICA project also aims to develop economically viable and environmentally sustainable regional business models. In Flanders, a pioneering start-up collaborating with established fruit and vegetable processors presents an innovative approach to valorise organic waste by producing microbial biomass for fertiliser blends. This model emphasises resource efficiency and sustainability in line with circular economy goals.

### PROBLEM

Flanders faces challenges in fully utilising its organic waste streams for BBF production. While some processing companies handle waste through anaerobic digestion or composting, a significant portion of agricultural residues remains underexploited. This limits the region's potential to maximise nutrient recovery and develop sustainable fertilisers, contributing to nutrient loss and underuse of circular economy principles.

### APPROACH

The business model was refined through data collected from regional workshops and stakeholder interviews, focusing on the collaboration between a start-up and established F&V processors like ALLGRO. The model proposes transforming F&V waste into microbial biomass through carboxylic acid platform technology. By partnering with intermunicipal companies for further processing of residual solids, such as pyrolysis for biochar production, this approach maximises waste valorisation and creates high-value fertiliser components.

### OUTCOME

1. The refined business model demonstrates how microbial protein paste can serve as a viable BBF component.
2. While scaling challenges remain, especially around reducing production costs, the model highlights a pathway for transforming fruit and vegetable waste into valuable resources.
3. This collaboration strengthens waste management and supports regional sustainability.

### PRACTICAL RECOMMENDATIONS

- ✓ Start-ups and fruit and vegetable processors should explore advanced waste transformation technologies to improve the cost-effectiveness of microbial biomass production.
- ✓ To reduce production costs and achieve market competitiveness, the microbial protein production capacity should be increased, ideally reaching 10 000 ton/year to lower the breakeven price and increase profitability.
- ✓ Policymakers should provide financial incentives to reduce gate fees and support the integration of pyrolysis, for instance via intermunicipal companies, to enhance the economic value of waste.



## BUSINESS MODEL 2 - FLANDERS

Business model based on intermunicipal collaboration in Flanders

### SHORT SUMMARY FOR PRACTITIONERS

EN version

The RUSTICA project aims to develop and implement bio-based fertiliser (BBF) technologies and business models using waste from the fruit and vegetable sectors to close regional nutrient cycles. In Flanders, one of the business models focuses on intermunicipal waste management companies, which play a key role in waste collection and composting. These companies currently produce green waste and fruit and vegetable waste compost, which is sold at low prices. The business model suggests expanding their operations to cooperate with other intermunicipal companies, each producing either biochar, microbial biomass or insect biomass, jointly creating specialised nutrient blends from these building blocks. By integrating these advanced processes, intermunicipal companies could tap into untapped agricultural waste streams, fostering a more circular economy. However, challenges remain, including the high costs of production, particularly for microbial biomass and biochar, and lower agronomic performance compared to conventional mineral fertilisers. Additionally, stakeholders such as farmers are hesitant and need to be convinced by the blends' effectiveness and practical considerations such as machinery needs. Despite these barriers, rising mineral fertiliser costs and stricter environmental regulations present opportunities for adoption. Although not researched, long-term sustainability and improved soil health offer further potential benefits, but financial incentives and regulatory adjustments are needed to ensure this model's feasibility.

### SHORT SUMMARY FOR PRACTITIONERS

NATIVE version

Het RUSTICA-project heeft als doel om technologieën en bedrijfsmodellen voor biogebaseerde meststoffen (BBFs) te ontwikkelen die gebruik maken van afval uit de fruit- en groentesector om regionale nutriëntenkringlopen te sluiten. In Vlaanderen richt een van de bedrijfsmodellen zich op intercommunales die een sleutelrol spelen in afvalinzameling en compostering. Deze bedrijven produceren momenteel groenafval en compost van groente- en fruitafval, dat tegen lage prijzen wordt verkocht. Het bedrijfsmodel stelt voor om hun activiteiten uit te breiden en samen te werken met andere intergemeentelijke bedrijven, die elk ofwel biochar, microbiële biomassa of insectenbiomassa produceren en gezamenlijk gespecialiseerde BBF blends maken van deze bouwstenen. Door deze geavanceerde processen te integreren, zouden intercommunales onaangeboorde afvalstromen of gewasresten kunnen benutten en zo een meer circulaire economie bevorderen. Er blijven echter uitdagingen bestaan, zoals de hoge productiekosten, met name voor microbiële biomassa en biochar, en de lagere agronomische prestaties in vergelijking met conventionele minerale meststoffen. Daarnaast zijn belanghebbenden zoals boeren terughoudend en moeten ze overtuigd worden van de effectiviteit van de BBFs en praktische overwegingen, zoals de behoefte aan machines. Ondanks deze barrières bieden de stijgende kosten van minerale meststoffen en de strengere milieuwetgeving kansen voor toepassing. Hoewel dit niet is onderzocht, bieden duurzaamheid op lange termijn en een betere bodemgezondheid verdere potentiële voordelen, maar financiële prikkels en aanpassingen in de regelgeving zijn noodzakelijk.



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### CONTEXT

In addition to providing a technical solution to convert organic residue streams from the fruit and vegetable sector into novel bio-based fertilisers (BBFs), the RUSTICA project also aims to develop economically viable and environmentally sustainable regional business models. In Flanders, the role of intermunicipal companies in managing organic waste offers significant potential for expanding BBF production within the region.

### PROBLEM

Flanders faces a challenge in fully utilising its organic waste streams, such as fruit and vegetable residues, for bio-based fertiliser production. Despite the existence of intermunicipal waste collection systems, agricultural residues and food industry waste remain underexploited. This gap in waste valorisation limits the region's ability to maximise nutrient recovery and integrate circular economy practices effectively.

### APPROACH

The draft business model was refined and adjusted with data collected from different stakeholders. This included regional multi-stakeholder workshops as well as one-on-one interviews with key stakeholders such as intermunicipal companies, farmers and fruit and vegetable processors. Based on their input, one business model was tailored to focus on the role of intermunicipal companies. By fostering cooperation among these companies and introducing technologies such as biochar production, anaerobic digestion, and microbial protein generation, the model aims to enhance the recovery of valuable nutrients from organic waste streams.

### OUTCOME

1. The refined business model enables intermunicipal companies to diversify their waste processing methods and increase the production of BBF blends.
2. These blends have been tested for their agronomic performance, economic viability and environmental impact.
3. While the blends deliver moderate nitrogen levels to crops, they are not yet cost-competitive with traditional mineral fertilisers. However, the environmental benefits, particularly reduced nitrogen leaching and the potential for negative carbon emissions, highlight the long-term sustainability of this approach.

### PRACTICAL RECOMMENDATIONS

- ✓ Intermunicipal companies should invest in advanced waste (pre)treatment technologies to improve their processing efficiency and produce more valuable end products.
- ✓ Stakeholders should explore opportunities to scale biochar technology, which could reduce production costs and make bio-based fertilisers more competitive.
- ✓ Farmers should be supported with training and incentives to adopt BBFs, particularly in light of stricter nitrogen regulations.
- ✓ Policymakers should consider subsidies and financial incentives to encourage investment in BBF technologies and infrastructure.