Final Conference

From research to practice: implementing circular bio-based fertilisers

27 November 2024, Irish College, Leuven

RUSTICA

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

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH ANDINNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

1

Welcome

Liesbet Vranken, KU Leuven

RUSTICA

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

© 2024 RUSTICA all rights reserved
Grant Agreement No. 101000527

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH ANDINNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

2

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Agenda

09:15	Welcome *Liesbet Vranken*	
09:25	RUSTICA technological & market development *Nathan Deman - Daan Kuiper - Dominik Jasinski*	
10:40	Coffee break & visit exhibition pilot	
11:00	The RUSTICA perspective: political and legal aspects of bio-based fertilisers *Adelheid Wiedemann*	
11:20	Embracing regional diversity: European RUSTICA regions *Hanne Cooreman & Fien Amery - Federica Cisilino & Claudio Mondini – Celine Marjolet - Guadalupe Lopez & Carolina Martinez*	
12:45	Lunch	
		13:30 Panel debate on key outcomes of the RUSTICA project *Fien Amery - Daan Kuiper - Dominik Jasinski* *Moderator: Tessa Avermaete*
		14:30 Reflections from dialogue with DG AGRI *Benjamin Van Doorslaer, DG AGRI*
		14:45 Q&A
		15:00 International perspective: case of Valle del Cauca *Mirjam Pulleman & Guillermo Pena Chipatecua*
		FAO perspective on bio-based fertilisers *Mohamed Eida, FAO*
		16:00 Coffee break
		16:30 Stakeholder reflection debate on opportunities *Bram Van Hecke, Kabinet Jo Brouns - (tbc) Omar Zidarich, GITC – Filip Velghe, Mirom Roeselare - Leila Bourdier, Suez* *Moderator: Tessa Avermaete*
		17:00 Closing
		Reception

10:00 - 12:00

RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

3



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

RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

4

RUSTICA´s key data

- 16 partners
- 8 countries
- 6 technologies
- 5 multi-actor networks
- 5 regions/case studies
- 2 pilot demonstrations

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

5

RUSTICA Consortium

- 16 partners
- 8 countries:
  - Belgium
  - France
  - Spain
  - Italy
  - Germany
  - The Netherlands
  - Croatia
  - Colombia

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

6

Bundling academic and non-academic expertise across Europe

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

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

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

7

Rationale RUSTICA

- Nutrient pollution
- Soil degradation
- Food waste
- 70 million tonnes of dry matter of field crop residues

  -> Invest in recovery of nutrients from food waste

  -> Replace mineral fertilizer with bio-based alternative

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

8

Objectives RUSTICA

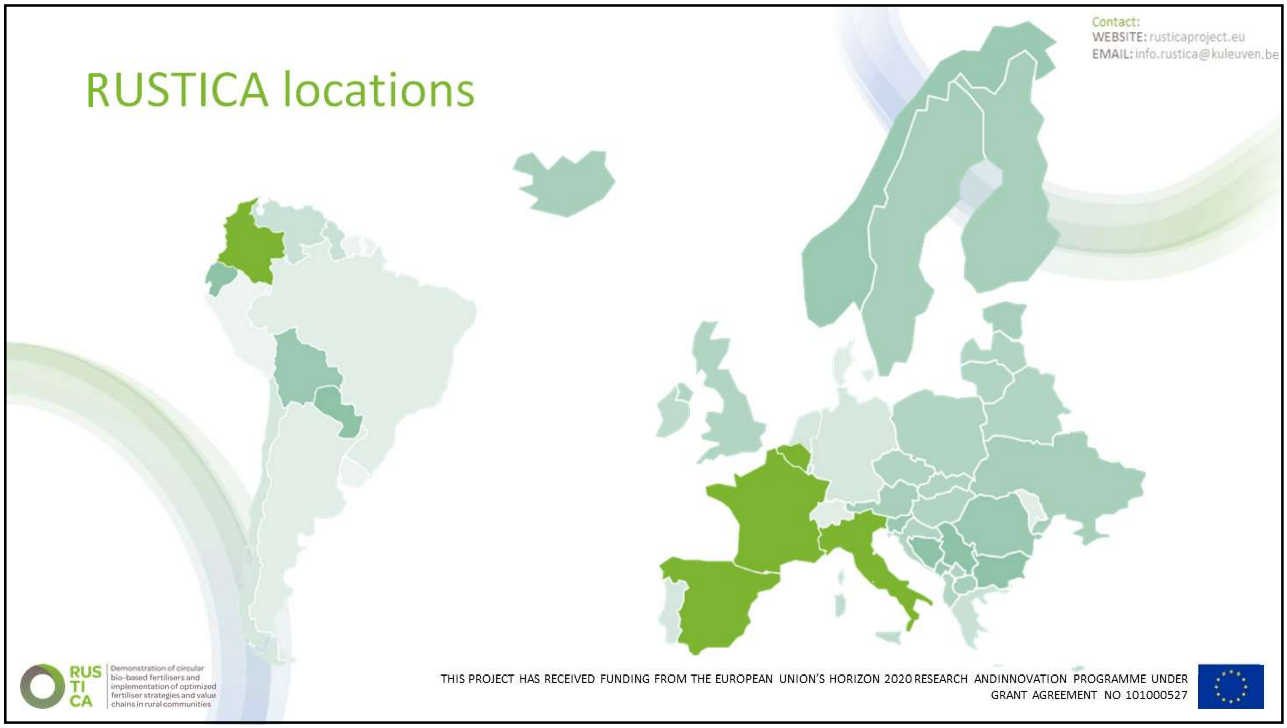
- Foster the validation, demonstration and implementation
- 6 technological options for mineral nutrient recovery
- Co-develop circular bio-based business models
- 4 regions across the EU + additional validation in Latin America

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

9

RUSTICA locations

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be



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

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

10

Work plan

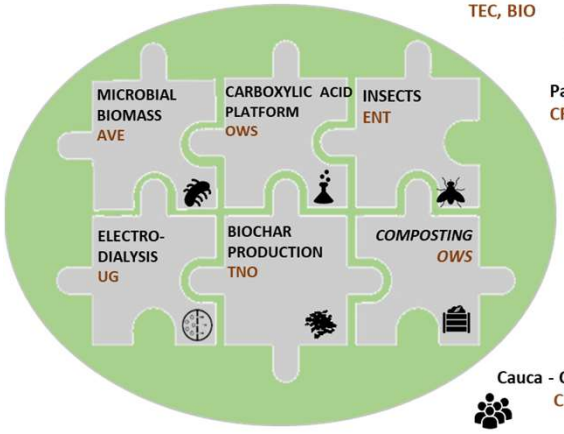
- Technology optimisation and integration
- Regional multi-actor approach and pilot demonstration
- Systemic feasibility assessment
- EU multi-actor approach & networking

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

11

Technological development

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be



Almeria - SP
TEC, BIO

Pays de la Loire - FR
CRAPDL

Flanders - BE
EVILVO

Friuli Venezia Giulia - IT
CREA

Cauca - CO
CIAT

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

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH ANDINNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

12

Market development

- Market analysis
- Techno-economic analysis
- Legal analysis
- Environmental and social LCA

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

13

EU level multi-actor approach

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

- Regional workshops
- EU and global workshops

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

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

14

RUSTICA technological- and market development

Nathan Deman, DRANCO, Dominik Jasinski & Daan Kuiper, CROPEYE

RUSTICA

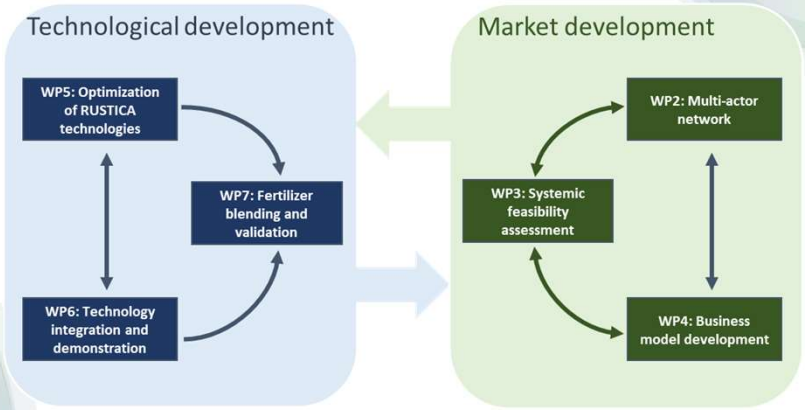
Demonstration of circular bio-based fertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH ANDINNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

15

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

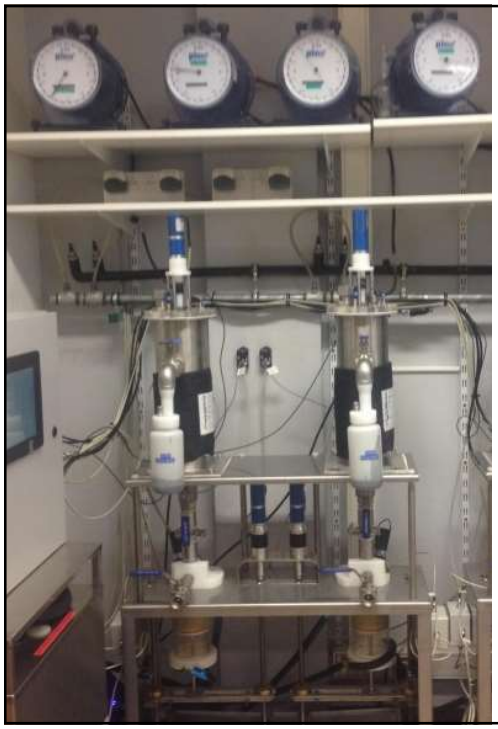
Overview of RUSTICA structure



RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

16



Technological development

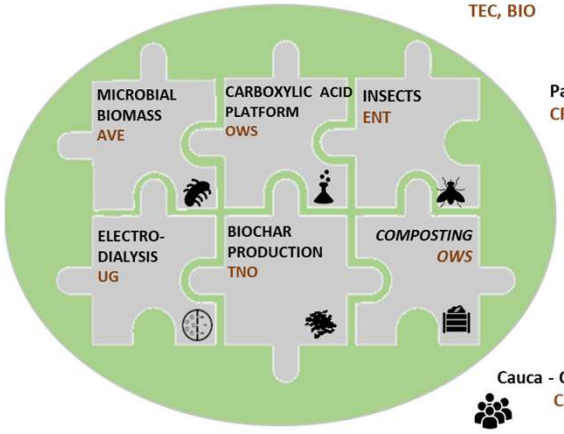
- Optimise and demonstrate technologies for nutrient recovery from F&V residues as bio-fertilizer
- Demonstrate the integration of technologies to reach a combined nutrient recovery of more than 90%
- Demonstrate the production of fertilizer blends adapted to local demand

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

17

Technological development

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be



Almeria - SP
TEC, BIO

Pays de la Loire - FR
CRAPDL

Flanders - BE
EVILVO

Friuli Venezia Giulia - IT
CREA

Cauca - CO
CIAT

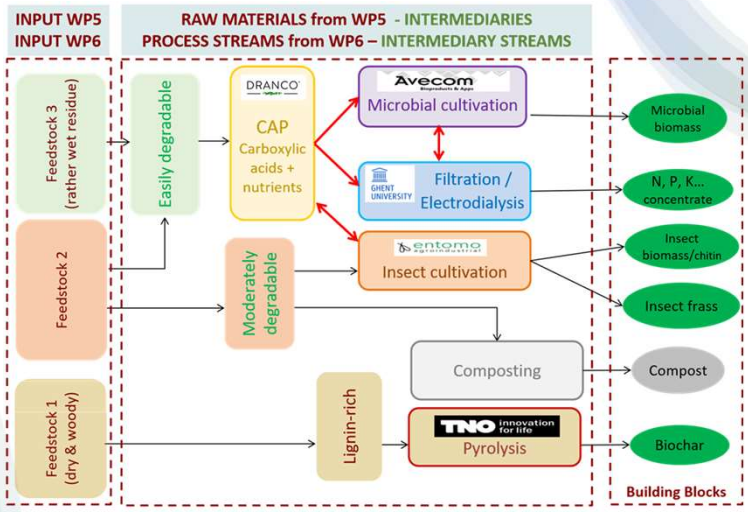
RUSTICA Demonstration of circular bio-based fertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH ANDINNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

18

RUSTICA technologies

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be



THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

19

Carboxylic Acid Platform (CAP)

TRL: 5

DRANCO

Substrate testing in the lab

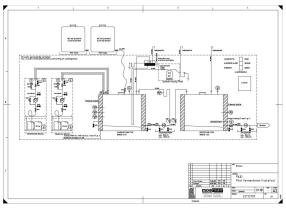
Technology: Anaerobic fermentation
Input: Easily degradable biomass
Fruit and vegetable cutting waste ALLGRO
End product: CAP-solution

Biomass → Shredder → CAP → Dewatering → CAP-solution

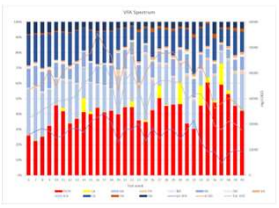
NPK and C-Rich Solution

Side Streams: Centrifuge Cake

Anaerobic digestion: Biogas
- Heat
- Electricity



CAP 3m³ pilot at ALLGRO



Pilot results

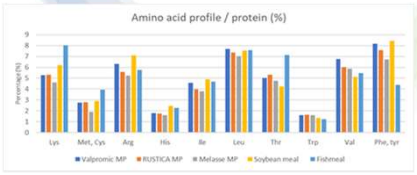
20

Microbial Protein Production (MP)

TRL: 5

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Technology: Aerobic fermentation
Input: CAP-solution
End product: Microbial Protein
Slow release N-source



CAP-solution → Aerobic Fermentation → MP biomass separation → MP biomass drying → MP powder

70% protein content

Side Streams: Process water

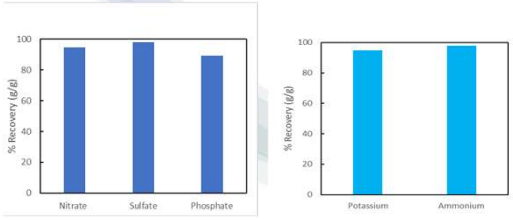
1/2 to 2/3 recycled
- Reduced COD content
- Easily treatable

Electrodialysis (ED)

TRL: 3-5

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

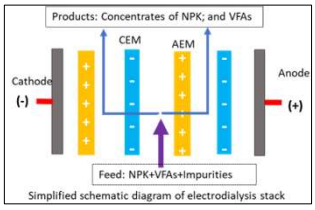
Technology: Electrodialysis
Input: CAP-solution
End product: NPK-solution



CAP-solution → Filtration → ED – bulk separation → ED – nutrient balancing → NPK-solution

Side Streams: VFA-solution

High value product



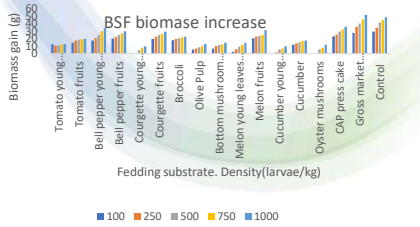
Simplified schematic diagram of electrodialysis stack

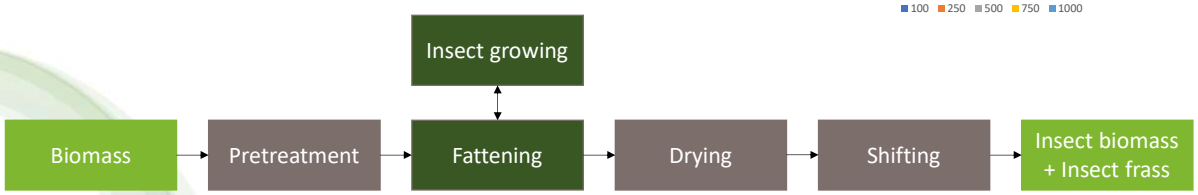
Insect cultivation (IC)

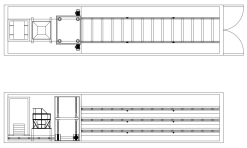
TRL: 5

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Technology:	Insect cultivation
Input:	Greenhouse side streams
End product:	Insect biomass (C- and N-source)
	Insect frass (soil structure improvement)







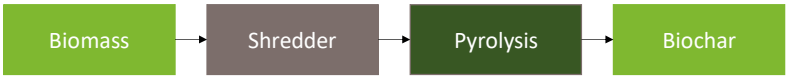
23

Biochar production (BP)

TRL: 5

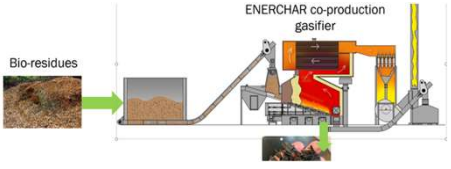
Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Technology:	Pyrolysis
Input:	Lignin rich substrates
End product:	Biochar
	- soil improvement
	- water retainment



Side Streams: Pyrolysis gas

- Heat
- Electricity



24

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

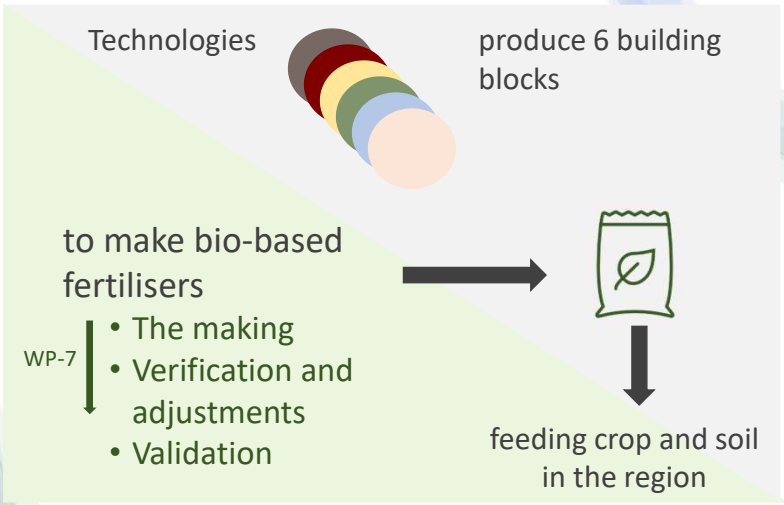
Conclusion

Multiple existing technologies could be used for the RUSTICA approach:

- Biomass properties
- Availability of the technology
- Regulatory instances of the region

25

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

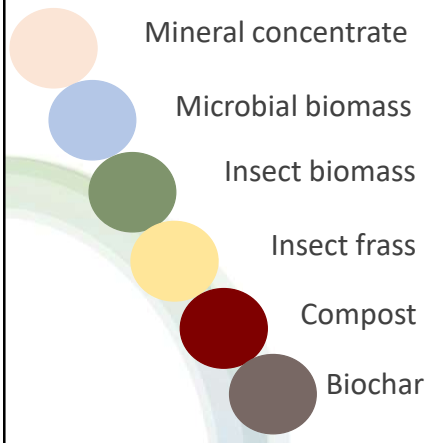


THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

26

Six building blocks for five main soil functionalities

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be



- Mineral concentrate
- Microbial biomass
- Insect biomass
- Insect frass
- Compost
- Biochar

Crop nutrition
Direct or via mineralisation

Soil life
Resilience, mineralisation, crop protection

Soil physics
Water retention, erosion, heavy metals

EcoSystem services
GHG-emission, Nitrate leakage, CO_2 capture, biodiversity

↓

Nutrient management and organic matter management in the soil

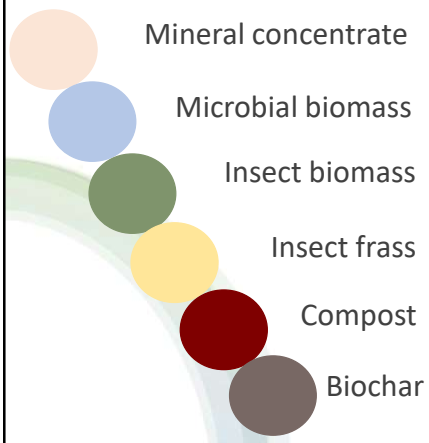
RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

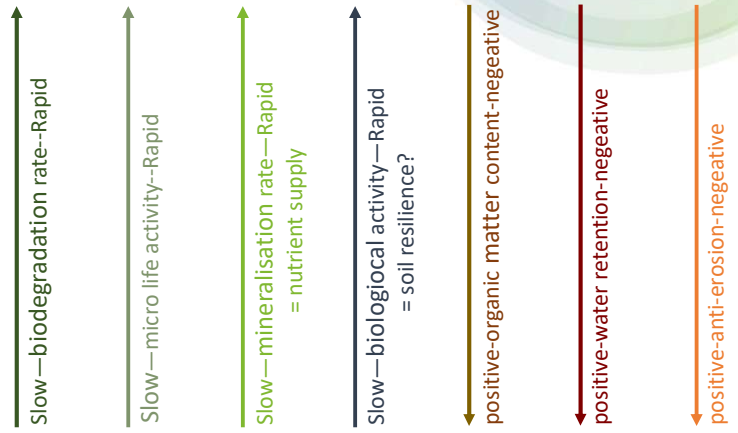
27

Effects of RBBF depend on the composition and degree of bio-degradation

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be



- Mineral concentrate
- Microbial biomass
- Insect biomass
- Insect frass
- Compost
- Biochar



RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

28

RBBF in field trials

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

	Flanders	Pays de la Loire	Almeria	Friuli-Venezia Giulia
Crop	**Leek**	**Lettuce**	**Cucumber**	**Grapes**
Productivity	+	+	+	+
Product quality	+	+	+	+
Biological activity	+	+	+	+
Water retention	nd	nd	+	+
Anti erosion	nd	nd	nd	+
Crop	**Cauliflower**	**Grapes**	**Tomato**	
Productivity	+/-	?	+	
Product quality	+/-	+	+	
Biological activity	+	?	+	
Water retention	nd	nd	+	

+: similar or better than conventional

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

29

Conclusions

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

- RBBF composed of vegetable waste based building blocks can replace mineral fertilisers,
  - Promoting soil-born mineralisation (biological process)
  - Increasing biological activity leading to improved soil resilience
  - Promoting water retention and anti erosion
- Its composition determines the balance between mentioned effects
- Characteristics of acceptor-soil determine readiness to process RBBF
- High demanding crops like cauliflower could need some mineral support (also depending on the capabilities of the soil)

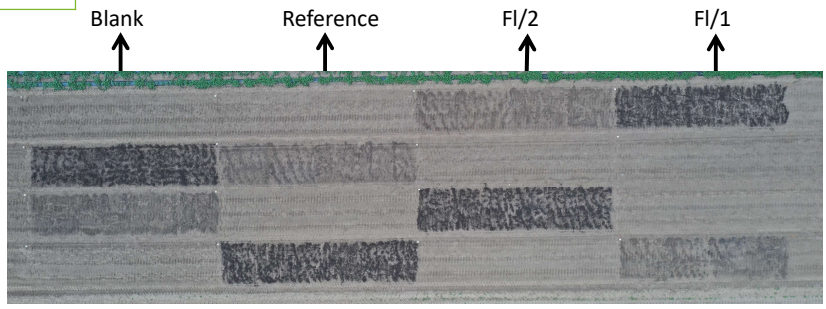
30

Field trials in Flanders (BE)

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Ton/ha	Fl/1	Fl/2
Compost	10	2
Biochar	1	2
Microbial biomass	1	1
Insect frass	1	1.5

Comparison with:
- Blank (no N fertiliser)
- Mineral fertiliser



31

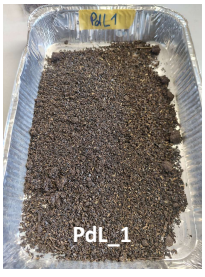
Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Field trials in Friuli-Venezia Giulia (IT)

BB type	Blend code		
	FVG_5	FVG_6	PdL_1
Compost	66.7	83.3	62.5
Biochar	16.7		18.75
Microbial biomass			6.25
Insect biomass	16.7	16.7	
Insect frass			
Total	100	100	100

Organo mineral fertiliser (OMF)

Manure



32

Market development

- Market analysis
- Business model development
- Techno-economic analysis
- Legal analysis
- Environmental and social LCA

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

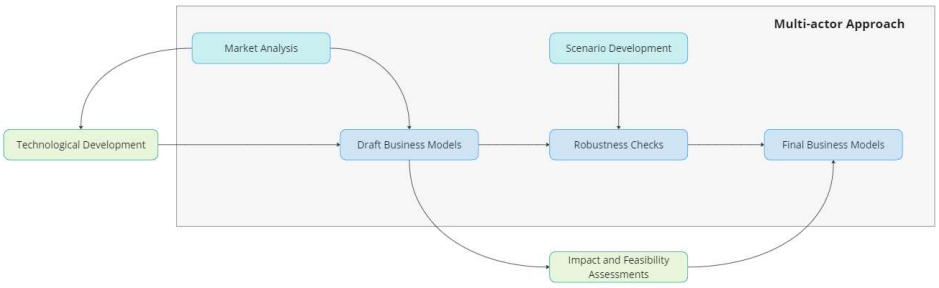
33

Methodological overview

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Multi-stakeholder input for market analyses and description of current and potential regional value chains and business models

Impact and feasibility assessments: Life Cycle Assessment (LCA), Life Cycle Costing (LCC), Techno-Economic Assessment (TEA), Agent-Based Modeling (ABM)



RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

34

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Regional Business Models

- Intermunicipal Collaboration
- Microbial Fertiliser Development

Flanders

- Multi-technology waste processing →

Almeria

- Multi-supplier building block production
- Compost and biochar integration
- NPK concentrate production

Pays de la Loire

- Intermunicipal alliance
- Coffee synergy

Friuli-Venezia Giulia

- Food market unit →

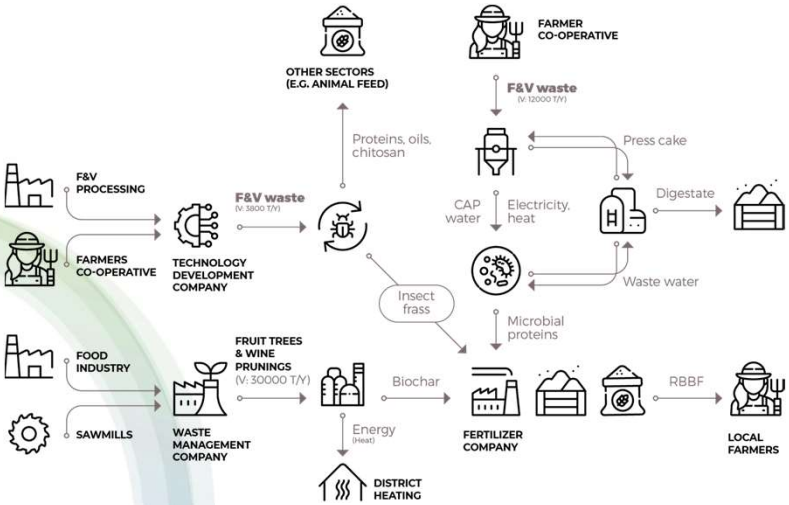
Valle del Cauca

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

35

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Example BM: Multi-supplier building block production



BUILDING BLOCKS	BLENDS Pdl/1 %
Compost	63
Biochar	19
Microbial biomass	6
Insect frass	13

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

36

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Example BM: Multi-supplier building block production

	Crop type: lettuce		
	PdL/1	Organo-mineral fertiliser	Mineral fertiliser
Fertiliser dose (kg/ha)	**6500**	**750**	**570**
Dry matter (kg/ha)	3906.5	750	570
N (kg N/ha)	79.3	82.5	79.8
P (kg P/ha)	27.0	37.5	28.5
K (kg K/ha)	47.3	105.0	114.0
TOC (kg C/ha)	1832.1	118.5	0.0
Irrigation water (l/ha)	-	-	-
Field experiment period (months)	-	-	-

	Crop type: vineyard	
	PdL/1	Organic fertiliser
Fertiliser dose (kg/ha)	**3300**	**570**
Dry matter (kg/ha)	1983.3	484.5
N (kg/ha)	40.3	39.9
P (kg/ha)	13.7	14.4
K (kg/ha)	24.0	18.9
TOC (kg/ha)	930.2	177.6
Irrigation water (l/ha)	-	-
Field experiment period (months)	-	-

BUILDING BLOCKS	BLENDS Pdl/1 %
Compost	63
Biochar	19
Microbial biomass	6
Insect frass	13

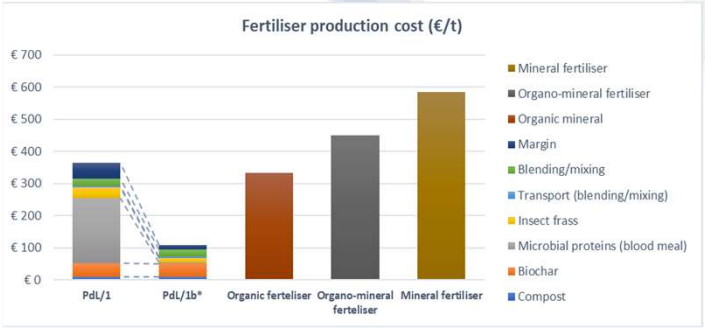
THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

37

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Example BM: Multi-supplier building block production

Blend code	Target crop	Blend composition	Cost (€) per tonne of building block
PdL/1	Lettuce and vineyard	62.8% compost 18.6% biochar 5.8% microbial biomass 12.8% insect frass	**€16** **€226** **€3 499** **€266**



**use of blood meal (€50/t) instead of microbial biomass and frass cost reduced to €100/t*

Cost of microbial proteins could be also **reduced if scaled-up** (€1,120/t in Flanders), but only if used **in combination with other technologies** (e.g. AD or pyrolysis as a source of energy for electricity and heat)
Cost of frass very high due to **low volumes** (input waste 3,800 T/Y), it could be reduced at larger scale to **€100/t** (Flanders, Almeria and FVG)
Expensive building blocks could be **replaced** by **alternatives available in the regions**, e.g. **blood meal (€50/t)** is currently **considered** in **the Netherlands** to **replace microbial biomass**, which would help to reduce the cost of **PdI/1** from **€364/t** to **€108/t** (with frass at €100/t)

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

38

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Example BM: Multi-supplier building block production

	Unit	Lettuce (PdL/1)	Lettuce (organo-mineral)	Lettuce (mineral)	Vineyard (PdL/1)	Vineyard (organic)
Cost of fertiliser*	€/$t_{Product}$	€ 364 (€108)	€ 450	€ 585	€ 364 (€108)	€ 332
Fertiliser dose	t/ha	6.5	0.75	0.57	3.3	0.57
Fertilisation cost	€/ha	€ 2,429	€ 345	€ 339	€ 1,234	€ 195
Crop production yield (T/ha)	t/ha	43	43	43	2.25	2.25
Fertilisation cost per 1 ton of crop per ha*	€/t/ha	€56.5 (€17.8)	€8.0	€7.9	€548.6 (€173)	€86.6

- ***Fertilisation cost with Pdl/1b in bracket***

Cost-wise **RBBF not competitive** with commercial **mineral fertiliser, OMF and OF (poultry manure)** considering **current market conditions**. **Carbon Removal Credits** through biochar (and other BBs) **not considered** in the economic analysis (approx. €140/tCO2 according to CORC index Puro Earth), which would reduce the cost of Pdl/1 fertilisation by another €5 (for lettuce) to €50 (vineyard) per ton of crop/ha
Despite recent short-term market imperfections and price variations, the **long-term trend** for **mineral fertiliser prices** is **upward,** while **RBBFs** should **go down** in the long run

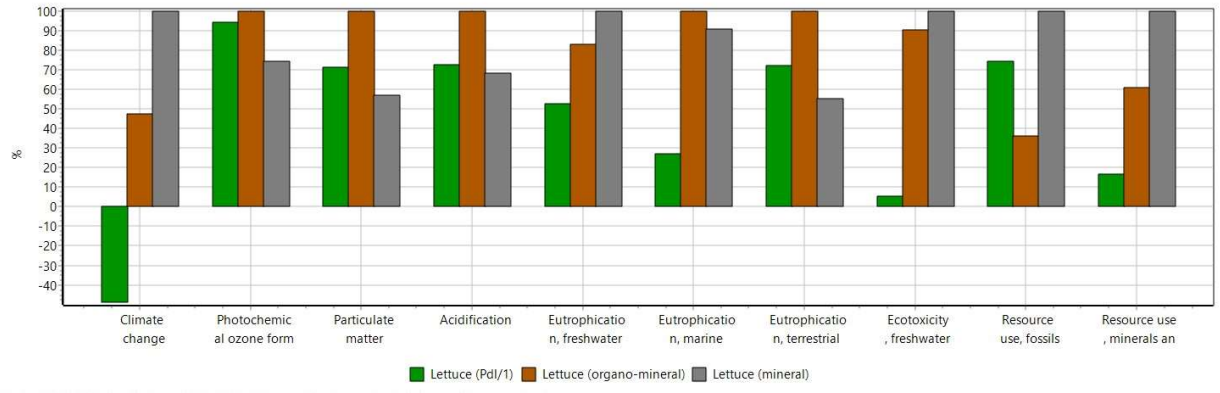
THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

39

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Example BM: Multi-supplier building block production

LCA results – RBBF vs reference (FU=1 ton of crop/ha)



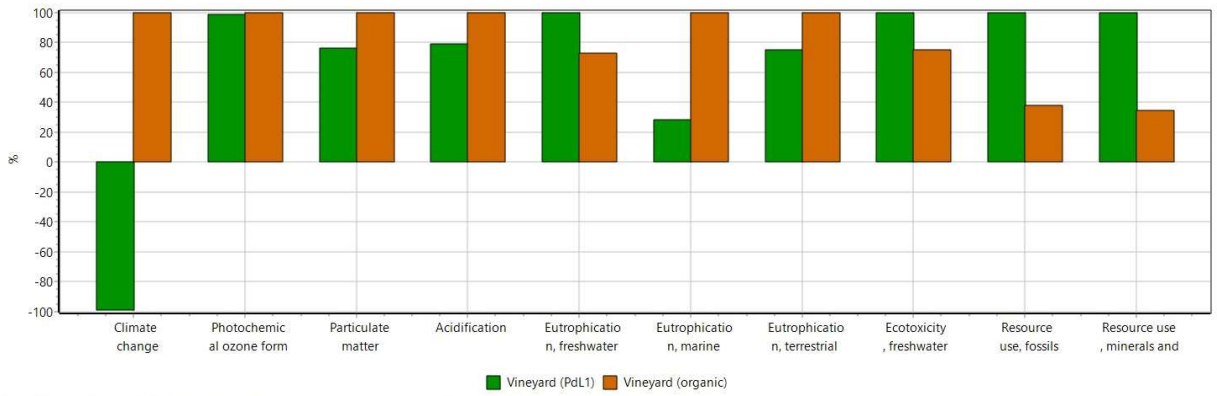
THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

40

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Example BM: Multi-supplier building block production

LCA results – RBBF vs reference (FU=1 ton of crop/ha)



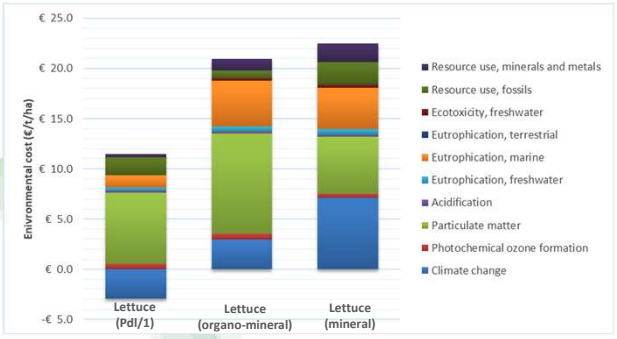
THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

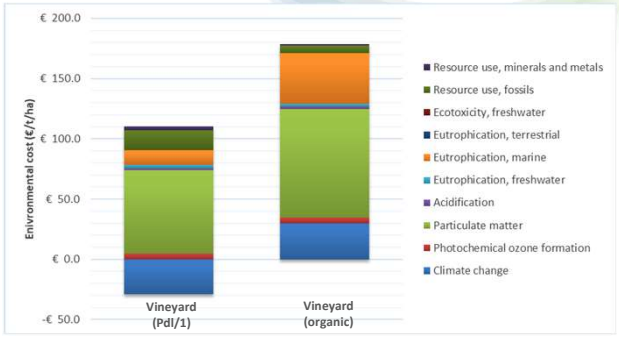
41

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Example BM: Multi-supplier building block production

Weighted LCA results – Environmental cost (1 ton of crop/ha)





Environmental improvements can further **compensate**, at least to some extend, the **current higher production cost for RBBFs** than the **reference fertilisers, €12-€14** (lettuce) to **€80** (vineyard) **in favour of RBBFs** per ton of crop per ha

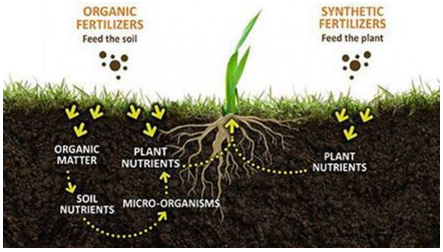
THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

42

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Other potential agronomic advantages of RBBFs

- **Increased soil organic matter content** - recorded in the field trials of Flanders, FVG and Almeria
- **Improved soil health and quality** – anti erosion effect recorded in FVG
- **Improved water holding capacity** – recorded in Almeria
- **Increased soil biodiversity** – increase of biological activity in all regions
- **Improved crop resilience** - recorded in Almeria, and for the grapevine test in France
- **Improved crop quality** – recorded in FVG and Almeria and partly in Flanders (leek)



The **time constraints** (maximum 2 years of trials) allowed to **provide** only **partial evidence** supporting all these **claims**!!! Also, there is a **necessity of coupling LCA** and **agronomic models** to gain a more **precise picture** of **BBFs performance**.

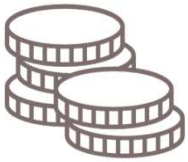
THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

43

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

General conclusions

- The cost of RBBFs depends on many factors, but in general, some building blocks of RBBFs are more expensive than the other (e.g. microbial proteins and insect biomass)
- As a substitute for mineral fertilisers (OMFs and OFs), RBBFs are currently more expensive (per ton of crop per hectare) but there is still plenty of room for further optimisation and improvement
- Possible strategies to lower costs
  - Combining drying processes (e.g. microbial biomass) with energy production processes such as anaerobic digestion or pyrolysis
  - Upscaling of technologies (e.g. insect production in PdL)
  - Looking for cheap source of biomass (especially for biochar production)
  - Factoring in carbon credits
  - Maximising value from selling by-products (where applicable)
  - Looking for alternative building blocks available in the region (e.g. manure or blood meal)



THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

44

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

General conclusions

- An extensive value proposition of RBBFs (far beyond of mineral fertilisers) should reduce the effect of price in the buying decision by farmers:
  - Improved soil organic matter content
  - Improved soil health and quality
  - Improved water holding capacity
  - Improved biodiversity
  - Improved crop resilience and quality
- Also, higher production costs can be compensated, to some extent, by environmental cost (value), which is better for RBBFs than the reference fertilisers
- The are also social benefits of introducing RBBFs (e.g. improved employment, regional closed-loop nutrient cycles and waste valorisation, technology development, by-products like renewable energy)
- Tailored business development approaches are needed per region
  - Based on regional waste streams, crop and soil needs
  - Based on regional technological expertise and partnerships

RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

45

The RUSTICA perspective: legal and political aspects of bio-based fertilisers

Wiedemann GmbH
Bio-based Advancement

Adelheid Wiedemann, Wiedemann

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

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH ANDINNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

46

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Agenda

- Overview - scope
- Main RUSTICA value chains
- Feedstocks
- Processing to building blocks
- Building blocks/blends for various markets
- Organic farming in the EU
- RUSTICA legal aspects - public documents

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

47

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Overview - scope

International	European	National	Regional
• Conventions • Agreements	• Priorities/Strategies • Legal environment along value chains and use	• Legal aspects in EU countries • Situation in Colombia	• EU test regions • Valle del Cauca

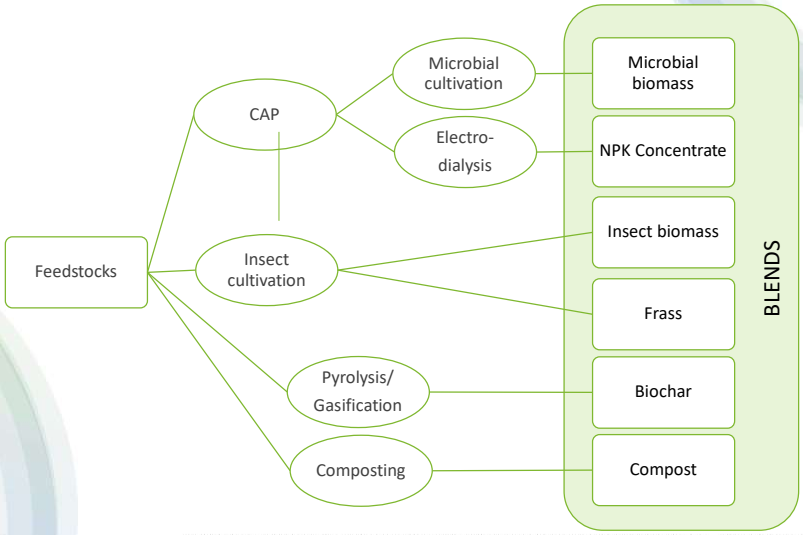
RUSTICA analyses at various levels

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

48

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Main RUSTICA value chains



THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

49

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Feedstocks

Waste | By-products | Animal by-products | Residues | Biomass

Important terms to be considered in the context of bio-based fertilisers

Legal sources: e.g., 2008/98/EC; (EC) No 1069/2009; (EU) No 142/2011; (EU) 2018/2001 (non-exhaustive)

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

50

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Processing to building blocks

Processing	Important legal areas (examples)
Carboxylic acid platform	REACH, feed, fertilisers, energy
Microbial cultivation	REACH, fertilisers
Electrodialysis	REACH, fertilisers
Insect cultivation	Feed, animal by-products, fertilisers
Pyrolysis/Gasification	REACH, fertilisers, industrial emissions
Composting	Waste, REACH, fertilisers

Legal sources: e.g., (EC) No 1907/2006; (EC) No 767/2009; (EU) 2019/1009; 2010/75/EU; 2008/98/EC; (EC) No 1069/2009; (EU) No 142/2011; (EU)2018/2001 (non-exhaustive)

RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

51

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Building blocks/blends for various markets

Building blocks/Blends
Compost
Biochar
Insect protein
Insect frass
Nutrient concentrate
Microbial biomass
Blends

?

Harmonised rules for fertilising products

EU Fertilising Products Regulation (FPR)

Non-harmonised rules via national and regional legislation

Legal sources: e.g., (EU) 2019/1009; (EC) No 1069/2009; (EU) No 142/2011; (non-exhaustive)

RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

52

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Organic farming in the EU

Policy and legislation	Organic production
EUROPEAN GREEN DEAL:	Target of 25% in the EU by 2030
Common Agricultural Policy:	Support of organics by CAP Strategic Plans
Organic Action Plan:	3 Axes to boost organic farming
Regulation Implementing Organic Production:	Rules on e.g., compost, biochar and frass
Regulation on Organic Production:	Restrictions for mineral nitrogen fertilisers

Legal sources: COM (2019)640; (EU)2021/2115; COM(2021)141; (EU)2018/848; (EU)2021/1165 (non-exhaustive)

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

53

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Conclusions

- Feedstock is decisive to options of bio-based fertilisers.
- Processing and manufacturing are strongly regulated.
- Marketing under harmonised rules is going straightforward.
- National/regional legislation considers emerging sectors.
- Organic production imposes additional stipulations.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

54

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Legal aspects - public documents

D3.2 RUSTICA valorisation concepts in the EU legislative frameworks

- https://rusticaproject.eu/wp-content/uploads/2023/03/D3.2_RUSTICA-valorisation-concepts-EU-legislative-framework.pdf

D3.6 RUSTICA legislative aspects at national and regional levels

- https://rusticaproject.eu/wp-content/uploads/2024/10/Rustica-Public-Deliverables_D3.6.pdf

D3.13 Outlook on future legislative aspects for RUSTICA nutrient cycles

- https://rusticaproject.eu/public-deliverables/

Report on CAP Strategic Plans

- https://rusticaproject.eu/reports/

Policy lens: Articles on political and legal environments

- https://rusticaproject.eu/legal-overview/

RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

55

Embracing regional diversity: European RUSTICA regions

Hanne Cooreman & Fien Amery, EV ILVO
Federica Cisilino & Claudio Mondini, CREA
Céline Marjolet, CRAPDL
Guadalupe Lopez & Carolina Martinez, TECNOVA

RUSTICA

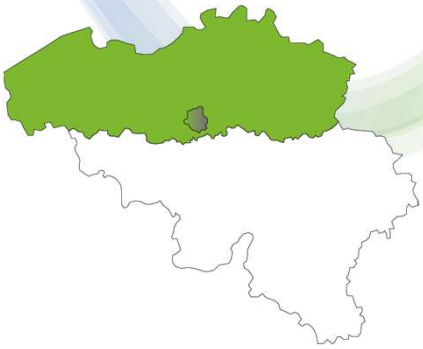
Demonstration of circular bio-based fertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH ANDINNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

56

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Flanders (BE)

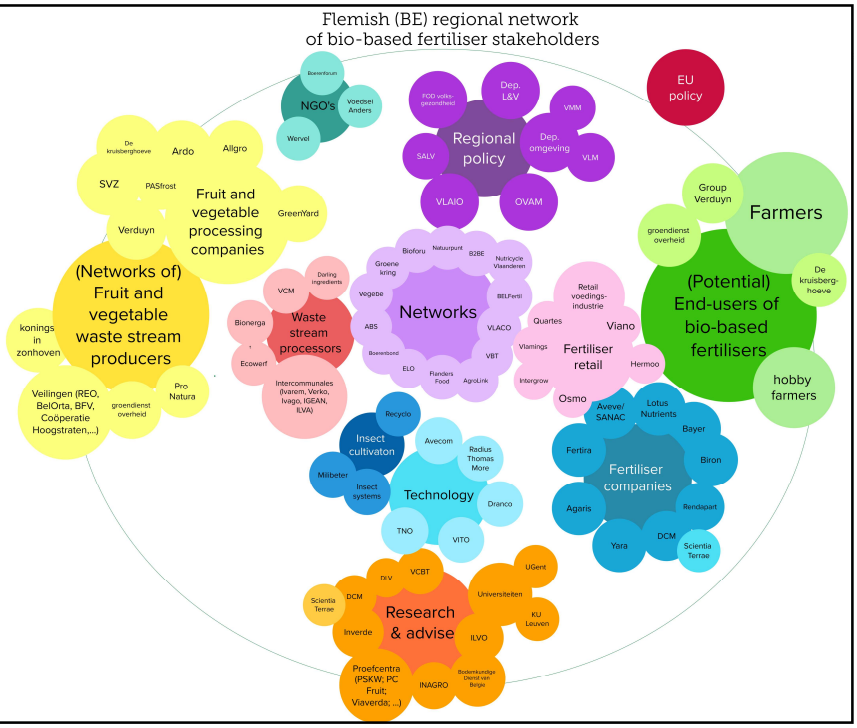


- Agricultural area: 625,000 Ha
- 50,000 workers
- Large scale and intensive
- Main crops: leek, onion, carrots, apples
- 280,000 T waste per year

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

57

Stakeholder map



58

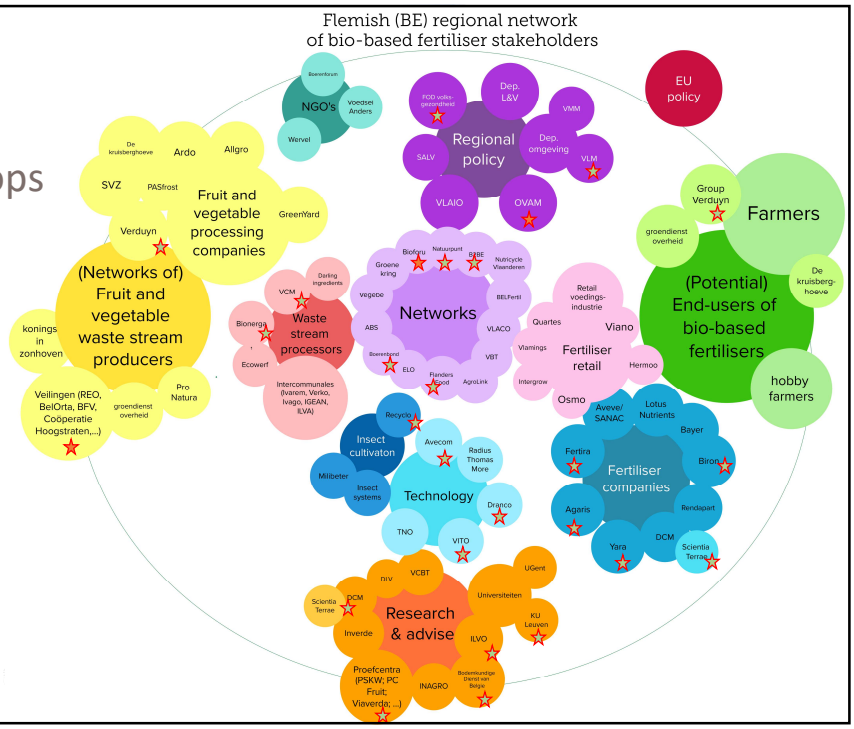
6 stakeholder workshops

spread over 3 years

$\bar{x}$ = 12 participants

+ bilateral contacts

on for example
legal advice and
business model input



59

6 Flemish Stakeholder Workshops

Main points of impact

01.'22

- Developing **SH map** together
- Decision for **leek** as one of the BBF RUSTICA crops
- **Future scenario:** Social, political, technological, economic and environmental factors related to BBF development and use scored on relevance and interlinked

05.'22

Value chain exercise

- small waste producers not as interested in adopting the BBF-technologies as waste collectors, processors or fertiliser producers.
- high energy and mineral fertiliser prices = great opportunity for BBF
- complexity of legislation = threat.
- easier to build on existing networks and business models such as well-organised collection systems.

11.'22

- Flemish business model should better take into account **legislation** on using animal by-products in the BBF blend.
- Clear suggestions to refine the **policy brief drafts**

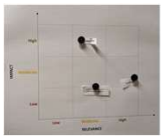
05.'23

International exchange on:

- possibility of a future without mineral fertilisers
- difficulty to find companies who are working simultaneously on the 4 technologies needed for RBBF
- Suggestion to contact intermunicipal companies to strengthen the Flemish BM
- how to incentivise farmers to use BBF

12.'23

Social LCA exercise



10.'24

Project results well received!

- SH suggest regional follow-up projects with a limited budget (eg NL-FL)
- Attention to combining animal and plant residue + an outspoken climate change perspective.
- Attention to the phosphate problem in our region.

60

Flemish stakeholder workshops:

Actionable insights for the future to create a better win-win context

1. **Tailored** benefits depending on participating stakeholder type = Time intensive!
2. **Flexibility** in project proposal in light of timing of shareable results
3. **Knowledge broker team** that is trusted, with complementary skills/knowledge and defined detailed expectations
4. **(Bilateral) In-depth involvement of stakeholders** in between workshops

Cooreman, H., Giacomella, L., Cisilino, F., Angeloni, A., & Farahbakhsh, S. (2024). *Insights into co-created multi-actor workshops to collect and integrate stakeholder input in a European project*. IFSA 2024. https://ifsa2024.crea.gov.it/wp-content/uploads/2024/07/Proceedings-IFSA-2024-Theme-3.pdf

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

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

61

Field trials

Focus:

- ! N-delivery !
- Soil carbon and soil health

Crops:

- 2023: leek (June-February)
- 2024: cauliflower (same field, cumulative effect)

62

Blends validated in field trials

Ton/ha	Fl/1	Fl/2
Compost	10	2
Biochar	1	2
Microbial biomass	1	1
Insect frass	1	1.5

Characteristics	Moisture	Stability	Total N (%)	Organic matter (%)
Fl/1	Relatively high	Not stable	2	40-52
Fl/2	Relatively high	Not stable	3	75-79

Can both deliver 100 kg N/ha to the crop?

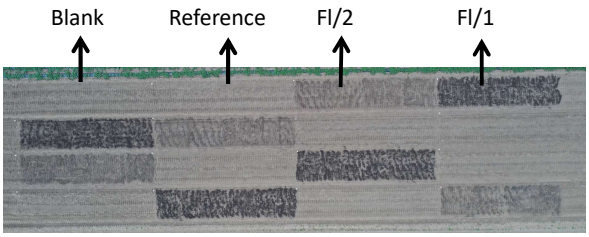
THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

63

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Treatments in field trials:

- Blank: no N fertiliser
- Reference: mineral N fertiliser 50+50 (leek) and 200+50 (cauliflower) kgN/ha
- Fl/1 blend 13 ton/ha (cauliflower: +100 kgN/ha)
- Fl/2 blend 6.5 ton/ha (cauliflower: +100 kgN/ha)

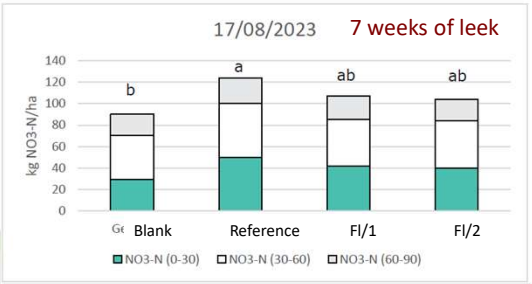


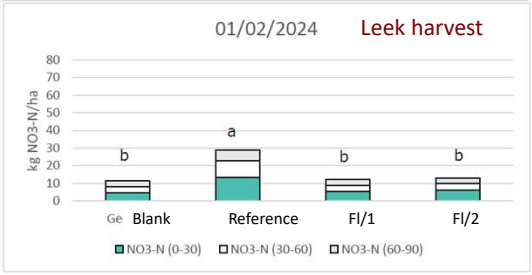
THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

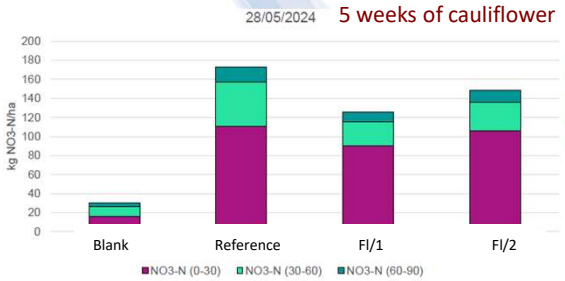
64

Mineral soil N

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be







- Most mineral soil N for Reference treatment
  - Also more in deep soil layers -> leaching to environment
- RUSTICA blends: (slightly) larger mineral N compared to blank
  - RUSTICA blends for cauliflower: received additional mineral N

65

Visual observations

- Leek:
  - Differences starting from week 14
  - Blank: lower scores
  - Fl/2: slightly higher scores
  - However at harvest: no differences observed during leek preparation
- Cauliflower:
  - Immediately lower scores for the blank
  - Reference scoring best
  - No difference between Fl/1 and Fl/2

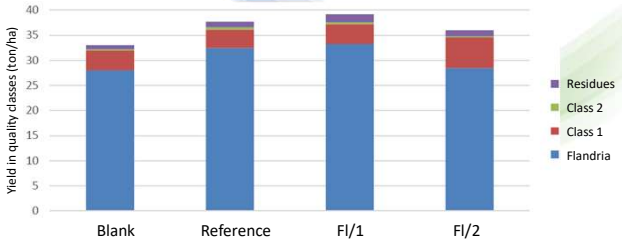
RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

66

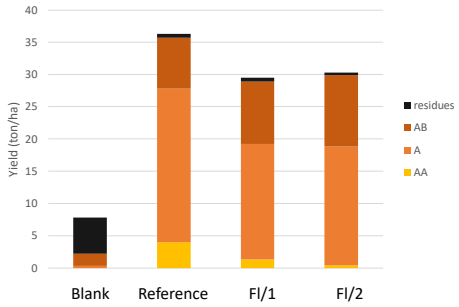
Yield and quality

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

- Leek:
  - No significant differences in yield and quality



- Cauliflower:
  - Number of cauliflowers ready for harvest: blank < blends < ref
  - Higher yield and quality for reference
  - Very low yield for blank



67

Soil characteristics

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

- Differences in soil characteristics after two applications:
  - Increase of soil organic C and N for Fl/02

	pH	OC	TN
(unit)	(-)	(% of dry matter soil)	
Blank	6.1 (0.2)	1.44 (0.07) a	0.143 (0.009) a
Reference	6.1 (0.2)	1.49 (0.02) a	0.146 (0.005) ab
Fl/01	6.1 (0.1)	1.49 (0.06) ab	0.146 (0.006) ab
Fl/02	6.1 (0.1)	1.59 (0.05) b	0.151 (0.005) b

  - No differences in microbial biomass measured by PLFA

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

68

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Main results/conclusions

- RUSTICA blends can deliver N to the crop
  - Sufficient for a slow growing crop
  - Extra N or larger doses needed for high N demanding crops
  - Slow N delivery: less N leaching
- RUSTICA blends (FI/02) can increase the soil organic carbon content
  - Effects on microbial biomass: probably more time/application needed

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

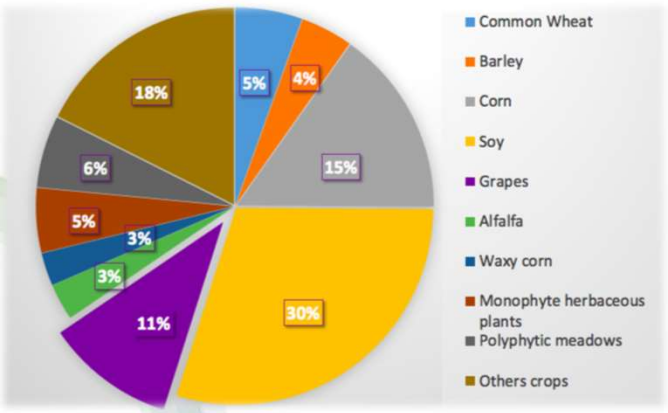
THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

69

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Friuli-Venezia Giulia (IT)

Total Agricultural area (%) - main crops

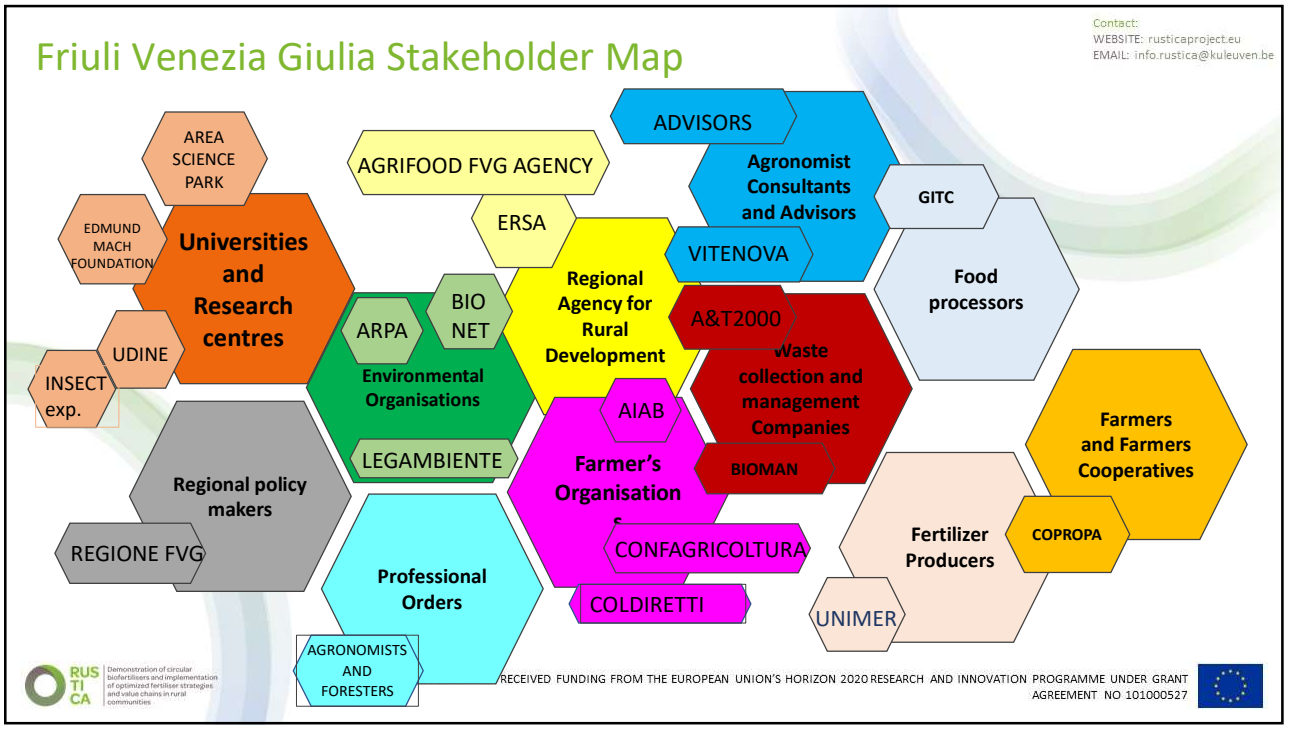


Source: own processing on ISTAT data (2022)

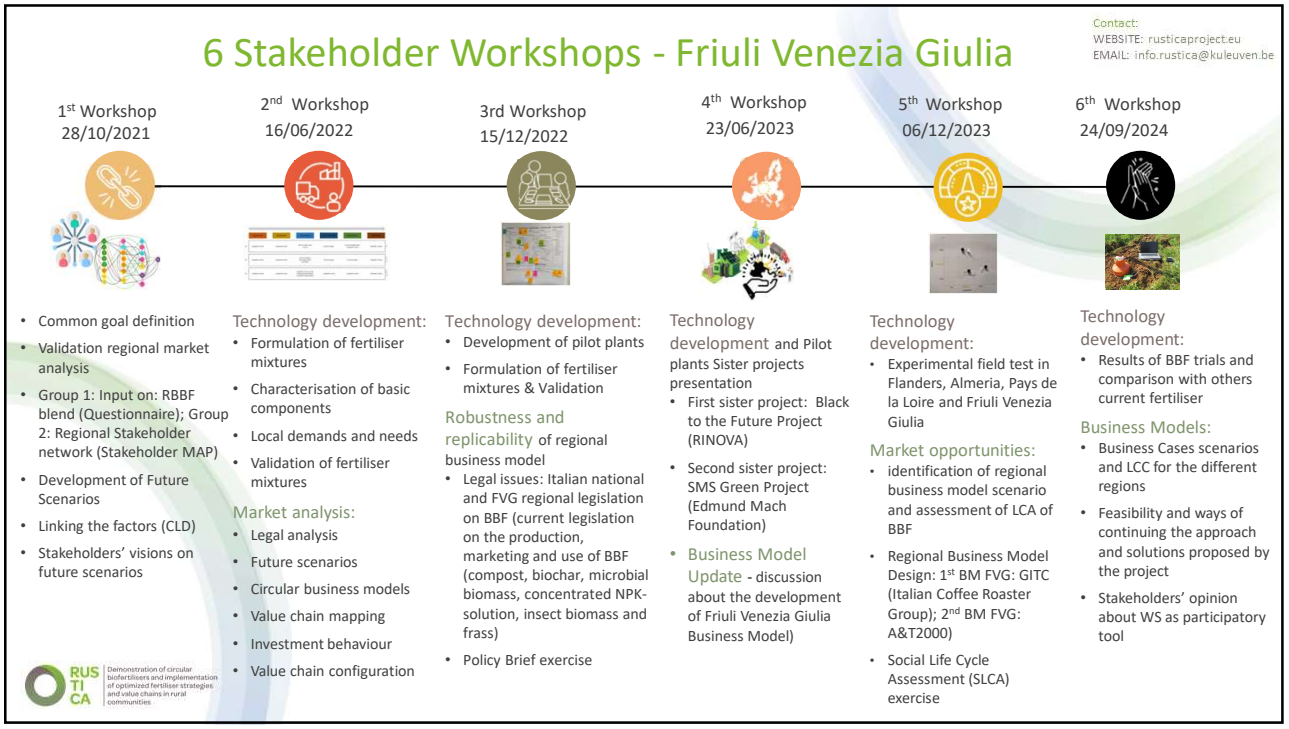
RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

70


Friuli Venezia Giulia Stakeholder Map
Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be
AREA SCIENCE PARK
EDMUND MACH FOUNDATION
Universities and Research centres
UDINE
INSECT exp.
AGRIFOOD FVG AGENCY
ERSA
ADVISORS
Agronomist Consultants and Advisors
GITC
VITENOVA
Food processors
Regional Agency for Rural Development
A&T2000
ARPA
BIO NET
Environmental Organisations
Waste collection and management Companies
AIAB
LEGAMBIENTE
Farmer's Organisation
BIOMAN
Farmers and Farmers Cooperatives
Regional policy makers
REGIONE FVG
Professional Orders
CONFAGRICOLTURA
COLDIRETTI
Fertilizer Producers
COPROPA
UNIMER
AGRONOMISTS AND FORESTERS
RUSTICA
Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities
RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

71


6 Stakeholder Workshops - Friuli Venezia Giulia
Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be
1st Workshop 28/10/2021
2nd Workshop 16/06/2022
3rd Workshop 15/12/2022
4th Workshop 23/06/2023
5th Workshop 06/12/2023
6th Workshop 24/09/2024
• Common goal definition
• Validation regional market analysis
• Group 1: Input on: RBBF blend (Questionnaire); Group 2: Regional Stakeholder network (Stakeholder MAP)
• Development of Future Scenarios
• Linking the factors (CLD)
• Stakeholders' visions on future scenarios
Technology development:
• Formulation of fertiliser mixtures
• Characterisation of basic components
• Local demands and needs
• Validation of fertiliser mixtures
Market analysis:
• Legal analysis
• Future scenarios
• Circular business models
• Value chain mapping
• Investment behaviour
• Value chain configuration
Technology development:
• Development of pilot plants
• Formulation of fertiliser mixtures & Validation
Robustness and replicability of regional business model
• Legal issues: Italian national and FVG regional legislation on BBF (current legislation on the production, marketing and use of BBF (compost, biochar, microbial biomass, concentrated NPK-solution, insect biomass and frass)
• Policy Brief exercise
Technology development and Pilot plants Sister projects presentation
• First sister project: Black to the Future Project (RINOVA)
• Second sister project: SMS Green Project (Edmund Mach Foundation)
• Business Model Update - discussion about the development of Friuli Venezia Giulia Business Model)
Technology development:
• Experimental field test in Flanders, Almeria, Pays de la Loire and Friuli Venezia Giulia
Market opportunities:
• identification of regional business model scenario and assessment of LCA of BBF
• Regional Business Model Design: 1st BM FVG: GITC (Italian Coffee Roaster Group); 2nd BM FVG: A&T2000)
• Social Life Cycle Assessment (SLCA) exercise
Technology development:
• Results of BBF trials and comparison with others current fertiliser
Business Models:
• Business Cases scenarios and LCC for the different regions
• Feasibility and ways of continuing the approach and solutions proposed by the project
• Stakeholders' opinion about WS as participatory tool
RUSTICA
Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

72

Workshops' Impact and Insights

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

1st Workshop - 28/10/2021

MKT Drivers

- Rising demand for sustainable, nutrient-efficient fertilisers.
- Increasing focus on circular economy opportunities.

Goals

- Raise awareness about organic waste value.
- Strengthen supply chain networks and create efficient BBF solutions.
- Assess economic and environmental impacts, focusing on transport costs and energy use.

Key Challenges

- High transport costs and environmental impact of biomass logistics.
- Competition with traditional fertilisers.

Innovative Solutions

- Regional collection systems.
- High-quality bio-based products for niche markets, like premium viticulture.

Future Scenarios

- STEEP factors, linking factors in causal loops, and imagining preferable futures.
- Four plausible scenarios provided, ranging from worst to best, with two intermediate options.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

73

Workshops' Impact and Insights

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

2nd Workshop - 16/06/2022

Value Chain Mapping

Key Players

Gaps

Support Services

Investment Behavior

Barriers

High investment costs, limited infrastructure, regulatory challenges, and seasonal waste variability.

Drivers

Public funding, environmental benefits, market opportunities, and established expertise or networks.

Value Chain Configuration

- Farmer-led
- Farmer Cooperative-led
- Intermunicipal Waste Management-led
- Fertiliser Company-led

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

74

Workshops' Impact and Insights

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

3rd Workshop - 15/12/2022

Robustness and Replicability of Regional Business Model

Italian and FVG Regional Legislation on BBF

- In Italy, **biochar and compost** are regulated products with clear quality standards and limits
- **insect frass, biomass, and microbial biomass** are unregulated.
- A significant legislative gap exists for **microbial biomass**, as it's not addressed in either European or Italian laws.

STRESS FACTORS

- Env. Awareness
- Min.Fert.Prices
- Fertiliser Producers
- Policy Support
- Technology Advances
- Env. Differentiation

KEY INSIGHTS

- Feasibility
- Policy needs
- Awareness
- Opportunities

RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

75

Workshops' Impact and Insights

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

4th Workshop - 23/06/2023

BM Key Discussions

Feasibility

Assessing the robustness of regional business models over the next 3-5 years

Opportunities

Utilising coffee industry by-products (e.g., silver skin, grounds) and exploring carbon credits for biochar.

SH insights

Regulatory and Economic Challenges

- Biomass vs Waste
- Quality & Certification
- Phytotoxic Concerns
- Opportunities - Local plant

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

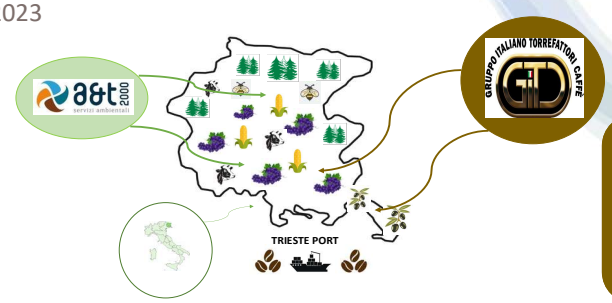
76

Workshops' Impact and Insights

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

5th Workshop - 06/12/2023

Waste management process:
- Biochar
- microbial biomass



Coffee residues valorisation:
- Silverskin, spent grounds
- biochar, syngas

Social Life Cycle Assessment (SLCA) exercise

- Workers
- Local Communities
- Consumers (Farmers)
- Society/Citizens

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

77

Workshops' Impact and Insights

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

6th Workshop - 24/09/2024

Business Model (BM) Scenarios and Life Cycle Costing (LCC)

BBF Field trials and comparison with current fertilisers

Results: Field trials demonstrated BBFs' potential as effective alternatives to conventional fertilisers, showing positive properties.

KEY INSIGHTS

Longer trials and expanded performance indicators are crucial for better assessment.

→ Direct demonstrations of BBF benefits are essential to convince farmers of their value.

Barriers

Limited and low-quality feedstocks locally. High application doses required for BBFs in the field.

Feasibility

Begin with simplified models and gradually expand. The coffee waste-based model the most rapidly implementable.

Strenghts

Local actor involvement and promotion of circular economy models.

SH Interest

SH willingness to follow the project's development and participate in future working groups.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

78

Key insights & learnings

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Main highlights:

- BBF Potential: Promotes sustainability and boosts the circular economy in Friuli Venezia Giulia.
- Regulatory Needs: Clearer guidelines on residue classification and permits are essential.
- Policy Support: Required to advance BBF development.
- Knowledge Sharing: Collaborate with RUSTICA project experts to validate BBFs and spread technical know-how.
- Effective Communication: Both institutional and technical communication are crucial.

Challenges:

- Rising mineral fertiliser costs.
- Increasing focus on sustainability and circular economy.
- Demand for high-quality fertilisers.
- Lack of technology providers and fertiliser manufacturers.
- No local networks for BBF management.
- Residue availability, logistics, and costs are critical factors.

RUS TI CA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

79

Key insights & learnings

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Positive Outcomes of Co-Creation

- Business Models Refined: Stakeholder feedback clarified and validated regional approaches.
- Enhanced Collaboration: Identified mutual benefits like reducing residue abandonment and transport costs, boosting local economies.
- Stronger Relationships: Built trust and communication among businesses, policymakers, and other actors.
- New Discoveries: Learned about local initiatives, including insect research (University of Udine), coffee value chains, and municipal residue recovery.

RUS TI CA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

80

Key insights & learnings

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Challenges of Co-Creation

Key Insights

- Diverse Priorities: Stakeholders had varying goals - economic vs. environmental.
- Regulatory Challenges: Unclear waste classifications and regulations slowed progress.
- Workshops as Catalysts: RUSTICA workshops promoted collaboration and feedback but need broader participation.
- Stakeholder Engagement: Involve more farmers, public institutions, and private companies.

Next Steps

- Research regulatory frameworks for BBF.
- Explore alternative feedstocks and residue sources.
- Enhance social impact assessments.
- Foster continuous dialogue with stakeholders.

RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

81

RUSTICA bio-based fertiliser blends

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

RUSTICA bio-based fertilisers are effective fertilisers, but a full exploitation of their potential can be achieved utilising them in a blend:

- fertilising products with multiple functionalities
- reduction of negative side effects of bio-based fertilisers
- process integration reduces production cost and environmental negative impacts
- fertilisers tailored to specific crops and pedoclimatic regions

Composition of blends for Friuli Venezia Giulia (% in weight)

BB type	Blend code		
	FVG_5	FVG_6	PdL_1
Compost	66.7	83.3	62.50
Biochar	16.7		18.75
Microbial biomass			6.25
Insect biomass	16.7	16.7	
Insect frass			12.3
Total	100	100	100

RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

82

Field trial Friuli Venezia Giulia (Italy)

Main objective

- Enhancement of soil quality
  - increase of soil organic C
  - boost of microbial pool
  - Increase of water availability
- N supply

Treatments

3 different bio-based fertilisers blends were compared, in a vineyard, to:

- control (without fertilisation)(CTRL)
- reference treatments:
  - organo-mineral fertiliser (OMF)
  - manure

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESE

83

Analysis

Soil

- Water content
- Total organic C and Loss On Ignition (LOI)
- Extractable OC and N
- Mineral N (NO_3^- and NH_4^+)
- Available P
- Microbial biomass C and N
- Respiration

Plants

- Yield (yield per vine, number of clusters per vine, cluster and berry weight)
- Leaf temperature, multispectral and thermographic analysis of vegetation

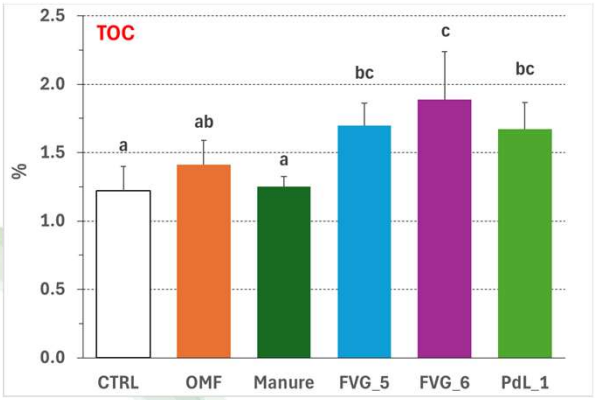
Must

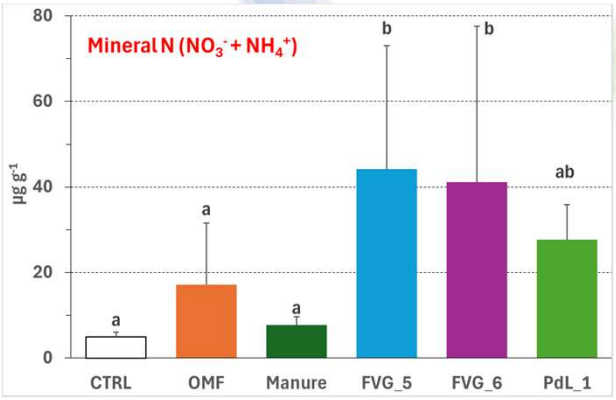
- Total N, °Brix (soluble solids), titratable acidity, pH, anthocyanins and polyphenols

84

Results of soil analysis

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be





RUSTICA blends enhanced:

- total soil organic C (TOC)
- mineral N

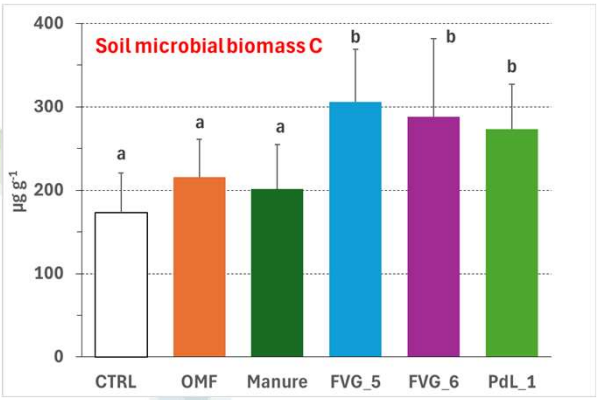
THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

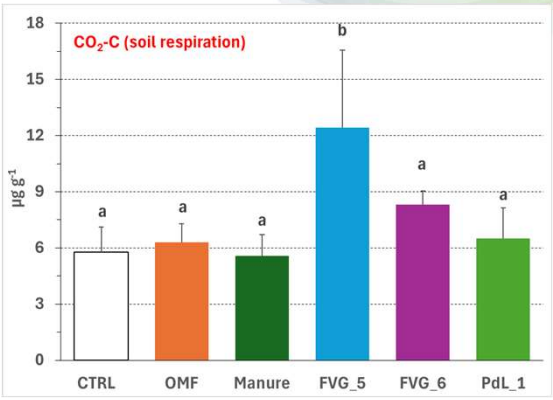
85

Results of soil analysis

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Amendment with RUSTICA blends resulted in a positive impact on soil microorganisms' size and activity





THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

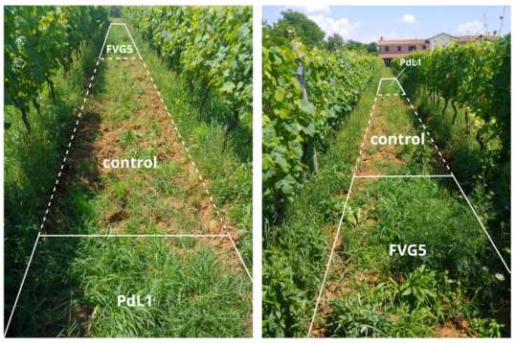
86

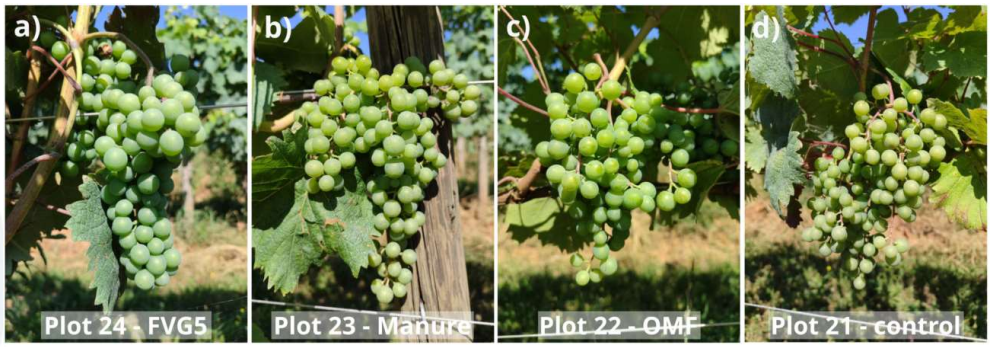
Results of plant analysis

Visual aspects

RUSTICA blends had a visually appreciable effect on:

- growth of grasses in between of vine rows
- cluster compactness and berry size

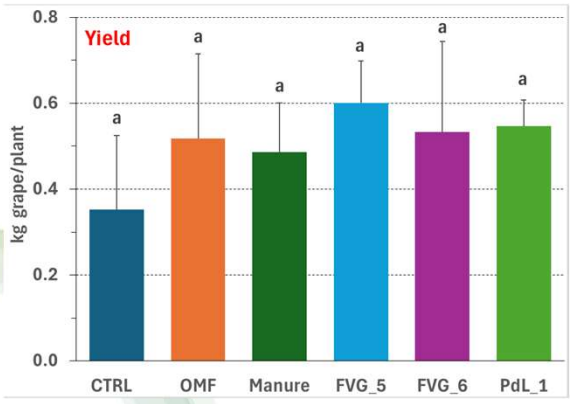




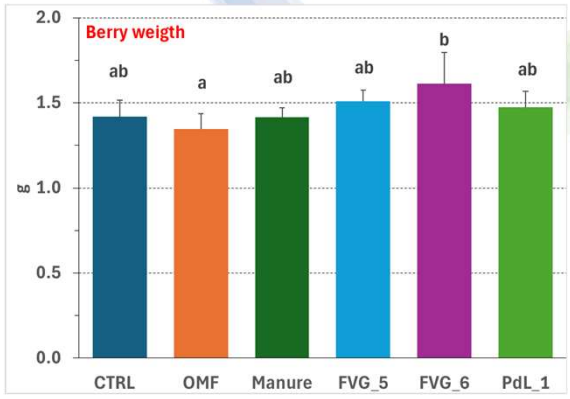
87

Results of plant analysis

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be



RUSTICA blends caused an increase in productivity (10-23% and 3-16% with respect to manure and OMF, respectively), although this was not statistically significant



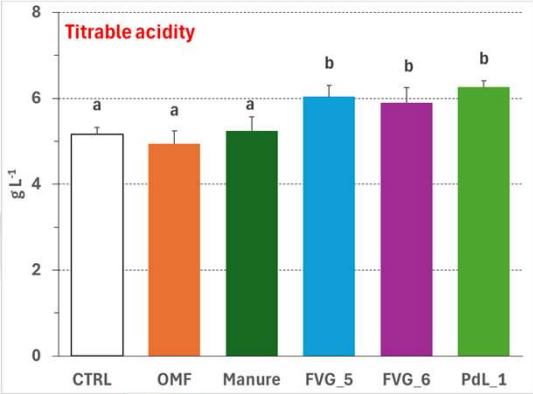
RUSTICA blends resulted in increased berry weight with respect OMF

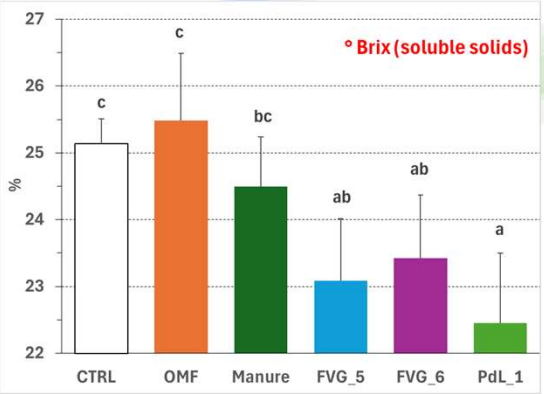
THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

88

Results of must analysis

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be





RUSTICA blends had a marked effect on must quality, namely acidity and soluble solids content

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

89

Results of must analysis

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Maturation indexes

Treatment	Maturation index 1		Maturation index 2	
CTRL	290 ± 09	bc	49 ± 2	b
OMF	296 ± 24	c	52 ± 5	b
Manure	271 ± 18	abc	47 ± 5	b
FVG/5	259 ± 11	ab	38 ± 2	a
FVG/6	261 ± 12	ab	40 ± 4	a
PdL/1	242 ± 17	a	36 ± 2	a

RUSTICA blends resulted in must with values of the maturation index within or near the optimal range

Must from RUSTICA blends was more prone to evolve in good quality wine

Maturation index 1 = soluble solids (°Brix) x pH^2 - optimal range 220 - 260

Maturation index 2 = soluble solids (°Brix)/titrable acidity (%) - optimal range 30-35

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

90

RUSTICA field trial conclusions

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Application of RUSTICA blends resulted in:

- enhancement of soil properties (organic C content, N availability, microbial pool)
- plant productivity comparable to that of the reference (organo-mineral fertiliser)
- better quality of must



RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

91

RUSTICA field trial conclusions

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

- Different behaviour of the blends is related to their composition in constituents with distinctive properties (nutrient content, degree of stability)
- Blends behaved significantly better than a well-known effective amendment as manure
- Blends application dose can be significantly reduced if the sole aim is to supply N
- Blending represents a reliable option to fully exploit BBF potential, resulting in innovative fertilisers with multiple functionalities that are an effective and viable alternative to usual fertilising products



RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

92

Almeria (ES)

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Major greenhouse concentration in Europe
- 32,000 ha of plastic greenhouse
- 2,800,000 Tm of fresh horticulture crops

Challenges
- Waste management and valorisation
- Sustainable management of crops (*water, fertilisers, pest-disease control,…)*
- Generational change of farmers

Drivers
- High fertiliser prices
- Ensuring availability of fertilisers
- EU Production autonomy
- Good opportunity for boosting agronomic waste management strategies
- Promising agronomic results

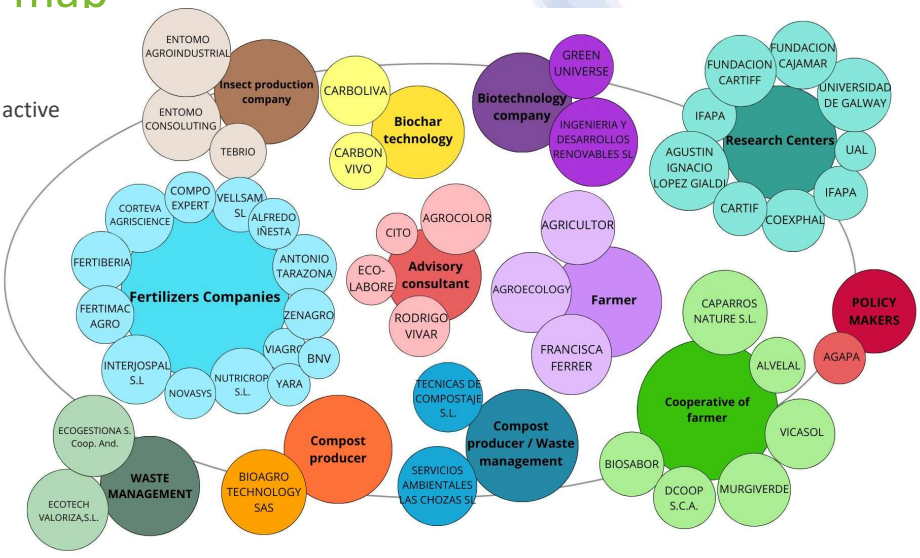
RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

93

Stakeholder map

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

67 stakeholders regionally active



RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

94

Stakeholder workshops

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

6 workshops
87 participants (*)



THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

95

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Reflections from stakeholder workshops

Barriers detected:

Regulatory	Economical	Technological	Final users´ local context
• Unique criteria of BBFs definition in EU regions. • Harmonisation *(production and use).* • Organic farming regulation.	• High production cost of new ingredients will determine the final price of BBFs. • Higher prices of BBF in comparison with inorganic fertilisers. • Development of technologies to reduce production costs. *(Energy costs, big scale)*	• Lack of stability and homogeneity of BBFs. • Sustainable and economical BBFs production methods. • Time-varying composition. • Seasonal production of residues. *(Insect and frass biomass)* • Pesticides and virus problems from agricultural waste.	• Lack of fertilisation criteria. *(Based on experience, associations, field technicians)* • Training needs to farmer and field technicians. • At least 2-year evaluation is required. • Sensors and portable measurement devices (nutrient requirement).

RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

96

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Conclusions from stakeholder workshops

- Solid and reluctant agricultural system: no changes unless economic or regulatory motivation
- Power of fertiliser manufacturers
- Promising agronomic results
- Good opportunity for boosting agronomic waste management strategies:
  - Large diversity of organic wastes and with big seasonality
- Production of BBF with good efficiency and efficacy for promoting the reduction of inorganic fertiliser applications, but with big energy costs
- Solid and multidisciplinary stakeholder network created
- Starting point to encourage further research:
  - Long-term validation experiences
  - Microbial consortia and its potential
  - Disease transfer from agricultural waste

RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

97

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Tomato and cucumber field trials under greenhouse

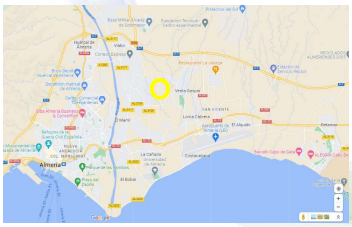
98

General objective

- Improvement of soil quality:
  - Increase of OM and TOC in soil
  - Improvement of soil water retention
- Regular nutrient release (nitrogen)

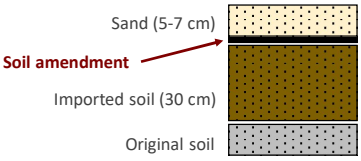
Location

Almería (Southeast of Spain), greenhouse area 500 m^2



Soil

Imported "enarenado" soil



THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

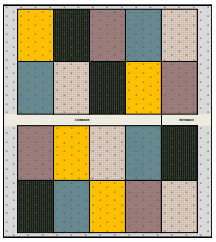
99

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Crops

Tomato crop (4th September 2023 - 10th March 2024)

Cucumber crop (15th April 2024 - 11th July 2024)



Treatments

5 experimental treatments, 4 replicates/ treatment

- Control
  Without soil amendment
- Reference amendment
  Semi-dried sheep manure (4 ton/ha)
- Alternative soil amendment
  Local compost from vegetable wastes (15 ton/ha)
- RUSTICA amendments
  - Blend A (Alm/2; 11.5 ton/ha)
  - Blend B (Alm/1B; 10.5 ton/ha)

Higher water retention

Higher nutrient release

BUILDING BLOCKS	BLENDS	
	Blend A (Alm/2)	Blend B (Alm/1B)
Compost	26	50
Biochar	52	20
Microbial biomass	-	-
Insect biomass	-	20
Insect frass	22	10

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

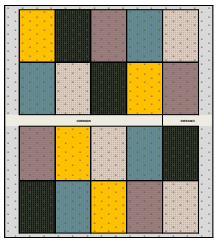
100

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Crops

Tomato crop (4th September 2023 - 10th March 2024)

Cucumber crop (15th April 2024 - 11th July 2024)



Treatments

5 experimental treatments, 4 replicates/ treatment

- Control
  Without soil amendment
- Reference amendment
  Semi-dried sheep manure (4 ton/ha)
- Alternative soil amendment
  Local compost from vegetable wastes (15 ton/ha)
- RUSTICA amendments
  - Blend A (Alm/2; 11.5 ton/ha)
  - Blend B (Alm/1B; 10.5 ton/ha)

Higher water retention ↑ Higher nutrient release ↑

Building blocks	Blends	
	Blend A (Alm/2)	Blend B (Alm/1B)
Compost	26	50
Biochar	52	20
Microbial biomass	-	-
Insect biomass	-	20
Insect frass	22	10

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

101

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Analysis of applied BBFs

Parameters	Manure	Compost	Blend A	Blend B
Chemical characterization				
pH	8,1	8,5	7,8	8,0
Electrical conductivity (µS/cm)	9631,0	10682,5	3420,0	4887,0
Total nitrogen (%)	3,1	1,4	0,1	1,6
Assimilable potassium (mg/Kg)	17049,5	21896,2	15853,0	12298,0
Assimilable phosphorus (mg/Kg)	374,7	305,1	60,0	63,5
Total organic matter (%)	62,5	36,2	74,2	57,5
Sodium (mg/L)	376,5	187,5	141,0	124,0
Potassium (mg/L)	2623,0	3534,8	925,0	1039,0
Calcium (mg/L)	212,3	35,0	24,0	46,0
Magensium (mg/L)	116,5	31,5	26,0	28,0
Chloride (mg/L)	1345,8	2044,8	353,0	354,0
Nitrate (mg/L)	47,0	60,0	13,0	13,0
Phosphate (mg/L)	54,8	42,0	274,0	342,0
Sulphate (mg/L)	1220,0	1364,3	113,0	101,0
Carbonate (mg/L)	<3	32,0	<3	<4
Bicarbonate (mg/L)	1903,0	720,0	1122,0	2053,0
Sodium adsorption ratio (SAR)	5,1	5,8	4,8	3,6
Saturation percentage (%)	66,5	43,7	76,7	74,9
Exchangeable sodium (meq/100g)	9,3	5,1	50,4	5,9
Exchangeable potassium (meq/100g)	43,6	56,0	202,7	31,5
Exchangeable calcium (meq/100g)	25,0	21,7	133,6	30,5
Exchangeable magnesium (meq/100g)	15,3	11,6	66,8	10,9
Cation exchange capacity (meq/100g)	93,3	94,5	453,6	78,7
Iron available (mg/Kg)	667,3	1670,0	313,0	736,0
Copper available (mg/Kg)	11,5	37,8	4,9	8,6
Boron available (mg/Kg)	10,0	21,9	4,1	0,8
Magnessium available (mg/Kg)	222,5	147,2	99,3	192,0
Zinc available (mg/Kg)	140,5	116,2	43,9	81,8

Manure

Compost

Blend A

Blend B

Parameters	Manure	Compost	Blend A	Blend B
Ratios				
C/N ratio	11,6	15,5	478,2	21,2
NO3/K ratio	<0,01	0,0	<0,01	<0,01
Ca/Na ratio	0,7	0,2	0,2	0,4
Ca/Mg ratio	1,1	0,7	0,6	1,0
K/Mg ratio	7,3	40,5	11,1	11,5
Granulometry				
>5mm (%)	13,85	<0,01	7,74	35,48
5mm-2mm (%)	9,38	12,42	5,68	29,14
2mm-0,5mm (%)	29,36	38,52	73,03	23,94
0,5mm-0,08mm (%)	39,95	41,74	13,24	11,09
<0,08mm (%)	7,46	7,32	0,31	0,35

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

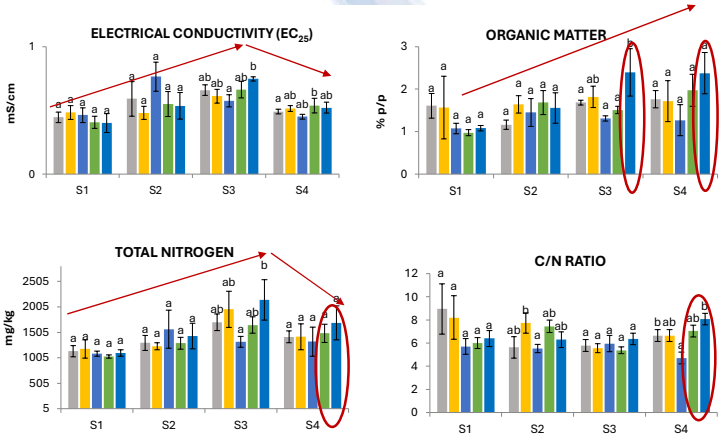
102

Soil analysis (nutrients)

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

- S1: First soil sampling (before soil amendments): 17th August 2023
- S2: Second soil sampling (14 days after soil amendments): 31st August 2023
- S3: Third soil sampling (after tomato crop, before cucumber crop): 15th April 2024
- S4: Fourth soil sampling (after cucumber crop): 23rd July 2024

Treatments:
- Control
- Manure
- Compost
- Blend A
- Blend B



THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

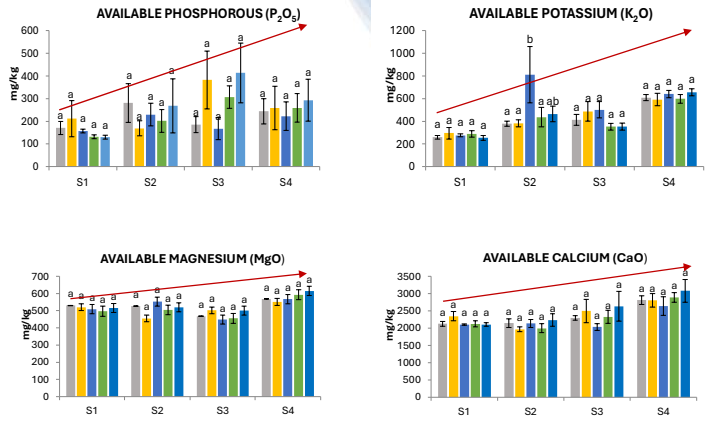
103

Soil analysis (nutrients)

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

- S1: First soil sampling (before soil amendments): 17th August 2023
- S2: Second soil sampling (14 days after soil amendments): 31st August 2023
- S3: Third soil sampling (after tomato crop, before cucumber crop): 15th April 2024
- S4: Fourth soil sampling (after cucumber crop): 23rd July 2024

Treatments:
- Control
- Manure
- Compost
- Blend A
- Blend B



THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

104

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

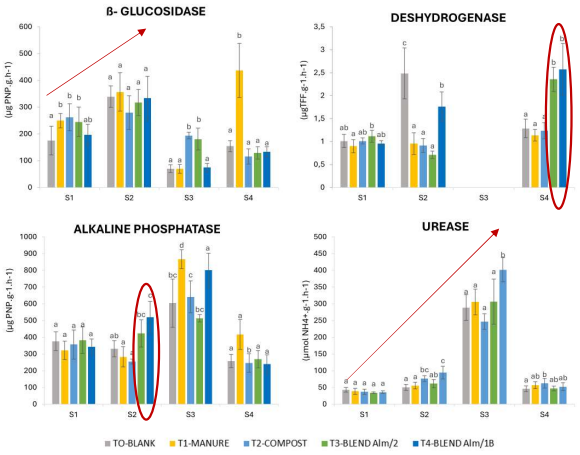
Soil analysis (enzymatic activities)

- S1: First soil sampling (before soil amendments): 17th August 2023
- S2: Second soil sampling (14 days after soil amendments): 31st August 2023
- S3: Third soil sampling (after tomato crop, before cucumber crop): 15th April 2024
- S4: Fourth soil sampling (after cucumber crop): 23rd July 2024

Treatments:
- Control
- Manure
- Compost
- Blend A
- Blend B

Soil quality and organic matter status

Metabolic activity of the soil microbiome



Potential mineralisation of organic P and soil biological activity

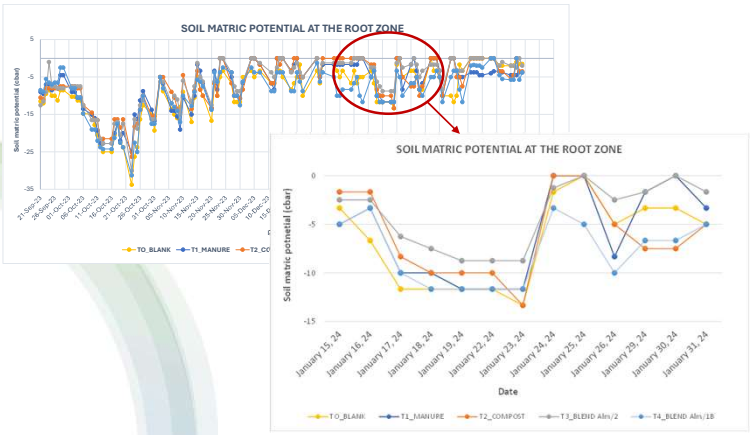
Indicator of organic matter degradation

105

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Soil matric potential

Measurements during tomato crop



Higher soil water retention with blend A

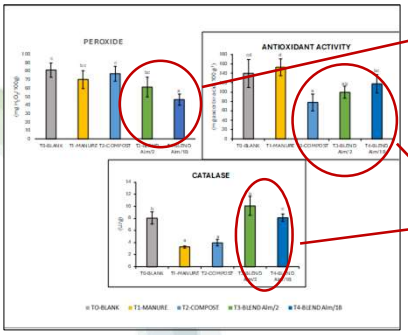
THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

106

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Biomakers in leaves

Tomato 

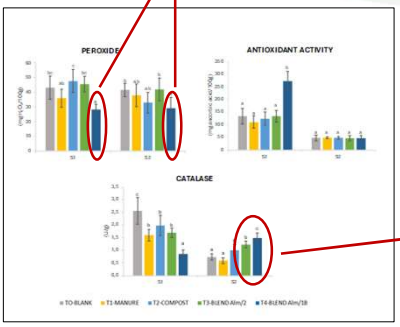


Lower stress conditions

Higher response capacity to stress conditions

Cucumber 

Lower stress conditions



Higher response capacity to stress conditions

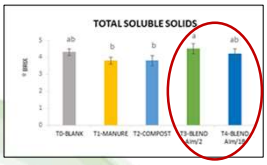
THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

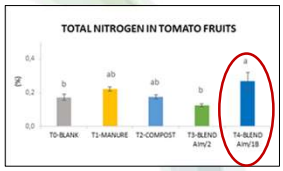
107

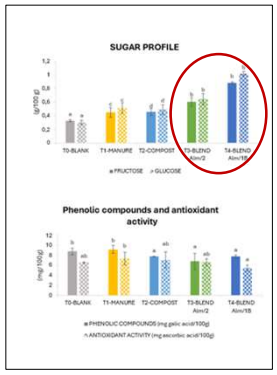
Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Quality of commercial fruits

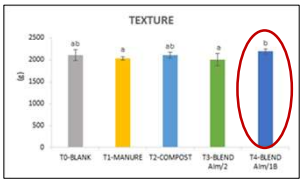
Tomato 

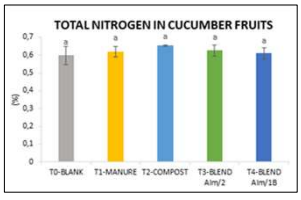


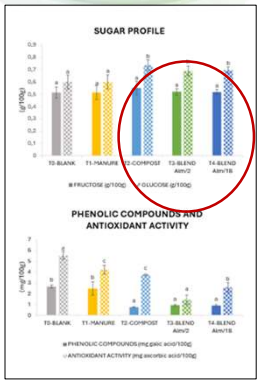




Cucumber 





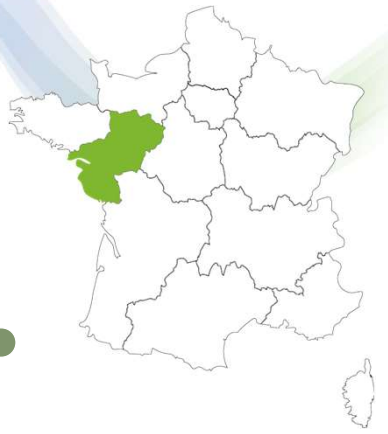


THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

108

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Pays de la Loire (FR)



Agriculture in Pays de la Loire: a cornerstone of the local economy

- 22,100 farms (19 % in organic production)
- 5th largest agricultural region in France
- 67 % of the area of the region used by agriculture
- A diverse and dynamic sector with various animal and vegetal production

Source : Schéma Régional Biomasse

Waste

- 695,000 T of household green waste by 2030
- 63,000 T of vegetable waste from the 9000 ha of vegetable crops (tomato, cucumber, leek, lettuce and lamb's lettuce)
- 21,000 T (dry matter) of woody waste in arboriculture and
- 37,000 T (dry matter) of woody waste in viticulture

…

RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

109

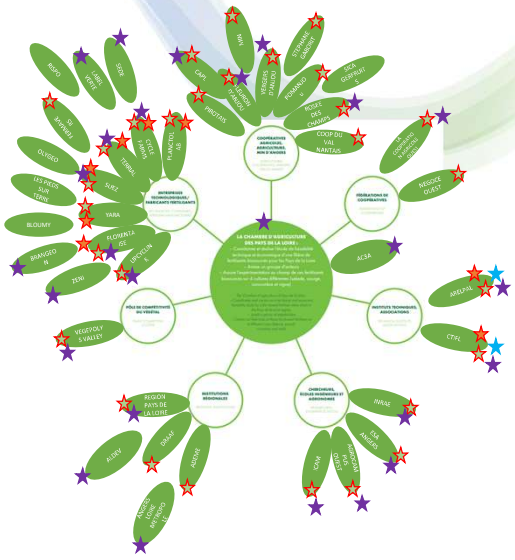
Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Stakeholder map in Pays de la Loire (France)

- 6 stakeholder workshops spread over 3 years with 28 participants
  - 7 to 17 participants to each workshop
- Bilateral or tripartite contacts organised by the Chamber of Agriculture
  - Meetings between regional stakeholders to develop links between them
  - One meeting between a regional stakeholder (international company) on BM and LCA/LCC + biochar

  Online meetings organised by the Chamber of Agriculture with RUSTICA partners, for regional stakeholders and more
  - One webinar on RUSTICA technologies organised for all RUSTICA stakeholders
  - One online specific meeting on biochar technology for Pays de la Loire stakeholders
  - One online meeting on business model of RUSTICA solid fertiliser PdL1 and 3
  - One online meeting on business model of RUSTICA liquid fertiliser PdL4
- Participation of two regional stakeholders in some RUSTICA WP7 meetings on liquid fertiliser
- Presentation of the RUSTICA project to regional stakeholders during the meeting of RUSTICA partners in Angers in May 2024 - 46 people registered + RUSTICA partners

  A regional newsletter on the RUSTICA project in Pays de la Loire for regional stakeholders



110

6 Stakeholder workshops in Pays de la Loire

Main points of impact

10.'21

17 participants + 3 facilitators
Presentation and first exercises

- Developing **SH map** together
- **BBF RUSTICA crops:** vegetables' production, viticulture, arboriculture and soilless culture
- **Some of the main priorities**: identification of regional biomass, cooperation between stakeholders, local value chain, economic, environmental, technical and agronomic feasibility, partially replace mineral fertilisers, circular model
- **Questions about** sanitary security , waste status, intellectual property, integration of the farmers in the business model

06.'22

16 participants + 3 facilitators
Value chain exercise

- **2 most potential central actors:** waste management companies and fertiliser producer
- **Some of the main barriers and drivers:** Return on Investment, competition of use of biomass, LCA, accessible and integrable technologies, existing logistics to adapt, regulations, political incentives…
- Confirmation of the interest in **liquid** and **solid** fertilisers

01.'23

7 participants+ 3 facilitators
Business Model, stress factors, policy briefs

- First draft of **BM on solid BBF**
- **Study of stress factors** : decrease of mineral fertiliser prices, competition of use of biomass, favorable regulatory context
- **The project becomes more concrete** for stakeholders – Interesting progress
- Need of more **information on regulations**

06.'23

7 participants + 3 facilitators
Value chain

- **Availability of regional biomass**
- Draft of **value chains of liquid and solid fertilisers** with 2 regional fertiliser producers as central actors
- **New stakeholders introduced** in the regional group of stakeholders, **development of the exchange** between regional stakeholders and RUSTICA partners

02.'24

5 participants + 3 facilitators ONLINE
Social LCA

10.'24

9 participants + 3 facilitators (5 excused)
Results on field trials, BM, LCA /LCC

- Next steps in the region Pays de la Loire

Project results in Pays de la Loire

- RUSTICA: a structuring project source of ideas for the future, with strengths and weaknesses (variable field trials, complex project)
- A regional network created in the region

111

Stakeholder workshops in Pays de la Loire :

Next steps for the future

- A regional project:
  Continue to work in the regional RUSTICA network with existing local companies and expertise. In-depth involvement of the regional stakeholders (companies, agricultural cooperatives, research…)
- Base this work on research projects
  RUSTICA and other projects' results on BBF.
- Establish a regional BBF roadmap together
- With regional skills, technologies and biomass:
  Use regional building blocks, of plant and animal sources, less costly (environmental and economic costs) - new regional blends
- And implement field trials over a longer period

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

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

112

Field trials in Pays de la Loire (France) Lettuce - blend PdL1

Blend PdL/1 - 2 trials

- Crop: lettuce
- Timing: summer 2023 and winter 2023-24
- Objective: to validate the fertilising effect of the blend+ check impact on soil quality
- Comparison of RUSTICA blend with organo-mineral and mineral fertilisers

Component	%
Compost	63
Biochar	19
Microbial biomass	6
Insect frass	13

RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

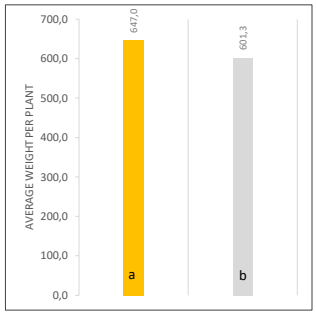
113

Field trials in Pays de la Loire (France) Lettuce - blend PdL1

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Results

- Higher yield (+46g) for RUSTICA treatment in first trial. But not statistical difference
  No difference in second trial.
- No difference in foliar development, nitrate content in soil and leaf for both trials



- Reducing effect on the activity of urease and LAP enzymes involved in the nitrogen cycle, in first trial

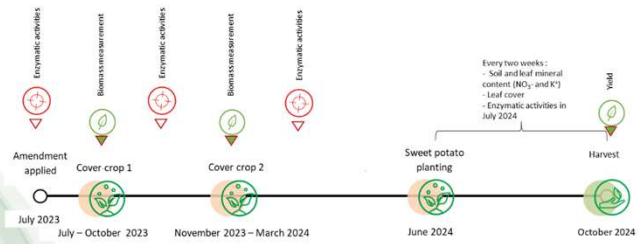
		Laccase	SD	B-glucosidase	SD	Urease	SD	LAP	SD	PAL	SD
Reference	July-23	64.31a	2.01	0.174a	0.04	37.92a	2.37	2.33a	0.24	0.189a	0.03
PdL/1	July-23	63.56a	2.96	0.198a	0.02	35.43b	3.48	2.20a	0.37	0.205a	0.03
Reference	Aug-23	71.07a	5.33	0.809a	0.17	15.40a	0.80	2.88a	0.39	0.809a	0.16
PdL/1	Aug-23	68.21a	5.58	0.755a	0.10	14.83b	0.99	2.48b	0.23	0.813a	0.12

114

Field trials in Pays de la Loire (France)
Sweet potato - blend PdL3

Blend PdL/3 - 2 trials

- Crop: 2 cover crops & sweet potato
- Timing:



- Objective: assess the effect of the blend as a soil improver
- Comparison of RUSTICA blend with a blank

Component	%
Compost	40
Biochar	60

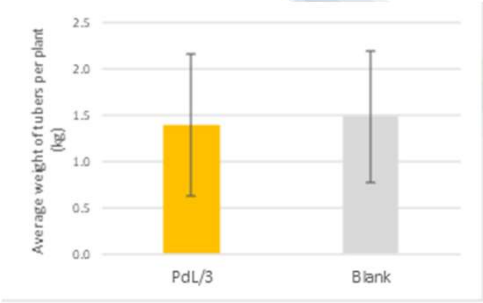
115

Field trials in Pays de la Loire (France)
Sweet potato - blend PdL3

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Results

- No effect on canopy development (leaves biomass)
- One year after application, there was no effect on soil or leaf nitrate levels.
- Reducing effect of blend RUSTICA in autumn 2023 for laccase and B-glucosidase enzyme activities.
- In summer 2024, the same reducing effect is observed on laccase, urease and PAL



On sweet potato :

- No effect on yield (number and weight of tubers)
- No effect on soil and leaf mineral content

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

116

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Conclusions: Field trials in Pays de la Loire (France) PdL1- Lettuce and PdL3- Sweet potato

PdL 1

- PdL1 aims to produce same lettuce harvest as mineral or organo-mineral fertiliser
- Any soil effect, maybe because of the shortness of the culture (6 weeks in summer or 3 month in winter)
- The very light N, P, K concentration can be a problem for the substitution with other fertilizers (high logistic costs due to huge brings).

PdL 3

- Overall, no effect on harvest indicators or vegetative growth (cover crops + cash crops).
- Depressive effects on the activities of certain enzymes. Why these enzymes react like this in this situation remains to be confirmed.
- Too much biochar?

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

117

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Field trials in Pays de la Loire (France) - Grapes - blend PdL1

- Application date: 28/02/2024
- Timing: February 2024 to November 2024
- 3 Treatments (blank, PdL1 and grower reference), 3 replicates
- Rows of 100m^2 for each modality (RUSTICA, produce fertiliser and blank) - 2 rows per treatment

Component	%
Compost	63
Biochar	19
Microbial biomass	6
Insect frass	13

	N	P	K
GAIA (% ADM, 85% of ADM) - producer fertliser	8.2	3	3.9
PdL1 (%ADM, 60% of ADM)	2.03	0.69	1.21

RUSTICA Fertiliser PdL1

GAIA product (producer fertiliser)

118

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Field trials in Pays de la Loire (France) - PdL1 - Grapes

Nitrogen residues in the soil during the time

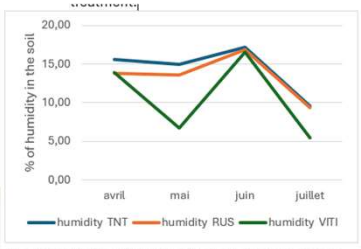


Figure 6: graph of humidity in the soil during the vegetative season

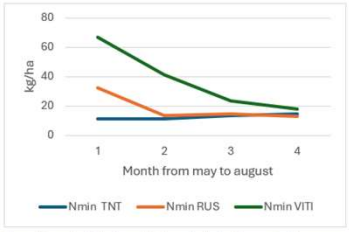
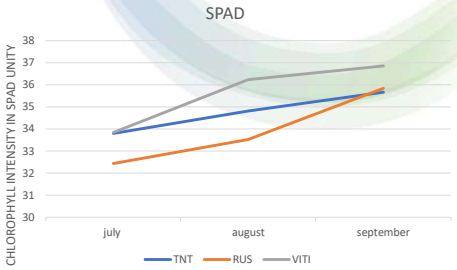


Figure 5: graph of N mineral in the soil during the vegetative season



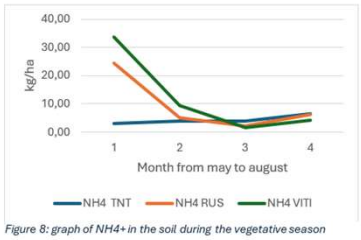


Figure 8: graph of NH4+ in the soil during the vegetative season

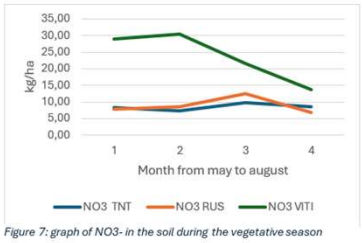


Figure 7: graph of NO3- in the soil during the vegetative season

TNT: blank
VITI: producer fertiliser
RUS: fertiliser RUSTICA PdL1

119

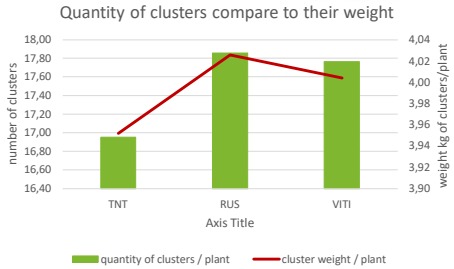
Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Field trials in Pays de la Loire (France) - PdL1 - Grapes

Harvest results :

- Disease is more important in VITI modality (producer fertiliser GAIA)
- Harvest quantity is better in RUS modality PdL1

	Quantity of clusters / plant	Cluster weight / plant (kg)	Intensity of Botrytis %
TNT	16.95	3.95	2.8
RUS	17.86	4.03	3.07
VITI	17.76	4.00	4.8



THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

120

Conclusions: Field trials in Pays de la Loire (France) Grapes - PdL1

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

- PdL1 modality brings less **N in soil** than the organic producer fertiliser
- Harvest results show an high level of **Botrytis** for **producer fertiliser** compared to **PdL1**
- **Harvest** is better in **PdL1** modality than the blank and the producer fertiliser

Limits of the application

- Exceptional weather conditions
- Small trial only 6 ranks

For the future

- Short time for soil trials
- Base references about soil

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

121

The experiment on liquid fertiliser PdL-1

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Background:

Finding a market perspective for UGent's mineral concentrate

Experimental design:

Compare the usual PdL nutrient solution applied in greenhouses for vegetables with "Ghent + adjusted N"; tomato plants on stonewool

Parameters measured:

Leaf quality by chlorophyll (=green pigment)analysis; stem diameter; plant fresh weight; plant dry weight; number of flowers; fruit dry weight; soil analysis (data not available yet)

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

122

The experiment on liquid fertiliser PdL-2

"Our" liquid fertiliser showed a better leaf quality (N per unit area leaf)
Initial growth rate of "our" liquid fertiliser is lower, but the plant catches up again
All other parameters perform equally in both treatments

123

International perspective: the case of Valle del Cauca

Mirjam Pulleman & Guillermo Peña Chipatecua, Alliance Bioversity & CIAT

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

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH ANDINNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

124

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Valle del Cauca (CO)

- **Agricultural area:** 1.14 Mio Ha
- Intensive farming in the flat areas
- Family based agriculture in the hilly regions
- **Main crops:** sugar cane, coffee, bananas, avocado, corn
- 14.5 Mio. ton **waste** per year

Challeges/ Opportunities:

- High dependence on **imported agroinputs**
- Low **waste recovery**/usage rate
- Government **policies** promoting **agroecology** and local **bioinputs** production
- Emerging bioinputs sector

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

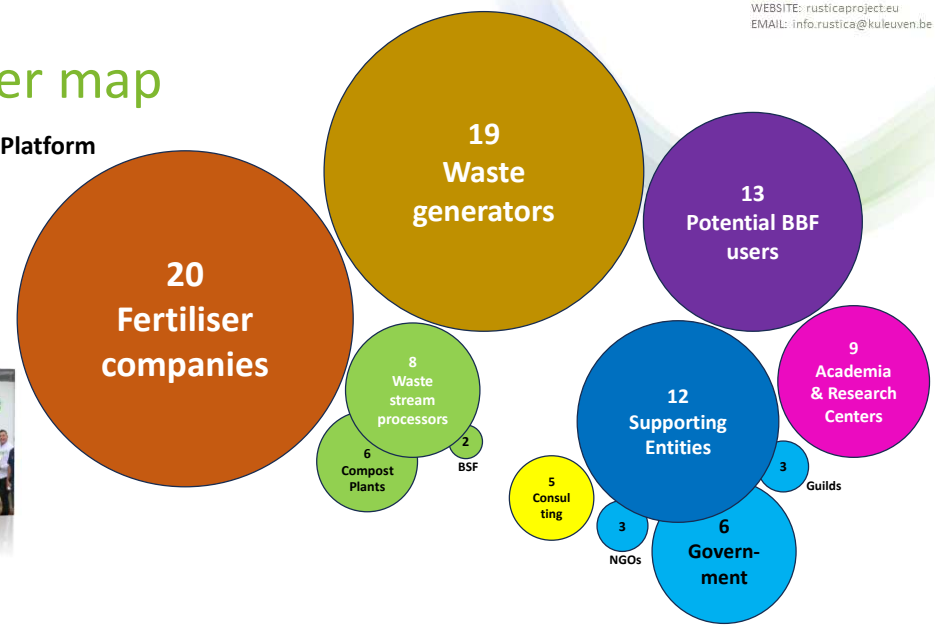
125

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Stakeholder map

Regional Stakeholder Platform Valle del Cauca

- **88 Stakeholders**



THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

126

Stakeholder Workshops - Colombia

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Specific aspects	• **Mapping** of **stakeholders** and sharing the state of the art of the chain. • Identification of **barriers** and **enablers** of the chain. • Recognition of **challenges** and **opportunities** for the chain. • Co-creation of **business model alternatives** to incorporate RUSTICA technologies in Valle del Cauca. • Recognition of **environmental factors** that impact business models. • Presentation of the **regulatory framework** for chain organizations and agricultural inputs. • Review of chain gaps in Valle del Cauca. • Identification of **social and environmental issues** by stakeholder's categories. • Construction of the **vision** for the chain by 2032. • Participatory development of the **action plan** according to Law 811 of 2003
Presentations by stakeholders	• ASOHOFRUCOL: Biofactories implementations with farmers. • BigFertil: Composting Plant. • Ministry of Agriculture: Policies organic fertilisers. • Gobernación del Valle del Cauca: Agroecology Plan. • LVargas Ingenieros SAS: (Fertiliser) Product registration ICA.

Workshop dates	1 5.11.2021	2 27.03.2022	3 2.12.2022	4 29.09.2023	5 29.12.2023	6 22.03.2024	7 26.07.2024	8 18.10.2024

RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

127

Stakeholder's workshops - outcomes

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

- Building a **collaborative** stakeholder **platform**.
- Co-Creating a **shared vision** for the organic fertiliser chain.
- **Strategic planning** to bridge key gaps.
- Fostering stakeholder cooperation: **synergies** between waste generators and waste transformers
- **Engagement** and **recognition** by **government** entities.

RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

128

Field trial at CIAT campus

129

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Field trial - Blend VdC2 and treatments

Composition VdC2

Building block	%
Compost	31
Biochar	19
Insect biomass	19
Insect frass	31
total	100

Treatments

T1 (100)	100% RUSTICA blend (kg/ha) N: 90 P: 58 K: 52
T2 (50)	50% RUSTICA blend (kg/ha) N: 45 P: 29 K: 26
T3 (0)	Control (without fertilization)
T4 (Traditional)	Mineral fertilizer (kg/ha) N: 76 P: 21 K: 11

Fertilizer quantity (t/ha)

T1: 100%	**T2**: 50%	**T4:**
4	2	0.23

Nutrient requirement and supply

Nutrient	Requirement of corn (kg/ha)	Blend contribution (kg/t)
N	180	223
P	70	14
K	60	13

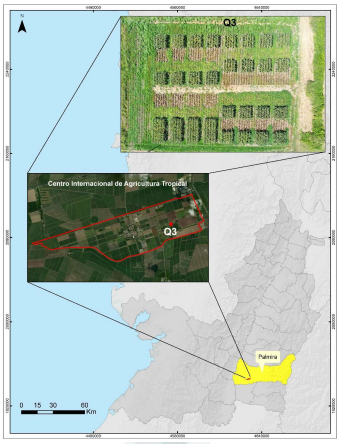
RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

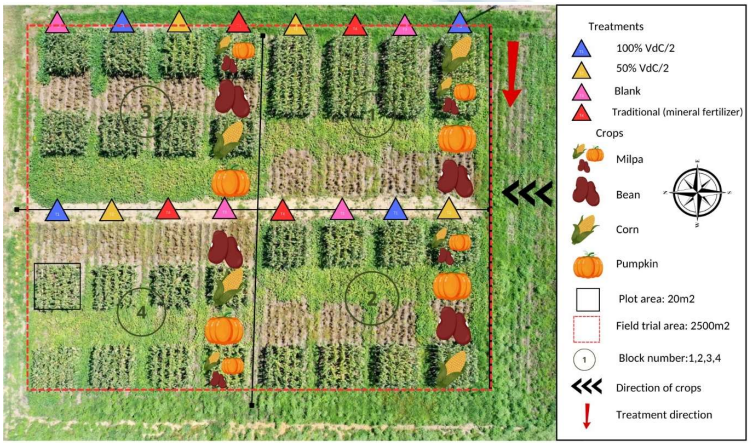
THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

130

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Field trial - Location and description





THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

131

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Variables evaluated

Variables to evaluate	When
Plant height	Two measurements during the crop life cycle
Fluorescence	Two measurements during the crop life cycle
Grain and fruit quality	At the end of the crop life cycle
Yield	At the end of the crop life cycle

Variables to evaluate	When
Bulk density	Two measurements during the crop life cycle
Porosity	
Resistance to tangential shear	
Resistance to penetration	
Chemical properties of soil	
Biological properties of soil	

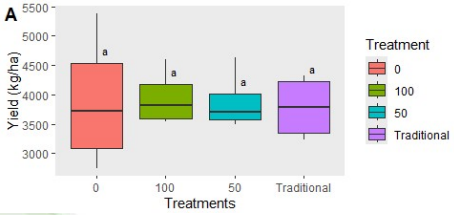
THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

132

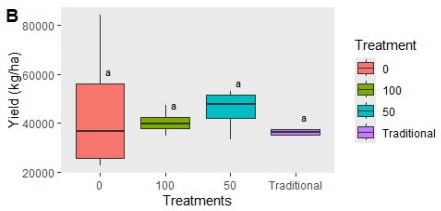
Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Results - Yield

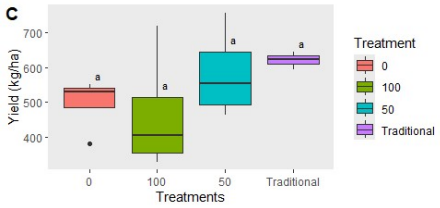
CORN



PUMPKIN



BEAN



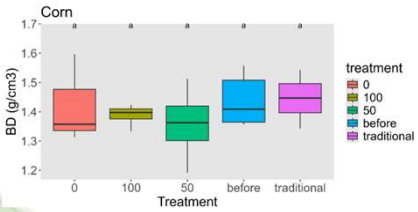
THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

133

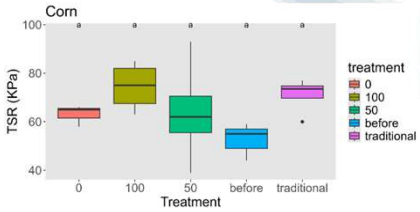
Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Results – Physical properties – Corn plots

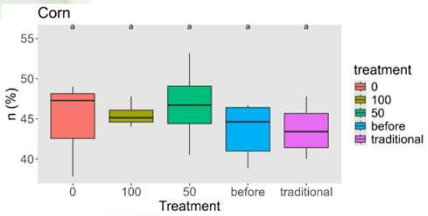
Bulk density



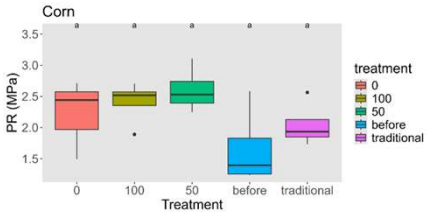
Resistance to tangential shear



Porosity



Resistance to penetration



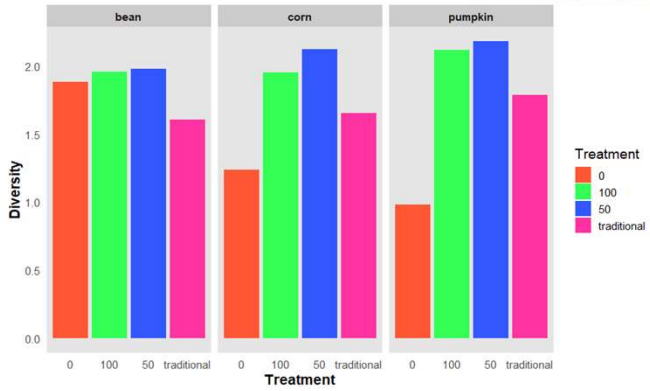
THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

134

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Results – Biological properties – Corn plots

Soil macrofauna diversity



THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

135

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Main Conclusions

- **No statistically significant differences in yield** not even in the control treatment .
- Limited yield response observed due to **soil oversaturation** caused by the legacy effect.
- Longer term studies are needed in order to determine the effects of RBBF on soil health.

Recommendation: Continue the trial under the same conditions to obtain more representative data and accurately evaluate the effect of blend VdC/2.

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

136

Contact:
WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

Thank you!

m.pulleman@cgiar.org
g.pena@cgiar.org

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

137

Stakeholder reflection debate on opportunities

Bram Van Hecke, Kabinet Jo Brouns (BE)
(tbc) Omar Zidarich, GITC (IT)
Filip Velghe, Mirom Roeselare (BE)
Leila Bourdier, Suez (FR)

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

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH ANDINNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

138

Panel debate on the key outcomes of the RUSTICA project

Fien Amery, EV ILVO - Daan Kuiper, CROPEYE - Dominik Jasinski, Particula
Moderator: Tessa Avermaete, KU Leuven

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

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH ANDINNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

139

Closing

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

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH ANDINNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

140

RUSTICA

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

Contact:

WEBSITE: rusticaproject.eu
EMAIL: info.rustica@kuleuven.be

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

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 101000527

141