



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

Deliverable 8.9: Policy briefs - Third edition

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Summary

A key communication and dissemination objective of the RUSTICA project is to engage policymakers and regulatory bodies both during and after the project, ensuring a pathway for the successful exploitation of its results. This involves fostering a supportive policy, funding, and regulatory environment for RUSTICA's innovations, establishing partnership agreements, and enhancing territorial development opportunities through new policies and programs.

The Consortium has finalised the third and comprehensive edition of the RUSTICA policy briefs, building upon the previous versions, "Policy briefs 1" and "Policy briefs - second edition." This final edition refines key approaches, addresses the challenges encountered, and offers more in-depth recommendations for policymakers.

Deliverable 8.9: Policy briefs - Third edition, will present the final version of the four policy briefs, which will be made public and shared with relevant policymakers.

The RUSTICA Consortium

The RUSTICA consortium, which is composed of university researchers, academia, consultants, scientists, businesses, and farmers, is working together to achieve the project's common objective while stimulating an environment where each consortium partner shares and exchanges experiences to achieve the goals set-forth.

Table 1 - The RUSTICA Consortium

Logo	Name	Country
	University of Leuven (KU Leuven)	Belgium
	DRANCO NV (DRANCO)	Belgium
	Chambre Régionale d'Agriculture des Pays de la Loire (CRAPDL)	France
	BioSabor, S.A.T. (BioSabor)	Spain
	Consiglio per la Ricerca in Agricoltura e l'Analisi dell'Economia Agraria (CREA)	Italy
	Fundacion para las Tecnologias Auxiliares de la Agricultura (TECNOVA)	Spain
	Avecom NV (AVECOM)	Belgium
	Entomo Consulting S.L. (ENTOMO)	Spain
	Particula Group d.o.o. (PAR)	Croatia
	Wiedemann GmbH (WIED)	Germany
	IDConsortium SL (IDC)	Spain
	Stichting CropEye (CROPEYE)	Netherlands
	Eigen Vermogen van het Instituut voor Landbouw, Visserij en Voedingsonderzoek (EV ILVO)	Belgium
	The Netherlands' Organisation of Applied Scientific Research (TNO)	Netherlands
	Universiteit Gent (UGent)	Belgium
	Centro Internacional de Agricultura Tropical (CIAT)	Colombia

Acronyms and abbreviations

BBF	Bio-based fertiliser
CE	Conformité Européenne, French for "European conformity"
DG AGRI	Directorate-General for Agriculture and Rural Development
EC	European Commission
ESPP	European Sustainable Phosphorus Platform
EU	European Union
FPR	Fertilising Products Regulation
LCA	Life Cycle Analysis
LCC	Life Cycle Cost
NERM	Nutrients in Europe Research Meeting
NGO	Non-Governmental Organisation
TRL	Technology Readiness Level

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Project Abstract

The RUSTICA project provides a technical solution to convert organic residues from the fruit and vegetable sector into novel bio-based fertiliser products of high quality that address the needs of modern (organic) agriculture. The project's ambition goes beyond the simple recovery of nutrients and includes the development of economically viable and environmentally sustainable alternatives to mineral fertilisers with the same or improved agronomic value.

The technical solution consists of 5 conversion processes (carboxylic acid platform, microbial biomass production, electrodialysis, insect breeding and biochar production) which can be combined depending on the available waste streams and integrated with state-of-the-art technologies such as composting. Synergies between the individual conversion processes will be sought and optimised to maximise economic and environmental benefits, and the processes will be demonstrated at TRL7. The resulting ingredients (microbial biomass, mineral nutrient concentrates, insect biomass, insect frass, insect chitin, biochar) will be combined to obtain tailor made fertiliser products adapted to specific crop needs.

Parallel with this technological innovation and integration, a multi-actor approach guarantees the implementation potential of the technologies in the agri-food chain and will lead to sound business models. Several non-technical aspects (environmental and social LCA, legal framework, expected market developments...) will be evaluated in 4 European regions and 1 region in Colombia. Stakeholder involvement at each step guarantees the development of marketable end products for the fruit and vegetable sector, with a high replication potential to other agricultural sectors.

Cooperation with other EU funded projects working on nutrient recovery from other waste products will stimulate a joint solution to evolve towards a sustainable and circular fertiliser management to close nutrient cycles within and between regions.

1. Introduction

RUSTICA aims to foster the **technical validation, demonstration and implementation of bio-based fertiliser and soil improvement production techniques focusing on waste from the fruit and vegetable agri-food system to close nutrient cycles on a regional level**. Additionally, project wants to **bridge the gap between the nutrient losses in the form of agricultural residues and the nutrient imports in Europe** by integrating and demonstrating 6 complementary technologies with high nutrient recovery potential to treat residues from the fruit and vegetable sector and turn them into a variety of fertiliser ingredients which will be formulated in tailor-made soil amendments and high effective fertilisers, with the aim to replace 5-10% of mineral fertiliser with bio-based alternatives by 2040.

Among the strategic objectives of the RUSTICA project are that results and insights from the 5 RUSTICA regions will be translated into business models for different archetypes of fertiliser recovery chains and comprised into a roadmap including recommendations for stakeholders and policy makers, to ensure replicability and applicability of the project's outcomes throughout Europe.

Therefore, the dissemination to policy makers and regulatory bodies has been considered as "Dissemination for Action". It is expected that policy makers and regulatory bodies will help pave the way for the implementation and exploitation of RUSTICA. One of the desired impacts in RUSTICA is to create a supportive policy, funding and regulatory environment for the project and its products; create partnership agreements; enhance territorial development opportunities also through new policies and programs

The objective of this deliverable is to present the final version of the policy briefs developed during the final phase of the RUSTICA project.

2. Methodology followed for the development of policy briefs:

Task 4.4 “European and global workshops on the replicability of the business models” consists of the organisation of three international workshops to discuss the replicability of the developed business models within RUSTICA project.

The first workshop was organised in Leuven, Belgium in May 2022. It brought together EU level experts to discuss the overall outcomes of the RUSTICA project, including the replicability of the business models. Among the main objectives was to identify the problems represented within the framework of public policies related to circular bio-based fertilisers and regional food systems.

One of the outcomes of the 1st EU stakeholder workshop has been the identification of 4 main policy briefs with their related action plans. These include a clear analysis of the problem, the limitations of the existing regulation and a clear definition of requirements for policy makers.

The second workshop was held in Cali, Colombia in April 2023. The workshop was organised by KU Leuven and CIAT, bringing together participants representing a broad group of stakeholders, including policymakers, industry representatives, NGOs, farmer organisations, and researchers from Latin America and Europe. The workshop aimed to foster discussion and knowledge sharing among stakeholders on circular food systems in Latin America, with a particular focus on the valorisation of waste streams from agri-food residues.

The second reunion confirmed challenges in legislation, particularly emphasizing issues of delayed or insufficient legislative measures.

The third and final workshop will be held in Leuven, Belgium, in November 2024 during which the final versions of the policy briefs will be presented in a more visual and user-friendly format.

A clear timeline and target groups for each policy brief, both at the national and regional levels, will be defined. All policy briefs will be published in the main stakeholders' national languages to facilitate communication with national policymakers. These briefs will serve as input for the final position paper, explaining to the target groups, key stakeholders, and researchers the role of bio-based fertilisers in transitioning towards a more sustainable food system.

3. Policy briefs dissemination strategy

To ensure that the RUSTICA policy recommendations reach the appropriate audience and stimulate action, a comprehensive dissemination strategy was developed. Each policy brief will have a dedicated space on the RUSTICA website, prominently featured under the [Policy Lens](#) tab, providing easy access to the documents. Promotion of these pages will be ongoing through RUSTICA's online channels, including newsletters, social media platforms, and news updates. Additionally, consortium members will actively promote the policy briefs at various scientific and industry events, enhancing visibility and engagement with stakeholders.

RUSTICA collaborated with the European Sustainable Phosphorus Platform (ESPP) and four RUR08 Sister projects (Fertimanure, Lex4Bio, Sea2Land, and Walnut) during NERM 2024 (Nutrients in Europe Research Meeting) to develop a joint position paper titled "Bio-based Fertilising Products: Quality, safety and alignment with EU Regulation". The paper outlines proposals on defining "Bio-Based Fertiliser" (BBF) and BBF quality, with the aim of ensuring market clarity and establishing a potential European Standard for environmental claims under the EU Fertilising Products Regulation. Moreover, the collaboration delves into understanding the acceptance of BBFs in the market, encompassing factors such as prices, subsidies, and the overall enhancement.

On November 14, 2024, RUSTICA will host a special event with key policymakers to foster direct communication and knowledge exchange between the agricultural sector and decision-makers. The event will include a seminar at DG AGRI in Brussels, Belgium, where colleagues from DG SANTE and DG GROW have also been invited, broadening the scope of the discussion. This seminar presents a valuable opportunity to share the outcomes of the RUSTICA project with EU policy officers and engage in meaningful dialogue with them.

4. RUSTICA's final policy briefs

4.1. Policy brief 1 - Policy and legislation on circular bio-based fertilisers

Key messages

Three key challenges related to the current EU legislation on bio-based fertilisers are highlighted:

- The transition from the current regulation to the new Fertilising Products Regulation is challenging.
- Uncertainties hinder the development of new bio-based fertiliser products.
- The European Commission should ensure a level playing field for the development of bio-based fertilisers.

Point of departure

Europe emphasises the importance of bio-based fertilisers for improving soil quality and resilience while promoting more circular food systems. This emphasis is reflected in the Farm to Fork Strategy, which highlights the urgent need to reduce nutrient losses to the environment. Within this strategy, the European Commission identifies the production of bio-based fertilisers as a 'largely untapped potential for farmers and their cooperatives'.

The European Commission has funded several projects under the H2020 framework to advance bio-based fertilisers. These ongoing projects focus on diverse technologies and include bio-based fertilisers derived from animal- and plant-based waste streams. Investment in research and innovation continues with the new round of Horizon Europe Calls.

On 16th of July 2022, a new regulation significantly changed the landscape for the marketing of fertilising materials in the European Union. Replacing EC Regulation 2003/2003 and serving as the harmonised alternative to current national rules, EU Regulation 2019/1009 (Fertilising Products Regulation, or FPR) establishes the feedstocks and Component Material Categories for products such as fertilisers and plant bio-stimulants.

Problems encountered

Although the development and validation of technologies show great potential for innovations in bio-based fertilisers, legislation lags behind. The former EU Regulation 2003/2003 is primarily focused on inorganic fertilisers, while companies producing bio-based organic fertilisers, had to rely on national legislation. As announced in the Circular Economy Action Plan, the Commission proposed new legislation on fertilising products in March 2016. This proposal, which had been in preparation since 2010, has two objectives: (1) to incentivise large-scale fertiliser production from domestic sources by transforming waste into nutrients for crops, and (2) to introduce harmonised cadmium limits for phosphate fertilisers. Although the final version of the proposal, the new EU FPR 2019/1009, repeals the 2003 Regulation, its overall principles remain largely unfulfilled.

Despite the extensive list of specifications for different fertiliser categories and the growing number of notification bodies in the EU, regulation continues to be a significant bottleneck for the introduction of bio-based fertilisers using organic feedstocks and innovative technologies, such as those being validated in the RUSTICA project. It would be beneficial to encourage communication between those who have recently requested or confirmed conformity and teams still in the development phase. Sharing best practices could facilitate the development and market introduction of bio-based fertilisers in Europe.

Moreover, innovative circular business models involving waste, animal by-products, or microorganisms still face restrictions. Legal rules governing these restrictions should be better communicated and aligned with current innovative technological solutions.

Furthermore, the international aspect of the fertiliser market requires attention. Europe must ensure a level playing field, not only among member states but also between the European Union and the rest of the world. Legislation should be straightforward and coherent, with controls in place to prevent unfair trading practices.

Finally, there is a lack of dialogue between European policymakers and stakeholders in the food system. Such dialogue could help policymakers develop market-aligned policies, that serve as a reality check. In this way, the conversation could contribute to setting realistic goals and formulating a policy framework that effectively stimulates changes in the food system, leading to more sustainable outcomes.

Request to policy makers

Legislation in Europe is designed to be aligned with the ambitions set forth in the Farm to Fork Strategy and the Green Deal. However, many obstacles currently hinder the adoption of innovation. There is a need for a clear assessment of which feedstocks and valorisation pathways are accepted for bio-based fertiliser production, and which are not. If the right environment is created, stakeholders are willing to share their insights, facilitating a productive dialogue.

The European Commission funds several projects and initiatives related to the development of bio-based fertilisers. However, consortia often struggle with the increasing complexity and uncertainty of legislation, leading to wasted time and resources. Coordinating efforts across consortia, supported by the European Commission, could provide valuable assistance in overcoming these barriers.

Identified recommendations

1. **Facilitate a smoother transition to the new Fertilising Products Regulation (FPR):** Provide clear guidance and support to stakeholders during the shift from the old regulation to the new FPR, ensuring that bio-based fertiliser producers can navigate the regulatory landscape without delays.
2. **Clarify feedstock eligibility and valorisation pathways:** Establish clear and coherent guidelines for which feedstocks and valorisation pathways are acceptable for bio-based fertiliser production, reducing uncertainty and encouraging innovation in the sector.
3. **Promote communication and best practice sharing:** Encourage dialogue between developers and companies that have successfully achieved conformity with FPR standards, fostering knowledge exchange and reducing bottlenecks for those in the development phase.
4. **Align legislation with technological advancements:** Ensure that legal restrictions on waste, animal by-products, and microorganisms are updated to reflect innovative bio-based fertiliser technologies and business models, making regulations supportive of circular solutions.
5. **Create a level playing field in the fertiliser market:** Develop straightforward, coherent, and harmonised rules to ensure fair competition both within the EU and globally, preventing unfair trading practices and ensuring equitable market conditions for bio-based fertilisers.
6. **Enhance stakeholder dialogue for market-aligned policies:** Establish regular, structured dialogues between policymakers and stakeholders in the food system to set realistic goals, adapt policies to market realities, and stimulate sustainable innovations in the sector.

4.2. Policy brief 2 - Reality check on the feasibility of circularity in the food system

Key messages

Three key challenges that must be addressed to stimulate the development of circular bio-based fertilisers are highlighted:

- Bio-based fertilisers have high production and transportation costs
- Bio-based fertilisers may contain impurities and contaminants
- Sustainable solutions in the bioeconomy are region-specific

Point of departure

Europe emphasises the importance of circular bio-based fertilisers for sustainable food systems. This is also reflected in the Farm to Fork Strategy, which calls for the urgent need to reduce nutrient losses to the environment. In this strategy, the European Commission also refers to the production of bio-based fertilisers as a 'largely untapped potential for farmers and their cooperatives'. Moreover, Europe has set an ambitious goal to drastically reduce the use of mineral fertilisers by 2030. Europe also stresses the need for a transition towards a circular economy, which includes a circular food system where waste generation is reduced, and the potential of by-products is fully exploited.

Several European H2020 projects focus on bio-based fertilisers. The RUSTICA project demonstrates that circular bio-based fertilisers have the potential to be as effective as mineral fertilisers.

Problems encountered

Circularity has been put forward as a key requirement for more sustainable food systems. The principles of a circular food system include recycling nutrients from agricultural residue streams and food processing waste through the development of bio-based fertilisers and their application to improve soil health and crop production. Here, we highlight three key challenges that must be addressed to stimulate the development and use of bio-based fertilisers.

First, while the environmental impact of bio-based fertilisers is often lower compared to mineral fertilisers, their production costs are typically higher. Therefore, economic support is needed to make bio-based fertilisers competitive with mineral alternatives, especially during the initial market penetration phase. This situation may change as technologies evolve or if the costs of mineral fertilisers increase. Additionally, R&D can focus on ways to lower production, reducing the need for economic support.

To tackle this crucial aspect, leveraging Life Cycle Costing analysis and determining the final production costs can provide valuable insights. Additionally, comprehensive assessment of environmental impacts is needed. This can be achieved through a Life Cycle Analysis that compares mineral and bio-based fertilisers. Such an assessment should include the transportation of feedstocks, as the distance between where feedstocks for bio-based fertilisers are produced, such as farms, and where bio-based fertilisers are manufactured may pose a considerable challenge. Large volumes and high transportation costs may hinder the feasibility of profitable business cases.

Second, circular bio-based fertilisers may contain impurities or contaminants. The key question is how to reconcile the possible presence of impurities and biotic or abiotic contaminants in residues or waste streams with the goal of reusing them in agricultural production systems. Impurities and contaminants do not necessarily represent an environmental or human health risk if concentrations remain below safe limits. Therefore, clear guidelines or standards should be established to define these safe limits, taking into account

environmental, animal, and human health considerations. These guidelines and standards should be accompanied with straightforward communication directed at all actors in the food chain. Transparent communication and sensibilisation awareness-raising are essential to overcoming the current cultural aversion to using certain residues in food production.

Finally, circularity ideally implies that the reuse or recycling of waste and residues is carried out at the regional level. This requires consideration of the availability of feedstock, technological expertise, and the regional policy framework. These factors should be kept in mind when scaling circular concepts to European and global levels. Some solutions or technologies may be perfectly valid in one region but not necessarily feasible or sustainable in another. In many regions, the availability of feedstock from agri-food residues and waste streams may be insufficient or inconsistent to support the efficient production or commercialisation of bio-based fertilisers. This could be due to limited residue and waste production, to competing demands for these residue streams (such as animal feed or fuel), or high transport costs.

Request to policy makers

Europe should align investment, regulation, and support with its ambitions as outlined in the Farm to Fork Strategy and the Green Deal. Economic and legislative obstacles hinder research and innovation aimed at developing more circular food systems. Opportunities for improvement lie not only in incentivising bio-based fertilisers, but also in harmonising guidelines, communication, and awareness-raising about circular food systems. Additionally, there is a need to decouple sustainability concepts to gain support for hybrid products and to recognise that different regional contexts require different solutions. Regional diversity significantly impacts agricultural production, making circularity more sustainable in some regions than in others.

The European Commission funds several projects and initiatives that relate to the development of bio-based fertilisers. Consortia struggle with the increasing complexity and uncertainty of legislation. This way, valuable time and means are wasted. Bundling forces across consortia by the European Commission could be a valuable support to overcome current barriers.

Identified recommendations

1. **Provide financial and regulatory support:** Offer economic incentives, subsidies, and research funding to offset the high production and transportation costs of bio-based fertilisers, ensuring their competitiveness with traditional mineral fertilisers.
2. **Develop harmonised safety and quality standards:** Establish clear, unified guidelines for impurities and contaminants in bio-based fertilisers, with a focus on maintaining environmental, animal, and human health safety across all regions.
3. **Promote Life Cycle Analysis (LCA) and Life Cycle Costing (LCC):** Encourage the widespread use of LCA and LCC methodologies to assess the environmental and economic benefits of bio-based fertilisers, ensuring the sustainability and cost-effectiveness of these alternatives.
4. **Facilitate regional adaptation of circular solutions:** Tailor circular bio-based fertiliser strategies to regional contexts by supporting regional-scale solutions that consider local feedstock availability, infrastructure, and policy frameworks.
5. **Enhance communication and awareness campaigns:** Implement EU-wide outreach initiatives to raise awareness about the benefits of bio-based fertilisers, address cultural resistance, and promote the adoption of circular food systems.
6. **Simplify and harmonise legislative frameworks:** Streamline and clarify EU regulations for bio-based fertilisers to reduce complexity and uncertainty and encourage collaboration across EU-funded projects to accelerate innovation and adoption.

7. **Support hybrid and flexible fertiliser solutions:** Encourage the development and market acceptance of hybrid products that combine mineral and bio-based fertilisers, recognising that different regions require tailored solutions for sustainable agricultural practices

4.3. Policy brief 3 - Bio-based fertilisers as a puzzle piece in the transition towards more sustainable food systems

Key messages

Three key challenges to the adoption of sustainable farming practices as a whole, and bio-based fertilisers in particular are summarised.

- Sustainable farming requires the integration of various farming practices.
- There is a need for profitable business models related to sustainable farming systems.
- Research on the development of bio-based fertilisers should be organised in an interdisciplinary and transdisciplinary manner.

Point of departure

With the Farm to Fork strategy, Europe has articulated its ambition for a transition towards more sustainable food systems. Europe presents an integrated and comprehensive policy that covers the entire food chain: production, processing, and consumption. The strategy embodies ambition and calls for, among other things, a reduction in the use of synthetic (mineral) fertilisers and the valorisation of residual streams. The European Commission also identifies the production of bio-based fertilisers as ‘a largely untapped potential for farmers and their cooperative’.

Problems encountered

Various concepts and defining principles for sustainable farming have been proposed, including organic farming, regenerative farming, and agroecology. Different approaches to sustainable agriculture are likely to mature and coexist. There is no single solution that will address all the challenges related to sustainable food systems. In reality, each farming system faces specific constraints. In this context, the polarisation between conventional farming and alternative farming practices does not contribute positively to the debate.

The use of bio-based fertilisers, among other benefits, stimulates soil biodiversity, thereby fostering natural mineralisation and enhancing soil and crop resilience. In the transition towards more sustainable farming, a combination of both mineral fertilisers and circular bio-based fertilisers may offer the optimal solution at the regional or farm level.

Furthermore, robust and resilient business models are essential to motivate farmers to make investments that increase sustainability at the farm level. Sufficient effort should be directed toward developing business models that support sustainable farming practices. In this context, it is important to recognise the regional differences across Europe. These differences apply not only to the physical environment in which farmers operate but also to the social and economic environments, such as perception of the circular economy. These differences must be taken into account when considering the potential for upscaling successful sustainable practices.

Finally, the RUSTICA project has highlighted the urgency of working both interdisciplinary and transdisciplinary to maximise the impact. Collaboration between researchers from different disciplines - is essential to address the full spectrum of sustainability and to achieve results that add value in agronomic, ecologic, economic and social terms. Additionally, the importance of transdisciplinarity should not be underestimated. To develop a marketable product, close cooperation with diverse key actors should be encouraged from the very beginning of a project.

Requests to policy makers

International recognition of various sustainability approaches should encourage the coexistence of different farming practices. Bio-based fertilisers have the potential to contribute to sustainability across all farming systems. Furthermore, the economic realities of the international food system must be acknowledged. A significant opportunity lies in fostering stakeholder dialogue, which can help policy makers develop market-aligned policies and contribute setting realistic goals.

Identified recommendations

1. **Promote the integration of diverse sustainable farming practices:** Encourage the coexistence of various farming approaches (e.g., organic, regenerative, agroecology) by fostering a flexible policy framework that allows for region-specific solutions, without polarising conventional and alternative methods
2. **Support the development of profitable business models:** Provide incentives and resources to develop robust business models that motivate farmers to adopt sustainable practices, considering regional economic and social contexts across Europe.
3. **Encourage interdisciplinary and transdisciplinary research:** Prioritise interdisciplinary research and ensure close cooperation with diverse stakeholders from the start of projects to address the full spectrum of sustainability - agronomic, ecological, economic, and social - and enhance the marketability of bio-based fertilisers.
4. **Promote the combined use of mineral and bio-based fertilisers:** Advocate for policies that support the integration of both mineral and bio-based fertilisers at regional or farm levels, ensuring the most effective and sustainable fertilisation strategies.
5. **Tailor policy to regional differences:** Acknowledge the diverse regional contexts across Europe in sustainable farming policies by considering factors such as feedstock availability, farming environments, and economic and social differences, ensuring that circular economy initiatives are regionally feasible.
6. **Facilitate stakeholder dialogue:** Foster continuous dialogue between farmers, researchers, and policymakers to ensure that sustainability goals are market-aligned and practical, helping to set realistic targets and ensure effective policy implementation.

4.4. Policy brief 4 - Circular bio-based fertilisers in a global context

Key messages

The key challenges and opportunities related to circular bio-based fertiliser production, utilisation, and trade in a global context are summarised:

- European strategies on sustainable food systems impact agricultural sectors globally through policies, regulations, and international cooperation.
- The development of locally adapted bio-based fertiliser technologies and value chains is crucial for food security in the Global South.
- International cooperation should focus on context-relevant research and innovation, as well as enabling policy frameworks.
- International trade of bio-based fertilisers may be necessary to bridge asymmetries between areas of high nutrient demand and areas with high availability of nutrient dense residues. However, discrepancies in regulations on bio-based fertiliser products around the world can complicate international trade.

Point of departure

The Green Deal is a forward-looking European strategy with a global reach, aimed at achieving the targets of the Paris Agreement. A cornerstone of the European Green Deal is the Farm to Fork Strategy, which outlines the EU's ambition to make its food system more sustainable by addressing priorities and challenges at every step in the food chain. The strategy includes a set of actions designed to transform agriculture and food systems into fair, healthy and environmentally-friendly systems, with an emphasis on the bioeconomy as part of the solution. Promoting the production and use of circular bio-based fertilisers is key to achieving the ambitions of the Farm-To-Fork strategy by reducing dependency on synthetic fertilisers, improving soil health, and lowering the carbon footprint of farming.

At the global level, the European Commission promotes the transition to sustainable food production and the bioeconomy through international cooperation, supporting key areas such as research and innovation aimed at climate mitigation, adaptation, and agroecological farming practices. The EC also invests in research, innovation, and knowledge transfer as reflected in the new round of Horizon Europe calls and of the DESiRa Initiative. Ongoing projects focus on diverse technologies, including bio-based fertilisers derived from animal and plant-based waste streams.

EU's bilateral trade agreements offer another means to promote EU environmental standards in third countries, as well as environmental and food safety standards for imported agricultural products and regulations impacting fertiliser trade. A specific example is the new EU Fertilizing Products Regulation. On the 16th of July 2022, this new regulation significantly changed the landscape for the marketing of fertilising materials in the European Union. Replacing EC Regulation 2003/2003 and supplementing current national rules, EU Regulation 2019/1009 (Fertilising Products Regulation, or FPR) establishes a list of materials, properties, and processes allowed for in the development of fertiliser and plant bio-stimulant products.

Challenges and opportunities

When it comes to the production and use of circular bio-based fertilisers, significant differences can be observed both between and within global regions. This applies to fertiliser requirements as well as the availability of residues and waste as feedstock for bio-based fertiliser production. Globally, hotspots with large surpluses of

nutrient-rich residues, such as those from intensive dairy farming, tend to be geographically separated from areas with high nutrient requirements, such as regions where animal feed is produced on low-fertility soils. Different regions globally can thus complement each other in their needs and capacities, making international cooperation beneficial from both an economic and environmental perspective. On the other hand, challenges associated with bio-based fertilisers in the international context include discrepancies in regulations on fertiliser products around the globe that complicate international trade.

Of particular interest are the benefits of bio-based fertilisers in the Global South, where food production and food prices are crucial for food and nutritional security, and issues like low agricultural productivity and soil fertility are widespread. This is partly due to high costs and insufficient or inefficient use of fertilisers. At the same time, inadequate waste management, such as open dump sites and burning, is a key source of greenhouse gas emissions and other environmental and human health issues. Recovery of nutrients from residue and waste streams is absolutely crucial to secure human nutrition, improve farmer incomes, and strengthen local agricultural value chains by making agricultural inputs from waste streams available at a competitive price. This means that the development of technologies and business models for bio-based fertilisers that are well-adapted to the local context is a priority, alongside enabling policy frameworks and incentives.

Recommendations to policy makers

Where possible, bio-based fertiliser technologies and value chains should be adapted to the local context. Solutions should be tailored to the resources, capacities, and markets available in a given context, focusing on developing cost-efficient approaches for different residue streams and target crops. However, local solutions may be hindered by a shortage of available residues as feedstock for bio-based fertilisers, or local expertise and infrastructure may be limited. In such cases, regulation that ensures a level playing field to encourage international cooperation and trade of bio-based building blocks and fertiliser blends is important. Policy makers should be aware that tensions between promoting international trade and promoting local supply chains may exist.

In summary, the development of bio-based fertilisers should primarily consider the local context, knowledge and human capacity. At the same time, policy makers should facilitate international cooperation by supporting the transfer of materials and know-how and by streamlining regulation.

Identified recommendations

1. **Adapt bio-based fertiliser solutions to local contexts:** Prioritise the development of bio-based fertiliser technologies and value chains that are tailored to local resources, capacities, and market needs, especially in regions with high agricultural potential but low fertiliser accessibility.
2. **Support international cooperation and trade:** Facilitate international cooperation by streamlining regulations and encouraging trade in bio-based fertiliser components to bridge gaps between regions with nutrient surpluses and areas with high nutrient demand.
3. **Develop enabling policy frameworks for the Global South:** Promote policies and incentives that support the development and adoption of locally adapted bio-based fertiliser technologies to enhance food security, improve soil health, and increase farmer incomes in the Global South.
4. **Harmonise international regulations on bio-based fertilisers:** Work towards harmonising global regulations to simplify the international trade of bio-based fertilisers and ensure that trade discrepancies do not hinder global adoption of sustainable agricultural practices.
5. **Balance local supply chains with international trade:** Encourage a balance between supporting local bio-based fertiliser supply chains and promoting international trade, ensuring that policy frameworks do not disadvantage either approach but foster complementary solutions.

4.5. Proposal on the definition of “Bio-Based Fertiliser”

European Sustainable Phosphorus Platform ([ESPP](#)), in collaboration with RUSTICA and other projects, has proposed a definition for "Bio-Based Fertiliser" to improve market clarity and product communication. The initiative aims to establish a European Standard for defining and measuring "Bio-Based nutrient" content, supporting environmental claims and certification under the EU Fertilising Products Regulation. The full proposal is available on the ESPP website through the following [LINK](#).