3rd SOFIE Summit of the Organic & Organo-Mineral Fertilisers Industry in Europe 1

Editorial 1
Policy and market perspectives 2
European Commission fertiliser supply policies 2
Industry perspective 2
Farmers' perspective 3
Market perspective for organic fertilisers 3
Innovation and agronomy 4
Soil Deal for Europe Mission 4
Industry vision for mineral – organic synergies 4
Agronomic value of organic fertilisers 4
Agronomic challenges for organic fertilisers 6
EU Fertilising Products Regulation 6
Developing and accompanying the FPR 6
Experience of FPR implementation 7
Notified Bodies 7
Consultant experts 8
SOFIE3 panel discussion and conclusions 8

ESPP stakeholder workshop: Towards a definition of "Bio-Based" nutrients 9

Key points from presentations 9
Towards an EU definition of Bio-Based Nutrient ? 12
Next steps 12

3rd SOFIE Summit of the Organic & Organo-Mineral Fertilisers Industry in Europe

One hundred participants met in Brussels, 16-17th January 2024, plus 65 online, for the 3rd SOFIE conference, organised by ESPP with Fertilizers Europe, Eurofema, International Fertiliser Society. The conference discussed policies to support organic fertilisers, markets, research and innovation and regulation.

Slides from the webinar, list of registrants with emails (where authorised) and transcript of Chat have been sent to all registrants.

Editorial

The Third Summit of the Organic and Organo-Mineral Fertiliser Industry in Europe (SOFIE3) was a successful event for stakeholders in the carbon-based fertiliser sector. The summit drew participants from industry, regulatory bodies and research communities. Discussions at SOFIE3 centred around key topics such as European policies on fertiliser supply, market and industry perspectives on organic fertilisers, innovation in organic & organo-mineral nutrient based agronomy, and regulatory updates under the EU Fertilising Product Regulation. This event underscored the importance of organic and organo-mineral fertilisers within the EU's agricultural framework, highlighting their role in enhancing nutrient use efficiency and promoting sustainable farming practices. Through the discussions on policy support, market dynamics, and technological innovations, SOFIE3 set steps forward for the growth and sustainability of the organic fertiliser industry in Europe.

Robert van Spingelen, ESPP President

Policy and market perspectives

European Commission fertiliser supply policies

Fabien Santini, European Commission, DG Agriculture, summarised developments relevant to fertilisers and EU policies. Russia's aggression against Ukraine resulted in a fertiliser market price and supply crisis in 2022.

The Commission published a Communication "Ensuring availability and affordability of fertilisers" in November 2022 (see ESPP eNews n°72). The Commission sees the Common Agricultural Policy as a key tool to implement the objectives of improving nutrient use efficiency and nutrient recycling set out in this Communication, including with organic fertilisers.

Analysis of the 28 National Strategic Plans under the CAP (Common Agricultural Policy), published 23rd November 2023, identified 122 interventions relevant to nutrients, covering e.g. nutrient use efficiency, soil nitrogen fixing crops, manure management.

The Commission has established an EU Fertilisers Observatory and an Agri-Food Data Portal (see ESPP eNews n°80) to collate and make available data on fertiliser supply and prices. This shows that nitrogen fertiliser imports increased +121% from 2022 to 2023, whereas phosphate fertiliser imports fell by nearly 30%. Prices are still today 1.5 to 2 x higher than in 2020, when they were low due to Covid.

Industry perspective

Antoine Hoxha, Fertilizers Europe, welcomed that food security is now back on the European agenda, driven by Covid supply chain problems then the fertiliser price and supply crisis. Nitrogen fertiliser use in Europe was down -16% (2023 vs. pre-crisis 2021), and phosphorus and potassium fertilisers were both down by -21%, as farmers have cut fertiliser use because of high prices. There have generally not been yield losses, but there have been problems with quality of crops (e.g., protein contents).

Mineral fertilisers are widely used by farmers in combination with organic fertilisers, in particular with manure. Around half of the nitrogen applied in agriculture in Europe is from manure, around two thirds of phosphorus and four fifths of potassium. This varies between region. Eastern Europe has much less manure and is more dependent on mineral fertilisers.

Most manure nutrients are already returned to land, so the potential to increase recycling is limited. A lower proportion of nutrients in sewage sludge and household organic waste is today recycled.

A key challenge for the future is to decarbonise the mineral fertiliser industry. Although the EU fertiliser industry is the world's most efficient, still around two tonnes of CO_2 are produced per tonne of ammonia. Green ammonia is possible, via hydrogen produced using renewable electricity. But the cost will be considerable: over 60 billion € for renewable energy investment for the EU fertiliser industry (see Fertilizers Europe roadmap in ESPP eNews n°81). All technological options to decarbonise should be kept open, such as for example carbon capture and storage from conventional production that is a cheaper, and easy to implement solution.

Lucile Sever, European Biogas Association (EBA), indicated that the current biogases production (21 bcm) is equivalent to around 6% of EU gas consumption, and that around one fifth of this is upgraded into biomethane.

A recent consultation of EBA members and experts concludes that, for agricultural wastes, around 200 tDM/y of digestate are generated per GWh of biogas energy, and around 250 tDM/GWh for biowastes. In total, over 30 MtDM/y of digestate is produced in Europe (2022), containing nutrients equivalent to 15% of EU synthetic fertiliser use, 11% for phosphorus and 6% for potassium, plus around 9 Mt/y of total organic carbon (likely to be in a more stable form). Studies show that 60 - 90% of organic carbon in digestate remains in soil three months after application, significantly more than for manure or plant residues (Reuland et al. 2023).

Today only around 15% of EU digestate is upgraded by processes such as solid-liquid separation, drying, nutrient recovery … Most is applied to fields without prior processing.

As part of a regulatory analysis in the EU FER-PLAY project, EBA identifies as challenges to better use of digestate nutrients:

- EU FPR requirements for "Organic Fertiliser" (PFC 1A) difficult to meet for digestates,
- Animal By-Products (ABPs) Regulation limits recycling to fertiliser of digestates where digesters intake partly ABPs,
- Nitrates Directive restrictions of use of recycled nitrogen from manure,
- Restrictions to use of sewage sludge in digestates recycled to land.

These challenges contradict the aims of soil carbon storage and of carbon and nutrient recycling indicated in policies such as the proposed Soil Monitoring Act, incentives to organic fertiliser use in CAP eco-schemes, carbon policies, Waste Framework Directive, Urban Waste Water Framework Directive revision.

Farmers' perspective

Dominique Dejonckheere, Copa-Cogeca, also underlined that fertiliser prices today are still higher than before the price-supply crisis of two years ago. Farmers are squeezed between too low food prices and high input costs, resulting in historically low fertiliser consumption today. Yet 90% of the EU's 1.4 billion t/y of manure goes to fields without processing.

Nutrient recycling and better manure nutrient use face technical challenges (transport costs, spreading equipment) but also significant regulatory obstacles: waste status and waste transport regulations, Nitrates Directive limits to manure nutrient use.

Copa-Cogeca wants policy changes to facilitate nutrient recycling:

- Need for an EU food and protein strategy,
- Nitrates Directive manure nutrient spreading limits should not apply to products which are comparable to mineral fertilisers (precise nutrient composition compatible with precision farming),
- Facilitate nutrient recycling with renewable energy (biogas – digestates),
- EU Fertilising Products Regulation should continue to include further recycled nutrient materials, to enable trading across the EU,
- Develop nitrogen recovery processes,
- Develop processing to marketable organic nitrogen fertilisers of N-fixing cover crops,
- Policy tools are needed to create a market for recycled nutrients,
- Higher fertiliser prices to farmers resulting from CBAM should be compensated by credits for farmer investment in nutrient management,
- Further work on credits for carbon fixing in agricultural soils, including verifying for how long carbon is retained in different soils and climates.

Market perspective for organic fertilisers

Alberto Persona, S&P Global – Fertecon, presented further analysis, following the conclusions of his presentation at SOFIE2 (SCOPE Newsletter n°146). He had then explained that the price for the N, P and K in manure and other secondary organic materials provides a theoretical value, but which can only be realised if the nutrients are processed into a product adapted to farmers needs and which enables storage and delivery to the farmer where and when required. But, if the nutrients in manure have such a value, why does manure have a negative price (disposal cost)?

Mineral fertiliser has significant distribution costs. Farmers in Europe pay nearly 50% higher than bulk price. Global transport costs remain high, even if somewhat lower than during the Covid and Russia/Ukraine crises.

Manure and organic wastes face considerably higher costs, including processing and pelletising, local logistics and transport, with high costs both of moving manure to the processor and of distribution transport (organic fertilisers have a lower nutrient / bulk ratio than mineral fertilisers). Consequently, the net value of manure to farmers is negative (disposal cost), except very briefly in 2021-2022. To address this, the nutrient use efficiency of manure recycling must be addressed, by improving manure storage, processing and application. This could significantly reduce EU dependency on imported fertilisers which will become increasingly costly to farmers as CBAM (Carbon Border Adjustment Mechanism) ensure that imports have the same CO_2/renewable energy costs as EU production (see above).

Ana-Marija Spicnagel, IPS Konzalting and Fertimanure EU Horizon project, presented work on uptake of nutrient recycling by farmers.

A stakeholder attitude questionnaire on recycled fertilisers generated 1500 answers from 8 European countries, including waste producers, processers and farmers. Conclusions are that farmers are willing to consider recycled fertiliser products, but with different levels of acceptance for different waste inputs. Most respondents are not familiar with all proposed types of recycled fertilising product. Form of fertiliser (handling, compatibility with equipment), nutrient crop availability and avoidance of risks are indicated by respondents to be their most important criteria, more important than price. However, most respondents are not willing to pay more for recycled nutrients than for synthetic fertilisers.

Work with a 60-cow dairy farm in the Achterhoek region, The Netherlands, showed that these motivated farmers are interested in innovation, and wish to recycle their own manure nutrients to reduce dependency on purchased fertilisers. Costs of recovering liquid potassium fertiliser were higher than nutrient value, but return on investment could be 3 – 5 years when accounting for avoided manure disposal costs.

Innovation and agronomy

Soil Deal for Europe Mission

Kerstin Rosenow, European Commission, Directorate-General for Agriculture and Rural Development (Research and Innovation), outlined the Horizon Europe Mission "A Soil Deal for Europe". According to the Mission Soil's "Implementation Plan" (2021), nearly one quarter of Europe's soils have unsustainable erosion rates. Soil organic carbon is on average being lost at a rate of 0.5% per year, so a very long way from the "4 per 1000" objective of a 0.4%/year increase. The cost of soil degradation is estimated at 50 billion €/year. Around 60% of Europe's soils are today considered unhealthy, and climate change will accelerate this.

On average, nutrients are over applied to land. Europe's soils have today surplus stored nitrogen of around 50 kgN/ha and phosphorus of 2 kgP/ha. In many regions, over half of nutrients applied to fields are lost. 65% to 75% of soils have nutrient levels high enough to risk causing eutrophication by nutrient losses to surface waters.

However, mineral fertilisers are critical for EU agriculture, with around three quarters of agricultural land receiving mineral NPK fertilisers.

Improving soil health and management is thus important, and is being taken forward by the EU Soil Strategy (see ESPP eNews n°77), the Horizon Europe EU Mission 'A soil deal for Europe' and by the EU Soil Observatory (data and knowledge hub). The Soil Monitoring Law (Directive on Soil Monitoring and Resilience, currently in decision process) aims "to achieve healthy soils by 2050". Because no one solution fits all and soil management must be adapted to regional climate, soil, geography and socio-economic context, a key tool will be the 100 living labs and lighthouses (resulting in more than 1000 testing sites across Europe), funded by the Mission Soil to be established in phases 2021 – 2027. Another 1,000 soil health testing sites are expected to be established supported by the CAP Operational groups, and by other private funders, such as philanthropic organisations. Long-term field trials are essential, so a question is how to ensure that these initiatives continue long-term.

The Mission Soil launched in April 2023 a "Manifesto", today signed by over 2 500 signatories. Individuals and organisations are invited to join to support and participate in the Mission's activities.

Industry vision for mineral – organic synergies

Sergio Godoy, Yara, presented the company's strategy of overall plant nutrition delivery, combining mineral and organic fertilisers, biostimulants and digital tools for precision nutrient management on the farm. Organic fertilisers are an important route for nutrient recycling. Yara has today three organo-mineral fertiliser production sites in Finland (Ecolan), Italy (Agribios) and Norway (Gronn AS).

Long-term field trials in Germany (65-years) show that combining farmyard manure with mineral fertiliser enables to increase crop yield, to increase farmers' net income and to improve use of rainfall water.

Greenhouse trials with wheat show that use of only organo-fertiliser (OF) leads to considerably lower yields and increased risk of leaching (accentuated because the OF works better if applied early). Optimal yields and reduced leaching risk were achieved by combining OF and mineral fertiliser.

Overall, the trial and test results confirm that optimal results are achieved by combining mineral and organic fertilisers, but that appropriate timing of application is essential, and must be adapted to the crop, the soil and the climate. This is the 4 R's: right fertiliser, right time, right nutrient application rate and right delivery mode.

Agronomic value of organic fertilisers

Renske Hijbeek, WUR Wageningen University & Research, followed on from this last point with a summary of published evidence on links between agricultural soil carbon storage and soil fertility.

"4 per 1000" is a multi-stakeholder initiative, supported by the United Nations, which aims to increase soil carbon in agricultural soils by 0.4%/year in order reduce atmospheric CO_2. However, there is uncertainty as to whether increasing soil organic carbon (SOC) increases soil ecosystem functions, and what effects it can have.

24 meta-analyses of studies conclude that in some cases increasing SOC (after correcting for nutrients N and P applied) can have negative impacts on crop productivity, in some cases positive, in some cases no significant impact. 20 long-term field studies in Europe show on average no impact on productivity, with impacts varying from -10% to +18%. In general, positive effects on productivity are mainly seen in sandy soils (unsurprisingly, as here the SOC can improve water retention and soil biology) and in crops which are

demanding (e.g. potato) or have short growing periods. On the other hand, it is difficult to retain SOC in sandy soils, whereas it is well retained in clay soils.

So organic input to sandy soils may benefit food production, but have little interest for CO_2 trapping, whereas organic input to clay soils can retain CO_2 for longer but with little crop benefit.

Leon Fock, Eurofema (European Organic Fertilizers Manufacturers Association), presented development of a model to estimate nitrogen use efficiency and leaching from organic fertilisers. This follows on from the work on Life Cycle Analysis of different organic fertilisers presented at SOFIE2 (2023). This work showed that organic fertilisers had varying environmental footprints, depending on the secondary materials used in their production, with generally good LCA 'per nutrient content'. However, this is only relevant if the nutrient use efficiency is taken into account and if the nutrients are not lost by leaching.

The developed model is based on modelling of soils, taking into consideration weather conditions, mineralisation of organic nutrients in soil, nitrogen leaching and soil N balance.

Results suggest that although organic fertilisers tend to have lower nutrient use efficiency during the first crop season, the nitrogen mostly remains in the soil (so may be available for next year's crop) with consequently lower leaching than with synthetic mineral fertilisers.

This suggests that LCA's should be corrected to take into account not only nutrient use in the first crop season but also nutrients stored in soils.

Further work needs to be done to integrate into the model losses of N to air as ammonia or N_2O.

The model and input data used are available to share if scientists or other organisations wish to take this forward with Eurofema.

Kari Ylivainio, Luke Finland and LEX4BIO Horizon 2020 project, summarised results of field trials of eighteen different recycled fertilisers at five sites across Europe (see Müller et al. 2023). The fertilisers tested included both organic fertilisers (pelletised manure, animal by-products or plant materials, food waste digestate compost, vinasse digestate, sewage sludge …) and inorganic recycled fertilisers (struvite, poultry litter ash) and combinations of these (organo-mineral fertilisers).

For phosphorus, some of the materials (struvite, organic materials) were as effective as mineral P fertilisers.

For nitrogen, the average crop N effectiveness (fertiliser replacement value) was only around 70% that of mineral fertilisers (ranging from 9% to 113%). It was slightly higher (around 75%) when the recycled materials were incorporated into soil (rather than surface spreading).

For phosphorus, some of the materials (struvite, organic materials) were as effective as mineral P fertilisers.

Ana Robles Aguilar, University of Vic, Spain and Fertimanure Horizon 2020 project, summarised results of nineteen other recycled nutrient materials at five other sites across Europe, all recovered from manures. These materials again included both organic fertilisers (dried solid fraction of digestate, manure biochar) and inorganic materials (recovered ammonium salts, 'nutrient concentrate' with 0.6% organic matter), as well as tailor-made organo-mineral fertilisers (recycled materials with added synthetic mineral nutrients).

Results showed very similar nutrient use uptake and yields for N, P and K compared to synthetic mineral fertilisers. In most cases, residual nutrients in soil (so leaching risk) were also similar, but the tailor-made organo-minerals showed lower residual soil nitrate (but similar total N). Atmospheric ammonia emissions were also mostly similar.

Parveen Fatemeh Rupani, Cranfield University, UK, presented glasshouse trials of an organo-mineral fertiliser which combines recovered ammonia carbonate (CO_2 and ammonia stripping) with fibrous organics (see SCOPE Newsletter n°145). Trials were carried out in a glasshouse at Cranfield University on spring wheat measuring nutrients and root development for six months. The setup in the glasshouse involved 24 210L lysimeters with moisture sensors installed at three depths. The results showed no significant effects on yield and root length between treatments. This was the first season trials in a glasshouse and further trials are underway using winter wheat, grown using the same lysimeter.

Grzegorz Siebielec, Poland Institute of Soil Science and Plant Cultivation – State Research Institute, noted that much of Poland has low soil organic carbon and faces increasingly frequent droughts: 90% of agricultural land has been impacted by drought in at least one year over the last decade.

Organic fertilisers such as compost have shown to improve crop growth in

drought years as tested in Interreg South Baltic STEP project (https://www.step-interreg.eu/).

The INNO-MIK biofertilizer project (Poland national LiderXII funding), coordinated by Sylwia Siebielec, IUNG, is testing bacteria strains for supporting crops through phosphorus solubilisation and release of indol acetic acid. Pot trials show that a combination of compost with the bacteria can extend resistance of plants to drought by several days.

Tommaso Barsali, RE-CORD, University of Florence, Italy, presented field trials of an organic fertiliser produced by co-composting cattle manure with wood biochar. Trials were on marginal land (not cultivated, not fertilised over the last decade) in Tuscany, with Spring barley. Organic treatments were applied once, whereas inorganic fertiliser was applied twice. The co-compost gave +40% higher grain yield compared to synthetic fertiliser or manure, with a similar N-content of grain. Soil organic matter was slightly increased at the end of the growing season with the co-compost, and slightly depleted with mineral fertiliser.

Agronomic challenges for organic fertilisers

John Williams, ADAS, UK, concluded the first day of SOFIE with an overview of nutrient management challenges. Fertilisers are farmers' most expensive input, but inappropriate nutrients supply has big impacts on profitability. Farmers need to assess the crop nutrient needs, what nutrients are supplied by manure, by plant materials and by residual nutrients in the soil from previous year's fertilisation. This will depend on biological activity in the soil (solubilisation of nutrients, loss of nitrogen to air) and on nutrient leaching losses.

For organic fertilisers, this is more difficult because nutrients will only become available to plants as a function of microbial activity, which depends on climate and moisture.

Also, control of application is essential. This requires knowing the nutrient and dry matter content of organic fertilising materials, which is often difficult with manures and slurries. Furthermore, appropriate spreading equipment is needed, and accurate application is only possible if the organic fertiliser is consistent in both nutrient content and physical form (density, particle size).

EU Fertilising Products Regulation

Developing and accompanying the FPR

Ana-Lucia Crisan, European Commission, DG GROW, summarised developments in updating the EU Fertilising Products Regulation (FPR) and work underway to accompany implementation by fertilising products suppliers.

- Digital labelling Regulation – is under finalisation by Council and Parliament.
- Delegated regulations are under preparation to:
  - include into the FPR under CMC10, "processed manure" (as defined in the Animal By-Products Regulation) - draft regulation HERE and ANNEX HERE,
  - define biodegradability criteria for polymers (controlled release fertiliser coatings, mulch films, polymers used as additives …) – drafts HERE,
  - implement various miscellaneous technical amendments concerning tolerances, enterococcus testing, presumption of conformity without testing where appropriate – drafts HERE,

  Public feedback will be requested on the last two bullet points shortly.
- Studies are now underway on:
  - Technical Documentation guidance (see below),
  - inclusion of certain other Animal By-Product materials into CMC10 (those specified in Delegated Regulation 2023/1065)
  - possible new materials or processes to include into CMCs,
  - microbial biostimulants (CMC7): assessing possible new microorganisms to add to list, including defining a methodology for such assessments in the future,
- CEN is developing harmonised standards for testing methods and providing various claims to support conformity assessment (updated version of Commission mandate to CEN listing standards for development here).
- Work is soon to be launched on the evaluation of the Fertilising Products Regulation, due for July 2026.

Laura Van Schöll, NMI Netherlands, presented work underway (under contract from the European Commission) to develop a guidance document to support preparation of technical documentation for EU FPR product conformity assessment.

The document is organised by section of the FPR (PFCs, CMCs and includes a list of standards and an annex of references to relevant legislation and other documents. Content is coordinated with the Commission's FPR "Frequently Asked Questions" document (FAQ).

Draft of the proposed guidance document is available here.

An objective is to transpose the guidance document into an online tool, enabling generation of a case-by-case template for a given product. This is currently under development.

Brent Riechelman, NMI Netherlands, presented the study to assess possible new materials and processes for inclusion into the EU FPR (new CMCs or modification to existing CMCs). This study will run for two years (ending in 2025). First report is here and see also ESPP eNews n°86.

The study will generate, where considered appropriate, text and criteria proposals for amendments to the FPR CMCs.

All proposals submitted to the Commission survey (2022) are first screened to sort them and filter out proposals outside the scope of this study (such as microbes for plant biostimulants and animal by-products). New proposals can still be submitted via this survey (but these will not be considered at this stage). (survey: see ESPP eNews n°69).

The remaining proposals are screened for the criteria of art. 42 of the FPR: "*potential to be the subject of significant trade on the internal market*" (i.e., not use only locally) and "*there is scientific evidence that they do not present a risk to human, animal or plant health, to safety or to the environment, and ensure agronomic efficiency*". Stakeholders will be consulted via two virtual workshops, the first on the assessment of significant trade (mid 2024) and the second on assessment of risks and agronomic efficiency (early 2025).

The proposals in the survey include: human urine and excreta, fish sludge (aquaculture), sewage sludge as a possible input to pyrolysis, new processing conditions for materials already covered in existing CMCs and others.

Questions raised by participants include:

- cat litter (4% of household waste, significant nutrient content),
- cyanobacteria,
- animal by-product (or not) status of fish sludge
- animal by-products, both Cat.2-3 and Cat.1

Experience of FPR implementation

Notified Bodies

The Notified Bodies are the organisations validated by Member States to carry out conformity assessments under the EU Fertilising Products Regulation, that is to emit CE-mark certification – list here.

Giel Tettelaar, EFCI Register, explained various difficulties being met by fertiliser producers wishing to certify products under the FPR. These include inadequate documentation (in particular on origin of component materials), companies referring to outdated versions of the FPR text (should use the consolidated version online) or not understanding how the FPR works (see the Commission FAQ), confusion about interactions with REACH.

The Notified Bodies Coordination Body develops, in consultation with the European Commission, clarification on FPR interpretation questions arising during conformity assessments, but this process cannot provide rapid answers. This coordination body also identifies points which are unclear in the FPR and problems of implementation, which will be submitted for consideration in the evaluation of the FPR now launched by the European Commission, and which may lead to revisions of the Regulation text. Such points include: REACH requirements for low volume materials used as components, unclear definitions (e.g. "solely of biological origin", "polymer", "risk assessment" …), gaps between conformity assessment modules

Dorottya Lőrincz, Certrust, outlined other challenges being met by producers wishing to certify fertilising products under module D1 (e.g. recycled nutrient materials):

- technical documentation is complex: companies should anticipate that they will probably need to obtain missing documents,
- ISO 9001 is not what is required by the FPR: an appropriate Quality Management System must be in place, but it does not need to be ISO certified,
- documentation and audit are required for all "special CMC" materials (CMC 3,5,12-15), for all manufacturers of these and for all sites producing these components,
- FPR criteria can require specific, non-standard testing: need to identify labs able to do the required analysis.

Consultant experts

Roland de Bruijne, Knoell, explained that Knoell (webpage) is an independent family-owned regulatory consultancy company with over 600 employees, operating worldwide, who can help companies prepare dossiers for crop nutrition products under FPR certification and/or other Plant Protection Products Regulations, Biocide Regulation, REACH and national applicable frameworks. Knoell is providing scientific, regulatory and technical expertise in placing fertilising products and plant protection products on the market.

Knoell notes that the FPR is interlinked (depending on the product concerned) with a number of other EU regulations, including REACH, Animal By-Products, Plant Protection, CLP (Chemical Labelling and Packaging Regulation), Organic Farming and Waste Framework Directive, etc.

This results in difficulties for products containing substances which are registered as Plant Protection Products (copper, sulfur, urea). The designation is not "what the company choses": if a product has a Plant Protection function, then it falls under the Plant Protection Product Regulation, and so cannot be CE-marked under the EU FPR.

Biostimulants pose the specific difficult of needing to justify the functional claim.

Self-certification (Module A) poses the risk that market surveillance authorities carry out analysis of products on the shelf or at the distributor, and find discrepancies.

Knoell further highlights that more and more information is incorporated in the FAQ document, initially meant for better interpretation of the FPR, however this document states that it does not necessarily represent the views of the Commission.

Murray Smedley, Barkwith Associates, consultants www.barkwithassociates.com who offer a range of regulatory dossier services and advice, also identifies a number of challenges with FPR implementation and also with placing on the market under Member State national fertiliser regulations:

- materials derived from Animal By-Products are still not included in the FPR, or status unclear,
- lack of EU harmonised standards for testing necessary for FPR certification, especially for certain ecotox criteria,
- national market surveillance authorities may not accept self-certification,
- not all testing laboratories can offer certain specific testing required by FPR,
- certification under one Member State national fertiliser regulations may not lead to "Mutual Recognition" in another Member State. This can depend particularly on the Member States' respective data requirements,

Companies need to carefully plan FPR certification, including checking REACH registration criteria for all component materials, collecting all data required on all components and on final product, setting up 'good housekeeping' to ensure data storage.

SOFIE3 panel discussion and conclusions

SOFIE3 closed with a panel drawing conclusions from the conference discussions:

Penelope Vincent-Sweet, EEB and ECOS (European Environmental Bureau and Environmental Coalition on Standards):

- importance of nutrient Circular Economy and nutrient recycling to agriculture and for the environment,
- need for more focus on the soil as a living organism and the positive role of organic fertilisers. A chemical bookkeeping approach to nutrients is insufficient, harmful to long-term soil quality and outdated.

Cecilia Dardes, Fertilizers Europe:

- SOFIE shows that there is extensive knowledge and innovation, and can contribute to disseminate this, by bringing together stakeholders to catalyse new ideas,
- there is increasing cooperation between the mineral fertiliser industry and organic nutrient recycling, to deliver optimal nutrient use efficiency to farmers,
- Fertilizers Europe supports nutrient recycling, but calls for market support for recycled nutrients and for a comprehensive and holistic EU strategy on fertilisation, addressing both production and use.

Sergio Godoy, Yara :

- "back to the roots": soil health is essential for sustainable crop productivity. Organic and organo-mineral fertilisers support this,
- combining organic with mineral nutrients, as well as e.g. foliar fertilisers, biostimulants, can be the best option for farmers,
- need to continue to develop understanding of applications in the field of processed organic and organo-mineral fertilisers: agronomic effects, soil, emissions …
- policies should incentivise use of organic fertilisers and recycled nutrients,
- how to bring together the European vision and local implementation?

Lucile Sever, European Biogas Association:

- valorise soil ecosystem benefits of organic fertilisers: quantify ecosystem services,
- better recognise organic fertilisers in EU policies: agriculture, soil, water, carbon pricing, taxonomy …. Today, in 28 CAP national Strategic Plans, only one includes digestate.

Leon Fock, Eurofema:

- there is today a real market for organic fertilisers, but considerable opportunities for further development are not yet engaged,
- to enable this, the EU Fertilising Products Regulation needs to be 'completed', in particular to include organic fertilisers derived from animal by-products,
- research and innovation needs to be transposed into farm application,
- the organic and organo-mineral fertiliser industry needs to work together and be better organised across Europe.

Robert Van Spingelen, ESPP President concluded the conference by underlining the need to enable the nutrient Circular Economy at the local level, with local production (reducing transport) and appropriate technologies (small scale).

The EU Fertilising Products Regulation is today scarcely accessible to small local producers, in particular because of the costs of conformity assessment.

Combining organic with mineral nutrients is increasingly recognised as optimal to ensure nutrient delivery to crops, increase farmers net revenue, improve soil health and reduce nutrient losses, whilst also ensuring nutrient recycling.

The challenge is to bring together European knowledge, competence and methodologies with decentralised local production, distribution and farmer information. This will enable roll-out of processed organic and organo-mineral fertilisers, adapted to precision nutrient management, with farmer confidence in quality and safety.

ESPP stakeholder workshop: Towards a definition of "Bio-Based" nutrients

Over 100 participants joined ESPP's workshop "Defining Bio-Based Fertilisers", Brussels & online, 18th Jan. 2024:

- Discussion with the European Commission DG GROW and DG Research clarified the difference between this term and the specific wording in the EU Fertilising Products Regulation "of solely biological origin".
- Dialogue with industry, research and standards experts and other stakeholders confirmed the need to have a clear definition of "Bio-Based" for nutrients, to ensure market transparency and user information, and also a methodology to validate such claims.
- Consensus to start from the existing CEN Standard EN 16575 (August 2014) "Bio-based products: vocabulary", but need to establish a validation approach because existing CEN methodology is not adaptable to nutrients.

See ESPP "Proposed definition of Bio-Based Nutrients", 3 pages, updated following this workshop, online here www.phosphorusplatform.eu/regulatory.

The CEN/TR 16721 isotopic radio-dating (C14) method cannot identify nutrients of "biological origin" because elements like phosphorus (P) and potassium (K) in plants or animals can originate from the uptake of mineral fertilizers or from mineral animal feed additives. Atmospheric nitrogen (N) fixed by plants and N from Haber-Bosch fertilizers have the same radio-dating signatures.

CEN/TR 16721 suggests that a plastic derived from CO_2 captured during the incineration of organic waste qualifies as "Bio-Based." In contrast, plastic from CO_2 captured at coal-burning facilities does not qualify. By analogy, substances like phosphoric acid extracted from organic waste incineration ash and ammonium sulphate reclaimed from manure digestate off-gases should also be classified as "Bio-Based." In the EU FPR regulation 2019/1009, "Inorganic Fertilisers" (PFC 1(C)) and "Mineral Fertilisers" (Annex III, part II $4(a)) could thus be "Bio-Based".Key points from presentations

Bertrand Vallet, European Commission DG RTD (Research & Innovation), indicated that "Bio-Based" fertilisers are a key part of the EU Bioeconomy Strategy and of R&D project funding targeting the Circular Economy.

Key challenges to uptake of recycled nutrient products identified in Horizon2020 projects include **economic drivers and user attitudes**. Further work on nutrient stewardship will be funded in Horizon Europe, including addressing regional nutrient boundaries, environmental impacts and economic modelling.

Clear and recognised vocabulary is important. The term "Bio-Based Fertiliser" (BBF) is already used both in DG RTD documents (e.g. Horizon Europe WP – Cluster 6) and in Horizon2020 project publications (e.g. Wester-Larsen et al. Lex4Bio 2022). Such research perspectives may be wider than a regulatory approach. Nonetheless an agrees definition should be sought.

Jan Chys, consultant for Fertilizers Europe, emphasised that industry supports and promotes standards, as essential to provide transparent information to downstream customers and to farmers, to guarantee delivery of reliable quality and to avoid risks of contractual or regulatory disputes. Harmonised EU standards are needed for measuring and validating quality parameters and marketing claims, backed up by national authorities' market surveillance. Measurement methods must however be cost feasible, reliable and include realistic tolerances. The fertiliser industry is at the forefront of work on relevant standards. Vocabulary is essential and should be the starting point for standards development.

The term "bio-based" should be related to the origin of the material. The term "fertiliser" should refer to nutrient delivery to crops, with agronomic performance and quality criteria, as in the EU Fertilising Products Regulation (FPR). A clear definition is essential to provide market and regulatory clarity.

Kari Ylivainio, LUKE Finland and **Laia Llenas Argelaguet, BETA Technological Center University of Vic,** Horizon2020 projects Lex4Bio and FertiManure, presented **work of the R&D community on definitions of "Bio-Based Fertilisers".** This term was in the European Commission Horizon2020 call for projects, but without a definition. The funded projects have therefore worked to clarify this, with the aim of **facilitating understanding by downstream users** (fertiliser distributors, agricultural advisory, farmers).

FertiManure's initial proposed definition was "***derived from biomass related resources***". This led to discussion and proposals to exclude from the definition of "Bio-Based Fertilisers" materials which are not processed or refined, and to propose to include only materials where processing results in a "change of composition or nutrient content" (not simply dewatering). A round table on manure management organised by FertiManure at ManuResource 2022 suggested that a "Bio-Based Fertiliser" should not include unprocessed manure, but should be marketable products, with a minimum nutrient content, certain product qualities (e.g. storable). There was not however agreement as to whether solid/liquid separated manure could be included.

Lex4Bio considered "Bio-Based Fertilisers" (BBF) from a range of raw materials, such as plants, sewage sludge, animal by-products, taking as starting point "***residue of living organisms***". Discussions proposed that not only the source raw materials, but also the processing technologies should be considered (see Wester-Larsen et al. 2022). Discussion noted that nutrients in BBFs are often present in an inorganic chemical form (not bound to organic carbon).

Alessia Gaetani, CEN (Comité Européen de Normalisation, the European Committee for Standardization), outlined CEN work on standards relating to "Bio-Based" and to fertilising products.

CEN European Standard EN 16575 (August 2014) "**Bio-based products: vocabulary**" defines:

- (2.1, 2.5) bio-based products as "Wholly or partly derived from biomass. May have undergone physical, chemical or biological treatment";
- (2.4) bio-based content as "fraction of a product that is derived from biomass. Normally expressed as a percentage of the total mass of the product";
- Biomass is defined (2.7) as "material of biological origin excluding material embedded in geological formations and/or fossilised".

Further standards work is currently underway on Life Cycle Assessment (LCA) of "Bio-Based" products (prEN 18027) comparing LCA of "Bio-Based" to fossilised materials. This draft standard is open to input, via National Standards Organisations (list here).

Three CEN Technical Committees address fertilising products: CEN/TC 223 Soil improvers and growing media, CEN/TC 260 Fertilizers and liming materials, CEN/TC 455 Plant biostimulants.

Much work is underway to develop harmonised standards for testing methods for criteria for different CMCs and PFCs of the EU Fertilising Products Regulation (FPR), following an extensive mandate from the European Commission,. This mandate now includes updates to include additional criteria resulting from the several Delegated Acts amending the FPR, in particular to cover the 'STRUBIAS' materials (CMCs 12, 13, 14). The current version of this mandate is here (consolidated version for information non regulatory).

CEN recognises the need to define "*Bio-Based Fertilising Products*" or "*Bio-Based Nutrient*", and to establish methods to demonstrate "Bio-Based" for nutrients, in order to avoid greenwashing.

CEN invites participation of stakeholder and company federations in standards work, by participating in CEN Technical Groups. EU trade or scientific organisations can also submit proposals for standards for consideration by CEN.

Leon Fock, Eurofema * noted that **there is a real problem of misleading semantics**. A wide, confusing and often non-justifiable vocabulary of claims are found on products on the market: Organic, Biological, Bio-Based, Biomass, Biological origin, Allowed in organic/bio farming, Recycled, Low carbon footprint, Biocompatible … It is important for product users to clarify this vocabulary, including for non-bio-based recycled fertilisers.

** Eurofema is a European federation of organic fertilisers manufacturers' associations, also open to individual manufacturers as observers in countries without an organic fertilisers industry association.*

Eurofema note that what can or cannot be sold as a "fertiliser" is already defined in the EU Fertilising Products Regulation, and in national fertiliser regulations. The challenge is therefore to define "Bio-Based" as applicable to fertilisers and nutrients.

The EU Organic Farming Regulation is largely not coherent with the EU FPR and includes undefined terms. Various organic materials authorised under the FPR are excluded from Organic Farming if "factory farming origin". On the other hand, some organic materials are authorised in EU Organic Farming, and would be identified as "Bio-Based" under CEN EN 16575, but are excluded from the FPR (e.g. grapemeal from Organic wine production after hexane extraction, which is industry standard processing, excluded from FPR CMC2).

These contradictions will not be resolved rapidly, but Eurofema considers that a clear and agreed definition of "*Bio-Based*" for fertilisers is important, and should be coherent with CEN EN 16575.

Biological origin of nutrient elements cannot be measured (carbon radio-dating used for e.g. bioplastics is not applicable), so the question is: how to verify and avoid greenwashing? Eurofema proposes that **reliable verification could be achieved by including "*Bio-Based*" into specified labelling options in Annex III of the EU FPR, with requirement of validation by Notified Bodies** (module B or D1).

Theodora Nikolakopoulou, European Commission, DG GROW (Fertilisers), suggested that incentives are needed to facilitate uptake of secondary fertilisers, and therefore that clear and agreed definitions are important, for "bio-based", "recovered", "recycled" … Possibly, the European Commission could look in to this topic during the future evaluation of the FPR and identify appropriate actions to promote the use of secondary raw materials in EU fertilising products

She presented reasoning why the definition of "*nutrients … of solely biological origin*" in the EU FPR should be distinct and different from the definition of "*Bio-Based*" nutrients.

The term "*nutrients … of solely biological origin*" occurs in three places in the EU FPR:

- PFC1(A): "An Organic Fertiliser shall contain organic carbon (C_{-org}) and nutrients solely of biological origin";
- PFC1(B): "An Organo-Mineral Fertiliser shall be a co-formulation of: (a) one or more inorganic fertilisers (…) and (b) one or more materials containing organic carbon (C_{-org}) and nutrients of solely biological origin";
- PFC3(A): "An Organic Soil Improver shall consist of material 95 % of which is of solely biological origin".

The contexts of these wordings suggest that, in all three cases**, the term "*nutrients … of solely biological origin*" concerns only nutrients present in organic materials**. Therefore the Commission's published Frequently Asked Questions explaining the FPR (FAQ, online here, Q7.9 in version 21/3/2024) states: "*materials of biological origin are materials that are contained in, extracted from or produced by living or dead organisms or parts thereof. When it comes to extraction, the material coming from living or dead organisms should not be broken down to single and simple chemical substances where the link with the organism is lost*". This could be coherent with the CEN methodology for measurement of bio-based content using carbon dating. However, discussion in the Fertilisers Experts Group on examples to illustrate this FAQ answer suggested that there are differences of understandings between different experts and Member States. Further discussion in this Expert Group will try to find consensus understanding.

Ms. Nikolakopoulou underlines **there is no upper limit to the organic carbon content of "Inorganic Fertilisers" (PFC1(C))** under the EU Fertilising Products Regulation, subject to respecting the minimum declared nutrients contents and other PFC product specific requirements (see Q7.4 of the FAQ online).

However, **for a product to be labelled "Mineral Fertiliser", organic carbon content must by ≤1%** by mass as specified in Annex III, part II, PCF (1), point 4(a) (labelling).

The term "*solely of biological origin*" can be legally considered to be a significant part of the "*definitions, or other elements relating to the scope, of product function categories*",

which the Commission cannot modify by delegated act (art. 42.1 of the FPR: decision of European Parliament and Council would be required). If problems are identified with this wording, the question should therefore be raised in the **evaluation of the FPR**.A study to support the FPR evaluation will be launched in the coming months. The findings of the evaluation will be assessed and may lead, if appropriate, to a legislative proposal to the European Parliament and Council for a revision of the FPR.

Towards an EU definition of Bio-Based Nutrient ?

In discussion with participants:

- Generic claims such as "biobased" may be banned by the Green Deal proposed directive "Empowering Consumers for the Green Transition", unless underpinned by recognised environmental performance. Specifically, the EU FPR states that labels "*shall not make claims such as 'sustainable' or 'environmentally friendly' unless such claims refer to legislation, or clearly identified guidelines, standards or schemes, with which the EU fertilising product complies*" (Annex III, Part I, art. 8(c)).
- Reference was made to the **European Union Terminology (IATE)** https://iate.europa.eu/home. A search for "bio-based" on this website finds some 25 links, of which around half are general references to bio-based products or bio-based economy, and around one third concern bio-based plastics or bio-based carbon. A search finds no references to "bio-based fertiliser" nor nutrients.
- It is important to distinguish between the definition of "bio-based" as applied to nutrients, and the **definition of "fertiliser" or "fertilising product",** which is not the objective of this discussion and can be referred to definitions and criteria of the EU FPR or national fertilisers regulations.
- The definition **of "bio-based" for nutrients should also address other functional uses of nutrients** (other than in fertilisers), both in the food chain (e.g. in animal feed or human food) and in industrial applications (e.g. P or N in fire safety or in pharmaceuticals).
- "Bio-based" can also be relevant for **non-nutrient, non-fertiliser fertilising products**, such as biostimulants, liming materials or soil improvers.
- The question of products which are **partly bio-based** should be addressed, to be distinguished from those which are entirely bio-based (see example below).
- There are issues with the use of "bio" to mean Organic (as in Certified Organic Farming) in some languages, but this workshop cannot resolve this. **Language translations** of "bio-based" should be defined.
- Several participants suggest to **not require that "Bio-based fertiliser" be "processed",** because it would be very difficult to define a cut-off between processed and non-processed (granulated ? dried ? …). This would also be contradictory to the EU FPR, where plant parts (e.g. of a nutrient-rich, N-fixing cover crop) could be contained in an Organic Fertiliser (CMC2 – PFC1(A)). It is suggested instead to require that the product respects a "fertiliser" definition and criteria in EU FPR or national fertiliser regulations.
- The questions of **chemicals and energy used in 'processing'** bio-based nutrients are considered different from that of the definition, and point to LCA aspects, not to the definition of "Bio-Based".
- Coherent with Circular Economy objectives and considering the need to avoid competition with food production, the **priority for "Bio-based nutrients" should be recovery from waste streams**.

*"**Partly Bio-Based Fertiliser" example**: If struvite is recovered from municipal wastewater by dosing sodium hydroxide (to adjust pH) and a magnesium mining by-product, then the P and N in the struvite are "100% Bio-Based", but the struvite itself could be considered 82% bio-based (% dry mass = ignoring water of crystallisation, considering as bio-based the NH_3 and the PO_4 but not the Mg).*

Next steps

Robert Van Spingelen, ESPP President, concluded that ESPP should take forward several approaches:

1. **Continue collaboration**: work with stakeholders and researchers to reach a consensus on a clear definition of terms. A revised proposal document, adjusted after this workshop's discussions, is online for comment at www.phosphorusplatform.eu/regulatory.
2. **FPR regulation amendment request**: ask the European Commission to include a specific definition of "bio-based" in the EU Fertilising Products Regulation's labelling (Annex III).
3. **Standardisation development**: collaborate with CEN to develop and adopt an EU standard that defines "bio-based" content for nutrients, applicable to fertilizers and other uses, along with a methodology for its measurement.
4. **Policy and incentives**: define incentives and policies to promote the adoption of bio-based fertilizers and recycled nutrients, building on the conclusions from the ESPP workshop on policy tools to support market pull for recycled nutrients, held on 13th March 2024.