



4th Phosphorus in Europe Research Meeting (PERM) Online, 2nd June 2021

Event web page: www.phosphorusplatform.eu/PERM4

Edited “Chat”

Opening Plenary

Chris Thornton: comment on the Soil Health and Food Mission: an objective of only 30% of EU soil NOT healthy, or deteriorating, by 2030! – seems not very ambitious.

Gunnar Thelin: carbon loss rate 0,5 % of C in soil or 0,5 % units?

Gunnar Thelin: what about water infiltration?

Cinta Cazador: Will methodologies be defined to measure these parameters? Which is the role of farmers? Will they have to fulfil these criteria?

Enrica Bargiacchi: Mission: to maintain an active farmers' network

Marie-Edith Ploteau (Lippeverband): Thank you Alfred Grand. Very interesting and useful mission; hope it will be selected at political level!

Chris Thornton: To Alfred: The proposed Mission title is "Soil Health AND FOOD" but the themes presented seem to only address the soil itself. Will the mission look at links between soil quality and soil nutrients and crop nutritional value? or between soil contaminants and contaminants in crops?

Ludwig Hermann: Opening for PhD positions across Europe:

<https://www.sdu.dk/en/forskning/recap/recruitment>

Anne-Kristin Løes: To Ana: is there any cost for the Projects to participate in this network?

ADENIYI ADEBULE: I am very concerned about the involvement of Africa in this initiative. I understand that it's EU focus. It is understandable, based on the vision....but I do hope that the initiative will consider extending their tentacles to some Africa countries... I am making this comment from South Africa, University of KwaZulu-Natal, Pietermaritzburg campus.

Chris Thornton: Do other participants have experience / results from post-project analysis identifying why projects succeed or failed in taking research to implementation? If so, please indicate and you can share

Chris Thornton: Question to Henning: can you give examples of project recommendations/results which have been effectively integrated into policy?

Bertrand Vallet: Policy integration require dedicated time from stakeholders to push for their results. It is a work on itself and cannot be expected only with a single policy recommendation paper. Is this the task of a research project? Perhaps integration of interested Policy parties from the beginning can help?

Chris Thornton: A problem - seen from the point of view of someone working on policy - is that each R&D project produces its own recommendations, then holds its own workshop we do not have

time to look at each report and attend each workshop. How to bring these together into concerted proposals?

Hajdu Zoltán: To Henning: if you assessed H 2020, Life, Interreg projects, are any differences between them regarding your GAP analysis?

Claudia Erber: Even if stakeholders are involved in the projects it's still very difficult to get results into policies/practices. As you stated it's often politics and you have to take time into consideration. It often takes years to get them implemented.

Jerome Gennen: We also have the problem that our research results are not taken into account in legislation and politics. The biggest obstacle, at least for fertiliser legislation, is that national legislation is negotiated by national authorities with the EU and this process does not allow for direct participation of experts.

Anne-Kristin Løes: If the overall aim is a better status of water Quality in the Baltic sea, how far can you actually get by conducting more and more Projects, without addressing basic problems such as too high animal density etc?

ADRIANA ROMERO: Henning: any starting point on how to engage public administrations (not only as stakeholders), similar to the UATs for end-users? Thank you!

Paula Biveson: This is very important issue and true, projects should aim for stronger influence. However, it is quite likely that a policy-maker gets information from many sources and is thus incapable to remember, which was the main source of information. A project can have had influence, even if it not has been mentioned.

Francesco FATONE: Thanks Henning, excellent input. To support the policy should we perhaps change the format of our deliverables? For instance bring them closer to a typical legislative proposal? Perhaps the challenge is to find a common and quickly usable language in bureaucratic discussions

Bertrand Vallet: @Francesco: more than a format problem, it is a timing problem. R&D projects are not necessarily aligned with the legislative timing. UWWTD is Under review but it took 30 years... Do we wait for the next 30 years to push the results that will come after the revised text is published???

Christian Kabbe: P recovery from ashes is missing, representing the future main route for P recovery from sewage/sludge/ash

Theodora Nikolakopoulou/DG GROW: Good morning to all. Just to clarify that national legislations on fertilisers or fertilising products fall under the complete competence and responsibility of national authorities, and that EU services are not involved at all in their development or implementation.

Christian Kabbe: Nutriman shall clearly define how a product is defined. Still seems to be a mix of everything wastes, intermediates and products

Nurdan BUYUKKAMACI: vivianite is too important P recovery type in addition to struvite from wastewater treatment plant

Marco Giacomazzi: will the clean energy transition subprogramme help researchers to show to farmers the benefits of manure management and processing through Anaerobic Digestion?

Chris Thornton: Are there other examples of projects which have evaluated success in achieving policy change or end-user uptake, other than SuMaNu?

Francesco FATONE: @chris SMART-Plant (amongst other) was considered in national draft legislation for resource recovery and safe reuse from sewage sludge. Regrettably the timing (as Bertrand mentioned) is a major challenge.

Marie-Edith Ploteau (Lippeverband): Answer regarding experience / results from post-project analysis: the EU COM inception impact assessment on Blue bioeconomy mentions "the under-exploitation of expertise in the EU algae and blue economy sectors despite the significant support by EU

funding". So I guess the study it refers to identifies the corresponding gaps : "a project database search (Interreg, LIFE, EMFF, H2020) has identified more than 250 algae projects supported by the EC (ARES(2019)5285529)."

Christian Kabbe: P-REX

Jean-Luc MARTEL: Why do you exclude direct use of treated and good quality sludge on land ?

Chris Thornton: To Edward. What is the objective evidence of a link between Nutriman and the Fertilising Products Regulation please? And what is the tonnage of recycled nutrients now being used on the market?

Enrica Bargiacchi: @JLMartel : do You know what's EU position on sludge in the Reg. (UE) 2019/1009? Only for P mining, nothing else

Francesco FATONE: <https://impact-sc5.eu/>

From Arno Rosemarin SEI : Hi Katja. When will the specs on the N/P call be published within cluster 6?

From Chris Thornton : How will regional nutrient governance be linked to the Water Framework Directive local water basin management, which in some countries at least, is a local "water parliament" with all actors involved (local elected politicians, farmers, forestry, industry, NGOs, State)

From Chris Thornton : To Katja. Could it be considered to develop a Cordis "pack" on R&D under H2020 on "nutrients" - not only nutrient recycling, but wider including nutrient losses on farms and loss mitigation (nutrient BEMPs), eutrophication ...

From Katja Klasinc : Chris, I will be happy to pass this question on to my colleagues in EASME, who are managing the result packs.

From Chris Thornton : Link to ESPP R&D project database <http://www.phosphorusplatform.eu/R&D>

From DRISS DHIBA : What are the segmentation by TRL for each project ?

From Gennen Jerome : Water vs nitrate directive is a Problem, but also nitrate an NEC directive

From Ludwig Hermann : In addition, we will see more non technology related projects dealing with farm management practices, buffer strips, biodiversity enhancing measures that are equally important in the Farm-to-Fork strategy.

From Else Bünemann-König : Mineable potassium is a finite resource - if on a longer time scale than phosphorus

From Maria Estevez : Exactly, same concern as Else, potassium should be more emphasized

From DAGNIJA LAZDIŅA : Really, that all macronutrients (NPK) should have similar attention in scope of recycling them to the plant - soil system!

From Chris Thornton : Ion exchange technologies exist to recover potassium from seawater where there is lots of the stuff. Today probably a very long way from economic feasibility. Potassium was assessed as a possible EU Critical Raw Material ... and rejected. Also, losses to surface water are of no impact. So "nice" to recycle and recover K, but probably not a priority. This may explain why nobody seems interested ?

From Arno Rosemarin SEI : N P K content of various organic sources

<https://extension.oregonstate.edu/crop-production/organic/nitrogen-phosphorus-potassium-values-organic-fertilizers>

From DAGNIJA LAZDIŅA : Because there are not special interest to K as it is for biogenous elements N and P , while in forest systems often especially K is limiting one!

From Cinta Cazador : The fertiliser industry is also interested in K from biobased sources

From Antonio Zamuner : What about the K by the biosolution of rocks and minerals?

From Gunnar Thelin : Huge risk depending on the artificial fertilizer industry. Recovered nutrients don't fit into their business models.

From Cinta Cazador, Fertiberia: They can fit. But of course, it is a matter and compromise of quality, availability and costs. It is challenging, but we are working hard on that

From Marina Ettl, Yara Circular Economy Department: Sorry Gunnar, this is not true for all fertilizer companies

From Mathieu GAUTIER : I am Mathieu Gautier, from DEEP laboratory (Wastes Water Environment Pollution) in INSA Lyon / Univ Lyon

From Bertrand Vallet, Eureau : Arno, very interesting reference but there is no sewage sludge referred here. Is there a reason?

From Hannah Fischer : Hannah Fischer: Agricultural Chamber North Rhine Westphalia, Germany. EIP Project on "Alternative phosphorus fertilizers (P-recyclates) to increase the yield of legumes and cereals in organic farming". <https://ec.europa.eu/eip/agriculture/en/find-connect/projects/alternative-phosphord%C3%BCnger-p-rezyklate-zur>

From Gunnar Thelin : Haber-Bosch N and mined P is still much cheaper for the large scale use in the fertilizer industry than any recovered sources, hence we need Another business logic than shipping recovered nutrients to the fertiliser industry.

From Harshad Pathak : This is Harshad Pathak from EasyMining Sweden.

From Maria Estevez : Maria Estevez from Aquateam COWI, in Norway

From Antonio Zamuner : I am Antonio Zamuner, from Federal University of Catalão - Brazil

From Chris Thornton ESPP : Question to Julia - what is meant by assuming 100% comparability between nutrients in recovered and mineral fertilisers? What should be done to modify this assumption?

From Julia Tanzer : to Chris: around 70% in our sample assume P in bio-based fertilisers (mostly manure, anaerobic digestate and compost) replace P in mineral fertilisers by 100%. Some studies have used different assumptions of substitution rates (e.g. assuming different P status of soils) and have shown that these assumptions can have significant effects on the LCA results.

From DAGNIJA LAZDIŅA LSFRI Silava (LV) : Yes, mineral fertilizers are still cheaper and what is more important, much more comfortable for spreading and dosing as bio alternatives.

From Bertrand Vallet : Regarding N, P, K I would say that sewage sludge is a good recycling products to provide all 3 micronutrients: <https://www.eureau.org/resources/briefing-notes/5750-briefing-note-on-nutrients-and-waste-water-management/file>

From Arno Rosemarin SEI : Hi Bertrand. Guess the reason why sewage sludge wasn't included is that farmers (and consumers) don't like to reuse sludge on croplands.

From Gunnar Thelin : Agree. Thus, users need incentives to use recovered alternatives such as e.g consumers pushing food industries to in turn push farmers to change

From Gennen Jerome : And the Legislation must be adapted! on the one hand, you can buy a cheap synthetic fertiliser without any control and on the other hand, you are treated as if you work with atomic waste when you want to use organic fertilizer. This is not normal and enhances the Problems for collaborations between those how have excess nutrients and those you Need nutrients

From Bertrand Vallet : Arno, that's a pity that the lack of control at source measures give a bad image to this valuable resource that does not require so much Energy, is local and would provide N,P and

K. Traceability and control at source would certainly help like in many countries in Europe (still around 50% of sewage sludge is used as fertiliser in Europe)

From Gunnar Thelin : Gennen, I agree!

From Bertrand Vallet : me too

From Gunnar Thelin : Taxes on artificial fertilizers would be relevant

From Arno Rosemarin SEI : Nelson Ekane et al 2021. Resources and Risks: Perceptions on the Application of Sewage Sludge on Agricultural Land in Sweden, a Case Study
<https://www.frontiersin.org/articles/10.3389/fsufs.2021.647780/full>

From Gennen Jerome : I think a tax is only one of many possibilities. Agriculture is an open system and farmers need to replace losses and exportations. BUT, a system without losses is quite difficult to do.

From Massimo Pugliese : According to my experience with farmers, sludge or not what is important is to provide to them biofertilizers formulated to be easily distributed with the machineries already available in the farm for mineral fertilizers and at the same time they are used to apply mineral fertilizers

From Arno Rosemarin SEI : Polluter pay principle doesn't work for agriculture since the EU pays out 1 billion per week to subsidize farmers to create P surpluses from use of manure and legally following the Nitrates Directive.

From Gunnar Thelin : Arno, well said!

From Arno Rosemarin SEI : The Nitrates Directive is in violation of the Water Framework Directive.....

From Chris Thornton ESPP : The Nitrates Directive is subservient to the Water Framework Directive (WFD) , as is the Urban Waste Water Treatment Directive. The two 1980's Directives fix trans-Europe minimum requirements, which are a useful baseline. If this is inadequate locally according to the obligations to achieve specific Quality Status objectives defined locally for each water body, then the WFD obliges to go further . That is what local Water Basin Management Committees do in the field by defining and implementing Measures of each water body.

From Arno Rosemarin SEI : Hi Chris. That is hypothetically correct. In practice WFD is hidden behind the CAP which subsidises P surpluses from spreading degraded low N/P manure according to the ND.

From Chris Thornton ESPP : Do some projects here have experience in actions in local Water Basin Management Committees?

From Betty Natalie Fitriatin : how about phosphate solubilizing microbes for enhanced soil P-available ?

From Jose-Luis Cortina : Question to Michael? Thermolysis technology are limited to the need of drying and the high cost of electricity on the south of Europe. Do you have any proposal to overcome these two issues?

From Jan-Hendrik Ehm : has the phosphorus in pyrolysis material a good plant availability?

From Arno Rosemarin SEI : Good point Gunnar T.

https://en.wikipedia.org/wiki/Regenerative_agriculture

From Minna Sarvi : About the taxes on mineral fertilizers. I guess that, at the moment, the gap between the costs of mineral fertilizers and recycled fertilizers is so much, that taxes itself would not help. Instead, more support for the use of recycled fertilizers would be needed so that they would be a more realistic choice for farmer.

From CLAUDIO CIAVATTA : Why "artificial" fertilizers? I think better "chemical" fertilizers.

From Anne-Kristin Løes : Is it possible to store the chat as a file somehow and share it?

From Chris Thornton ESPP : fertilisers ... and biostimulants!

From Kari Ylivainio : Pyrolysis/HTC depresses P availability, at least in sewage sludges,
<https://doi.org/10.1016/j.scitotenv.2021.145618>

From Minna Sarvi : About P availability in pyrolyzed material. In manures, it is lowered compared to the feedstock. Of course, soil conditions influence and in slightly acidic conditions it might be somewhat better. <https://doi.org/10.1016/j.eti.2021.101584>

From Arno Rosemarin SEI : The P map here shows the legacy of P surplus farming
<https://esdac.jrc.ec.europa.eu/themes/npk-european-soils>

Mina Kiani, University of Helsinki, Finland. We are working on agronomy and environmental effects of recycled sediment from P-rich eutrophic lakes on agricultural soil!
https://www.researchgate.net/publication/343889533_Recycling_lake_sediment_to_agriculture_Effects_on_plant_growth_nutrient_availability_and_leaching

Manure

From Gennen Jerome : manure has a N/P ratio of 3/1 because the forage nutrient content has the same ration ...

From JASMIN FISHER : Arni: You mentioned that the Farm-to-Fork strategy doesn't take the N/P problem enough into account, what steps do you think they ought to take to address the topic better?

From Elaine Jewkes : Are the fertilisers effectively "mineral fertilisers"? So therefore do not supply any organic material? Which could be beneficial

From Gennen Jerome : So you feed the crops? No! You fertilize the SOIL and the soil feeds the plant. You have to take the soil into account.

From Peter Wiwen-Nilsson : Considering the N/P ratio; should focus be on any specific manure type (i.e. Pig, Cow, Poultry) or are they all equally relevant?

From Gunnar Norén : Question: Overfertilization with manure. Nutrient Balanced fertilization-will EU Farm to Fork set Target Goals for Fertilization to avoid overfertilization?

From Evan Marks : @Elaine Jewkes, in FERTIMANURE we produce a wide swath of different fertilizers, from organic amendments and biochar to RENURE fertilizers with high purity (low OM contents)

From Elaine Jewkes : Is there any way recycled manures approach can work with mineral fertilisers? It isn't possible to combine organic materials with ammonium nitrate (dangerous), but can extracted materials be used? It might provide an investment opportunity for manufacturers (I think one is looking at this already)

From Arno Rosemarin SEI : Gunnar - the FaST tool under Farm to Fork and other similar tools has the potential of balancing N and P. So there may be some progress in the near future. But the Nitrates Directive really needs to be updated. :-)

Sewage

From Robin Harder : www.endofwastewater.net and www.egestabase.net

From Mickey WINOCOUR : what is the p concentration in product

From Leon Korving : For the Water Mining adsorption approach? There we aim to get a liquid P fertiliser product that contains 2-5% of P. We will use a concentration step (UF) to get to this concentration.

From Soeren Thomsen : @To all speakers. What are the important policy interventions at EU level needed to increase the implementation / speed up of P recovery?

From Soeren Thomsen : @To everyone: What could be the role of dry toilets or other sanitary systems which don't depend on water as a transporter?

From Bertrand Vallet : Dry toilets are not generating waste water but solidwaste by definition no? I think you would use it for compost I guess :)

From Soeren Thomsen : Thanks! I am an ocean scientists and just interest here to see what is/will be possible to avoid more P entering our ocean. Thanks to your work!

User uptake

Massimo Pugliese : Which were the dosages of fishbones and manure applied?

Nathan De Geyter : What about the economics of collecting & processing the wastes?

Xinmin Zhan : In the SABANA project, are you using wastewater as the medium for microalgae growth?

Ketil Stoknes : What about legal aspects/Food safety considerations?

Karin Tonderski : Have you managed to get this economically feasible ?

Nathan De Geyter : How are you dealing with the regulatory barriers?

Xinmin Zhan : Thank you very much. If you use wastewater, sewage, how do you ensure the product quality for aquaculture use?

DRISS DHIBA : What is the Carbon footprint of this Process?

Steve Skill : Hi Gabriel, Do you introduce post primary sewage directly to the algae. What is the HRT?

Xinmin Zhan : Thank you very much

Massimo Pugliese : Which standards are you considering for evaluating biostimulant/bio-suppressive effects?

Marco Giacomazzi : so you use sewage and manure to grow algae and then you use algae to produce biostimulants?

Harald Weigand : Do you analyse the sludge in terms of antibiotics?

Renske Verhulst : what was the stable form of the phosphates you mentioned?

Ketil Stoknes : Eva: What have you found out what plastics are in the products?

Nathan De Geyter : How do you explain the difference between the P-quality compared to the fish waste from the previous Norwegian project?

Anne-Kristin Løes : Actually the P availability may also be a Challenge in Fish bones, we have so far not gone that detailed on P uptake as Eva et al

Eva Brod, NIBIO : @Harald: For the moment, we have only studied fish sludge of land-based hatcheries, which don't use antibiotics - so this is not an issue. Also for in marine aquaculture Production, use of antibiotics has decreased considerably.

Karin Tonderski : How far have the students come in their work? I missed when it started

Karin Tonderski : Are those training courses etc open also for other PhD students ?

Eva Brod, NIBIO : @Renske: We characterised P by sequential fractionation. Most of the P was inorganic and found in the HCl fraction, and is therefore most likely present as calcium phosphates of various solubility

Eva Brod, NIBIO : @Ketil: The work on microplastics is still ongoing. Claire Coutris and Erik Joner are responsible for this work package. They have mainly been working on method development since detection of microplastics in complex matrices such as organic Wastes is a big Challenge.

Ana Robles Aguilar : Do you test any other quality aspects on the surface water?

Jose-Luis Cortina : Bioethanol was produce by using gasification ?

Ana Robles Aguilar : Do you use the digestate without any further treatment? it is possible to use it as direct application in your region?

Marco Giacomazzi : Does the digestate from bioethanol by-products have product status? or does it have a different status?

Cinta Cazador : Is the composition shown on dry matter results?

DAGNIJA LAZDIŅA (LSFRI Silava) Latvia : Digestate is good fertilizer also for trees - poplars.

Ketil Stoknes : What is the advantage of producing bioethanol, rather than biogas directly

Cinta Cazador : therefore, the amount of nutrients is not very high

DAGNIJA LAZDIŅA (LSFRI Silava) Latvia : LV research results show 25% increase of Hybrid aspen grows when cow manure digestate are used as initial fertilizer 30 t/ha wet (20%DM).

Marie Reuther : what is the content of dry matter?

Cinta Cazador : is it good to enrich the digestates with other nutrients? This will increase their fertilisation capacity and be a fertiliser

DAGNIJA LAZDIŅA (LSFRI Silava) Latvia : We use mix digestate with wood ash - very promising results on trees.

Cinta Cazador : Yes, this is a good idea

DAGNIJA LAZDIŅA (LSFRI Silava) Latvia : Dried digestate with wood ash also solve problems of spreading of wood ash, because material became less dusty.

Anne-Kristin Løes : But will it be permitted to let larvae feed on other things than pure plant Products?

Seyed Mohammad Mahdi Seyed almoosavi : Yes the main benefit of using the black soldier fly larvae is their recycling of waste material potential and they are able to use a wide range of organic wastes.

Ana Robles Aguilar : Why do you want to check specifically the P uptake from recycled P products in these species?

Anne-Kristin Løes : Which characteristics of the plants do you measure to explain differences in P uptake?

Mar Carreras : how do you analyse the microbial activity?

Yue Hu : We'd like to use soil respiration to analyse the microbial activity

Massimo Pugliese : Do you have some data about the nutrient content of this organo-mineral fertiliser?

Cinta Cazador : Which is the average composition of the organo-mineral fertiliser you are producing?

Marco Giacomazzi : do you use biowaste separate collection or mixed waste?

Karin Tonderski : Will you analyse the market price of the product to see if it can be enough to cover the processing costs?

Anne-Kristin Løes : At least in Norway, insect larvae for food or feed may only be fed on plant materials and possibly milk and egg Products, not sewage sludge etc

Gopal Krishan : Is there any work on phosphorus movement and source identification to groundwater?

Seyed Mohammad Mahdi Seyed almoosavi : In our study also we only used recycled minerals based on sewage sludge. And for feeding the insects we used a standard fly diet.

LCA & contaminants

Jean-Romain Bautista Angeli : Thank you for your presentation. Could you indicate the detailed allocation rules for the Run4life project ?

Isabel García : Question to all speakers: how do you see the future of a possible homogenization of the LCA results for bio-based fertilizers? Thanks

Floris Schoeters : Rahul can you explain a bit more on the difference between Flanders and Walloon area in regards to using the land to spread out the wastewater you talked about?

Rahul Ravi : Hi Floris, basically Flanders prohibits land application of sewage sludge due to safety concerns (hence incineration is practiced). From what I saw in literature, around 50% of sewage sludge in Wallonia is land applied.

Aleksandra Bogdan : Most of the LCA studies include WWTP as part of P recovery...this adds more discrepancies as WWTP may have various configurations and I do not see them being discussed. Is anyone tackling this?

Stewardship

Jake Reardon : you can find more information on recruitment for the Recap project here:
<https://www.sdu.dk/en/forskning/recap/recruitment>

Geneviève Metson : I agree with the person who said how to raise consumer acceptance (and that is where we can learn from a lot of other fields)