European Sustainable Phosphorus Platform

c/o European Partners for the Environment (EPE) av. Tervuren 216, B-1150 Brussels, Belgium

Secretariat: Chris Thornton +33 474 93 07 93 +33 680 72 70 75 info@phosphorusplatform.eu

European Sustainable Phosphorus Platform response to the stakeholder consultation on Horizon 2020 Societal Challenge 2 food security, sustainable agriculture, marine, maritime and inland water research and the bioeconomy:

Brussels 30th June 2014

The European Sustainable Phosphorus Platform brings together industry, knowledge institutes and public establishments to promote and implement phosphorus sustainability in Europe, including partners from the following sectors

- Water and waste treatment
- Fertilisers and soil amendments, animal feeds, food and beverage industry
- Phosphate mining, processing and chemicals industries
- Technology suppliers, knowledge institutes
- > Partner networks: composts, digestates, manure management, R&D networks ...
- Nutrient / phosphorus Platforms: Netherlands, Flanders, Germany, Networks:
- Geographical extension towards Baltic, Black Sea, Mediterranean, Neighbouring
- Farmers' organisations, organic farming, environmental and consumer NGOs
- Local / regional authorities























OSTARA









Fachhochschule Nordwestschweiz



Page 1 of 6















www.phosphorusplatform.eu - Twitter: @phosphorusfacts



European Sustainable Phosphorus Platform

c/o European Partners for the Environment (EPE) av. Tervuren 216, B-1150 Brussels, Belgium

Secretariat: Chris Thornton +33 474 93 07 93 +33 680 72 70 75 info@phosphorusplatform.eu

Q1: In the framework of the Horizon 2020 Societal Challenge 2, what are the most important specific challenges which require immediate actions in order to achieve smart, sustainable and inclusive growth?

- A key challenge is to reduce dependency of the agri-food system in Europe on imported raw materials (phosphate) and energy (nitrogen fertiliser production) by improving use efficiency and developing recycling of nutrients
- In particular, phosphorus: phosphate rock was included in the EU list of 20 Critical Raw Materials in May 2014, in recognition that it is vital for agricultural production and quality and food security, over 90% of use is in agriculture (fertilisers, animal feed), and Europe is nearly completely dependent on phosphorus imports. See: http://ec.europa.eu/enterprise/policies/raw-materials/critical/index_en.htm
- Phosphorus efficiency, reuse and recycling have synergies with reducing agriculture's environmental impact (eutrophication), local job creation (circular economy), and with recycling and management of nitrogen fertilisers (dependent on imported energy for their production), with energy/materials recovery (anaerobic digestion of manures, composting), biomaterials / bioenergy production (both land based bioenergy crops and other systems such as algae will require considerable inputs of phosphorus to grow, and in general the phosphorus is not required or is not desirable in the final product, so that phosphorus efficiency and P-recycling are essential prerequisites of such production iii)
- Nutrient efficiency, reuse and recycling are essential to increase Europe's food security, given the linkage between world phosphorus and energy prices and world food prices and related geopolitical risks
- Europe's nutrient and food-energy dependency challenge, taking into account environmental and land use pressures on agriculture, requires to **question levels of meat and dairy in diet**, as these are a key driver for nutrient consumptionⁱⁱⁱ
- Improving agricultural nutrient management requires improving understanding of interactions with organic content of soil, root structure, plant root soil interface, soil bacteria, legacy soil phosphorus, synergies between micronutrients and plant nitrogen fixation.

Q2: What key research and innovation areas need to be addressed in order to tackle these specific challenges, and meet the specific objectives of Societal Challenge 2?

- Understanding and improving crop use of phosphorus in soil reserves, in inorganic fertilisers and in organic amendments (biosolids, processed biosolids products)
- Understanding and improving the role of organics in agricultural soils (contribution to soil health, erosion and nutrient loss avoidance, crop productivity, nutrient availability), understanding the role of different fertiliser types and soil amendments in husbanding soil organic matter and developing soil amendment products / crop and land management systems which support this
- Improving agricultural methods, fertilisers and soil amendment products to enhance plant nutrient efficiency through soil organics, microbial health, root structure, micronutrients, interactions with nitrogen fixation
- Systems and technologies to integrate nutrient recycling into agro-food chains, including manure processing and phosphorus recovery



www.phosphorusplatform.eu - Twitter: @phosphorusfacts



European Sustainable Phosphorus Platform

c/o European Partners for the Environment (EPE) av. Tervuren 216, B-1150 Brussels, Belgium

Secretariat: Chris Thornton +33 474 93 07 93 +33 680 72 70 75 info@phosphorusplatform.eu

- Optimising phosphorus in animal feeding
- Source separation and valorisation of urine and faecal matter in livestock production (e.g. piggeries). This can enable reduction NH3, dust, odor and methane emissions; reduction of greenhouse gases, improve living conditions for the animals and working conditions (avoid flies, vermin), reduce antibiotic use, reduce energy consumption
- Ensuring agronomic efficiency and safety (contaminants) of nutrient recycling products (products produced from sewage biosolids, manures, animal and food processing wastes, including digestates, composts, recovered phosphate fertiliser products ...)
- Systems and technologies to fix (biologically, chemically), removal and reuse or recover phosphorus from agricultural drainage waters
- P –efficiency and P-recycling in bioenergy production: e.g. selection of low P demand crops for biofuels, reducing P-losses in crop growth and processing, developing P recycling technologies in biofuel production ... While biofuel crops and algae require considerable inputs of P to grow, the P is not present in e.g. the extracted ethanol / fatty acids. That means that all of the consumed P is left in the organic by-products. It is therefore essential to develop processes to reuse or recover and recycle nutrients embodied in these residuals, e.g. in animal feed, for reapplication to subsequent crops, in technical recycling processes producing marketable phosphorus products ...

Q3: What are the key assumptions underpinning the development of these areas (research & innovation, demand side and consumer behaviour, citizens' and civil society's concerns and expectations)?

- Continuing pressure to reduce agri-food industry environmental impacts, in particular eutrophication (through both legislation such as Water Framework Directive quality objectives and social pressure)
- Resulting obligations for manure treatment, processing and recycling for concentrated livestock production units
- Increasing pressure on world food security resulting from growing demand (population, increased meat and dairy in diets in Asia and elsewhere), climate change
- Links between global food prices (and insecurity) and supply and price pressures on nutrient raw materials, in particular phosphate rock
- Social pressure (consumers, supermarkets) to ensure food safety, with "suspicion" of biosolids use on land (particularly sewage biosolids, but also any recycled organic), with possible contradictions to objectives of increasing agri-food organics and nutrient reuse and recycling
- Development of energy and organic recovery routes from biosolids (methanisation, pyrolysis, organic polymer or fatty acids, bioplastics ...) where nutrients present in final sidestreams (not required in the product stream) and need to be dealt with to avoid environmental discharge, so offering important opportunities for nutrient recycling technology implementation



www.phosphorusplatform.eu - Twitter: ophosphorusfacts



European Sustainable Phosphorus Platform

c/o European Partners for the Environment (EPE) av. Tervuren 216, B-1150 Brussels, Belgium

Secretariat: Chris Thornton +33 474 93 07 93 +33 680 72 70 75 info@phosphorusplatform.eu

Q4: What are the bottlenecks – in practices and research – in addressing these areas, and what are the inherent risks and uncertainties, and how could these be addressed?
Q5: Is there evidence for any major gap (knowledge, science and technology, markets, policies, competences, skills)?

- need to ensure funding mechanisms so that farmers can pass on to upstream (food industry, consumers) additional costs of nutrient management, nutrient runoff and discharge avoidance, biosolids processing and to better monetarise the environmental benefits of carbon and nutrient reuse and recycling in manure products
- issue of safety of recycled nutrient products, in particular organic contaminants (pharmaceuticals, hormones, organic industrial chemicals), including ecotoxicity, risk assessment
- farmers' uptake of recycled nutrient products, including integration into farm supply distribution systems, information and understanding by farmers, agronomic benchmarking, compatibility with existing farmers' equipment and practices
- societal acceptance, including consumers, supermarkets, food supply merchants, agrofood industry
- regulatory complexities of homologation and placing on the market of recycled nutrient products, mechanisms for encouraging nutrient recycling within the CAP, norms and product standards for recovered and recycled products
- lack of **demonstration references on the agronomic efficiency** of recycled nutrient products (both inorganic recycled fertilisers and organic recycled products / processed biosolids) in a range of soil types and for a range of crops, to compare with conventional fertilisers, including assessment of nutrient losses (risk of contribution to eutrophication)
- for nutrient recycling technologies, need for the final stage of RTD, that is full-scale construction and demonstration operation over significant timescales of currently pilot scale technologies, with assessment of economic and technical performance, industrial reliability, assessment of environmental impact (LCA) and cost assessment. Such full scale plants are needed in different EU countries to ensure demonstration.
- 6) What are the emerging opportunities for advances in the areas tackled by Societal Challenge 2, taking into account the EU position in research and innovation?
- 7) In which areas is the strongest potential to leverage innovation and, in particular, ensure the participation of industry including SMEs?
 - Development of nutrient recycling technologies and implementation in manure streams and other agri-food bystreams, including producing recycled nutrient products adapted to user needs (fertiliser specifications, farmers' existing equipment for storage and spreading) and placing on the market
 - Improving efficiency of nutrient use in animal feeds
 - New fertiliser products and soil amendments which offer improved nutrient use, incite plant access to soil phosphorus reserves and contribute to soil health, erosion avoidance



www.phosphorusplatform.eu - Twitter: @phosphorusfacts



European Sustainable Phosphorus Platform

c/o European Partners for the Environment (EPE) av. Tervuren 216, B-1150 Brussels, Belgium

Secretariat: Chris Thornton +33 474 93 07 93 +33 680 72 70 75 info@phosphorusplatform.eu

8) How could Horizon 2020 Societal Challenge 2 best contribute to EU policies, and leverage and complement Member States' efforts for growth and job creation?

- Nutrient recycling (including biosolids management) as a part of a local circular economy
- Developing manure processing systems which produce market-ready fertiliser products
- Achievement of Water Framework Directive water quality objectives, with social and economic benefits

Q9: What types of cross-cutting and trans-disciplinary activities would best tackle these challenges/opportunities based on the first experience of Focus Areas such as Blue Growth or Sustainable Food Security2?

- need to collate existing research information and test/pilot process data to avoid duplication
- **testing and dissemination** of innovative agricultural methods and use of new fertiliser / soil amendment products
- **importance of collaborative platforms** to ensure the links between different actors concerned: wastewater treatment companies and engineering, manure and waste processing operators, regulators, NGOs/society, knowledge institutes, end-users of recovered nutrient products (industry, including innovation SMEs, fertiliser sector, farmers)
- because of the complexity of nutrient management and recycling (interactions with agronomy, water management, ecology, animal feeds, human food and diet, fertilisers, recycling technologies ...) it is necessary to develop tools to collect and organize information, making it accessible and comprehensible to stakeholders and companies in different sectors who speak different languages and have different modes of functioning (water industry, chemicals, food, fertilisers, ...)

10) What type of output could be foreseen and what could the impacts (on science and technology, innovation, economy, environment and society) be based on your identification of priority areas for action? What would success look like? How would you measure it?

- Reduced EU food system dependency on imported nutrients and energy, in particular for EU Critical Raw Material phosphate rock
- Improved compatibility between agricultural productivity and agricultural protection (eutrophication, soil erosion)
- Integrate nutrients (and farmers) into local circular economies
- Improve EU food security, both supply (reduced dependency on nutrients) and safety (contaminants in biosolids)
- Reduce potential conflict between resource use for food production and for biofuels and bioressources



European Sustainable Phosphorus Platform

c/o European Partners for the Environment (EPE) av. Tervuren 216, B-1150 Brussels, Belgium

Secretariat: Chris Thornton +33 474 93 07 93 +33 680 72 70 75 info@phosphorusplatform.eu

11) Which related innovation aspects could reach market deployment within 5-7 years?

- Manure processing technologies and systems, including nutrient recycling
- New organic and mineral fertiliser / soil amendment products
- New crop management systems improving use of soil phosphorus reserves
- New animal feed products and methods
- Biosolids contaminants testing and management systems: ecotoxicity testing, analysis, ...



ⁱ "Phosphorus in agriculture: global resources, trends and developments", September 2009, Report 282. http://www.mvo.nl/Portals/0/duurzaamheid/biobrandstoffen/nieuws/2009/11/12571.pdf A.L. Smit, P.S. Bindraban, J.J. Schröder, J.G. Conijn & H.G. van der Meer ISRIC – World Soil Information, Wageningen University and Plant Research International B.V., Droevendaalsesteeg, 1, P.O. Box 16, 6700 AA Wageningen, The Netherlands

ⁱⁱ US National Academy of Sciences "Sustainable Development of Algal Biofuels in the United States", 2012, http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=13437

[&]quot;Ecological Livestock: Options for reducing livestock production and consumption to fit within ecological limits, with a focus on Europe", Greenpeace Research Laboratories Technical Report (Review) 03-2012, 36 pages: http://www.greenpeace.org/international/en/publications/Campaign-reports/Agriculture/Ecological-Livestock/