

ESPP webinar on regulatory challenges around manure recycling 24th November 2021

Edited "chat" and added answers

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Fertilising Products Regulation (FPR) and EU End-of-Waste status

Sara Stiernström, EasyMining: What does "CMC 13: CMC is waste" mean? (in Laura's slide n°6).

Hans Jansen, Stercore: I confirm than under the EU regulation 2019/1009 (FPR), CE Fertilising Products achieve EU End-of-Waste status.

Laura van Scholl, NMI The Netherlands: EU End-of-Waste applies for EU Fertilising Products, not CMC materials.

Answer added by ESPP: CMCs do not obtain "End-of-Waste" status under the EU Fertilising Products Regulation (FPR) unless and until they are incorporated into a finished CE Fertilising Product, that is conform to a Product Function Category, undergone Conformity Assessment and received appropriate Labelling. This means that e.g. sewage sludge incineration ash remains a "waste" during transport to a factory which intends to process it into a CMC13 fertiliser material (this factory must therefore have an operating permit authorisation to take in waste)? Chicken litter combustion ash (itself CMC13), even if it directly fulfils PFC criteria without further processing, also remains a waste during transport to and storage at a factory which then proceeds to Conformity Assessment and Labelling to produce a CE Fertilising Product. [In both cases, unless the ash has national End-of-Waste status, in which case the ash will have to be REACH registered].

Gavin McQuaid, Northern Ireland Dept. Agriculture, Environment and Rural Affairs: Will there any restrictions on certified fertilisers produced from manure being exported to non-EU countries?

Bruno Glaser, Martin Luther University Halle-Wittenberg: yes.

Laura van Scholl, NMI The Netherlands: EU fertilising products with CE marking may be exported to countries outside EU. It depends on the importing country whether they pose import restrictions. Generally, the CE mark is seen as quality mark and facilitates acceptance of product in non-EU countries.

Answer added by ESPP: If manure has "waste" status and status then there are regulatory constraints on export, whereas obtaining fertiliser status (EU or national) enables export as a 'product'. Similarly, if manure has not reached an Animal By-Product End-Point there will be regulatory constraints.



<u>Current status of compost or digestate from manure under the EU Fertilising Products</u> Regulation (FPR)

Comment added by ESPP: As stated clearly in the "FAQ" <u>published</u> by the European Commission (Q8.1.4), it is not possible at present to use any Animal By-Product (ABP) or Derived Product (from ABPs) in CE fertilisers, because End-Points are not defined for this.

The recently published EFSA <u>Opinion</u> addresses some ABPs, which should now be included into CMC10, but not manure compost and digestate, for which it refers to the existing temperature/time criteria process as described in the implementation regulation 142/2011.

ESPP and Member States and other stakeholders are continuing to ask the Commission to address this and to clarify conditions for inclusion of composts and digestates from manure and other ABPs.

Consequences of processing or modifying a CMC, post-processing of digestate

Gavin McQuaid, Northern Ireland Dept. Agriculture, Environment and Rural Affairs: Does pasteurisation affect the post process status?

Answer added by ESPP: Pasteurisation intentionally modifies the chemical composition of the material (a dead pathogen can be assumed to have undergone such chemical modification). The general principle of the FPR is that if a CMC material is intentionally chemically modified, then it is no longer considered to be the same material. Some CMCs specifically also include "derivates", that is different materials produced by chemical reactions (e.g. CMC12, CMC13, and de facto CMC1), others do not (in particular, CMCs 3-5 for composts and digestates, CMC14 for pyrolysis, gasification and biochars, but also not CMC2, CMC6). The Commission's Frequently Asked Question document FAQ HERE n°8.13 addresses this question in the case of two materials chemically reacting together. This comparable to, but different from, the question of pasteurisation.

This seems to be a significant question, for post-processing of digestates and composts, and possibly also for CMC2 (plant materials: pasteurisation could ensure avoidance of transmission of plant diseases or invasive plant species) or CMC6 (similar possible concerns).

ESPP has submitted to the Commission the question of pasteurisation, and more generally low-temperature sanitisation processes (e.g. UV for liquids), ESPP input on FAQs 8/12/21.

Lars Stoumann Jensen, University of Copenhagen: How do you/EC define "not changing the chemistry" - would alterations of the pH (e.g. acidification to avoid NH3 loss) be acceptable or not - it does not alter the composition, only the speciation?

Answer added by ESPP: ESPP raised this question to the Commission, and a partial answer is provided in FAQ $n^{\circ}7.7$: "As an example, a mere change of the pH of a component fertilising product in the blend as a result of mixing EU fertilising products with different pH values should not be considered as a change in the nature of the products blended, if the same change of pH would have occurred if the farmer or user would have applied the two component fertilising products simultaneously but separately to the soil." This concerns combining two Fertilising Products, but presumably the answer is the same if combining two CMCs (e.g. sodium hydroxide = CMC1 and digestate = CMC5).

Henrique Miranda, Better to Earth: pH can change the way some reactions occur.

ESPP will request to Commission that this be clarified in a FAQ concerning post-processing of digestate.

Geo Smith, Nijhuis Saur Industries: What about "biological" conversion of NH₄ to NO₃ to prevent NH₃ emissions?

Daniel El Chami, Timac Agro Italia: It was asked if the plasma treatment of digestate is considered chemical transformation. It would be important to know the answer.

Josef Maroušek, Czech Institute of Technology and Business: what about sorption?

Anke Ehbrecht: Sorption is defined as no chemical reaction although it starts with a chemisoprtion/physisorption.



Answer added by ESPP: ESPP would suggest that questions probably need to be examined case by case. Modifying ammonium to nitrate, be it by chemical or biological means, or plasma treatment modifying nitrogen compounds in a substrate, all would seem to constitute intentional chemical change. Adsorption, if reversible, can perhaps be considered not as a chemical reaction, but simply as removing certain ions from one material and produces a new material consisting of these ions plus the adsorbent. It is unclear whether the new material "ion enriched adsorbent" can be considered as a mixture of two pre-existing CMC materials (ions, adsorbent) — this would be OK, in that several CMCs can (by definition) be combined together in a Fertilising Product. As regards the ion-depleted material, this would need to be reassessed as a new CMC because, unless specifically indicated in the definition of a CMC, even mechanical / physical processing of CMCs is not permitted without (see discussion of derivates above).

Nikolas Hagemann, Ithaka Institute: Pyrolysis of digestate will become relevant – is this included in the FPR?

Kiril Manevski, Aarhus University: maybe hydrothermal carbonisation processes (you kind of "sterilise" the material) in affect.

Adrie Veeken, Kekkilä-BVB Growing Media: And what about hydrothermal carbonisation of manures? Still in an initial stage but promising. What about biochar as carrier for nutrient extracts... will the FPR be relevant for that practice?

Anne-Kristin Løes, Norsøk (Norwegian Centre for Organic Agriculture): Is pyrolysis of digestate acceptable for P recycling?

Bruno Glaser, Martin Luther University Halle-Wittenberg: Biochar should be made from nutrient-poor material because if we pyrolyse manure, we will lose most of the nitrogen. This is actually the most critical point for biochar legislation in Germany.

Hans Jansen, Stercore: Stercore will process digestate as part of the raw material mix.

Answer added by ESPP: CMC14 "Pyrolysis and gasification materials" (which includes biochars) has a list of authorised input materials, and also specifies that these input materials can have undergone mechanical processing (etc) or "composting" or "anaerobic digestion". Thus, biochars etc. produced from digestate can be eligible, on condition that the inputs to the digester are materials specified in CMC14. Or put differently, a digestate (from these input materials) can be processed by hydrothermal carbonisation (pyrolysis – gasification) processes as defined in CMC14 to produce a CMC eligible for use in an EU Fertilising Product (subject to the contaminant and other conditions in CMC14).

Answer added by ESPP: CMC14 "Pyrolysis and gasification materials" includes certain Animal By-Products (ABP) (including manure) as input materials. However, this will only be possible if an ABP End-Point is defined for pyrolysis / gasification / biochar processes, by DG SANT, after a scientific opinion from EFSA. For this to happen, industry must prepare a dossier for EFSA, defining what pyrolysis conditions are covered (maybe narrower = more demanding than the CMC14 conditions) and providing data to prove that processing ABPs under these conditions ensures safety (data showing no pathogens in resulting biochar product).

Vesna Dragicevic, Maize Research Institute - Zemun Polje, Serbia:: What about dehydration of products from digestion and/or composting? Is it possible to use them as pellets for soil fertilizing? Of course in combination with proper microbiota, such as urease inhibitors.

Answer added by ESPP: A modification of CMC5 is currently under consideration to allow some methods of post-processing of digestate: drying is one of those requested.

Pyrolysis, gasification and biochars

Hans Jansen: I miss gasification in the list in Laura's slides. Pyrolysis is NOT incineration, ash is not Biochar.

Kiril Manevski, Maize Research Institute - Zemun Polje, Serbia: is pyrolysis considered incineration, and is biochar considered ash?

Answer added by ESPP: Pyrolysis and gasification materials are CMC14 in the FPR, including also biochars, subject to defined conditions. Combustion and incineration ashes, and materials processed from them, are CMC13.



Laura van Scholl: biochar can be included in the CMC 14.

Bruno Glaser: Biochar is the most efficient C sequestration. IF CO2 price increases, it is highly economic.

Hans Jansen: I fully disagree.

Martin Kulhánek, Czech University of Life Sciences, Prague: I also agree with Hans Jansen.

Henrique Miranda: https://better2earth.com/home/faq/ and https://better2earth.com/applications/wt-adofpion/ Henrique Miranda: We are working with Microbial Fuel Cells.

Amanullah Khan, University of Agriculture Peshawar: Biochar is the best organic source in cropping systems. Biochar improve soil fertility, nutrients use efficiency of chemical fertilizers.

Dorinde Kleinegris, NORCE Research Institute, Norway: Is manure also covering the sludge from aquaculture?

Kurt Möller, University of Hohenheim: Biochar production wastes the large amounts of nutrients in digestates, and reduce the P fertilizer value. Pyrolysis of manures is very expensive, and inefficient. Biochar does not improve soil fertility under temperate conditions. It does it only tropical conditions in acidic soils, it is mostly a pH effect also achievable with lime.

Christoph Steiner, Borealis: I agree with Bruno that the Nitrogen in the material is lost after pyrolysis.

José Maria Gómez Palacio, Biomasa Peninsular: There is nonsense in questioning microbiological safety pf biochar from manures, we do not need scientists to conclude or debate on that (EFSA..). Don't forget that manure is an excess materials in countries / areas with overload of nutrients and organic matter. And alternative roads for manure and improvements on soil structure are reasonable objectives.

Roberto Baigorri, Fertinagro Biotech: I have serious doubts about the fertilizing capacity of biochar.

Markus Aichinger, Borealis: Process regarding pyrolysis of manure or other organic feedstock: https://www.umsicht-suro.fraunhofer.de/en/press-and-media/press-releases/2014/biobattery.html

Hans Jansen: maybe better to organize a special webinar with biochar/pyrolyses specialists.

Alfonso Jose Lag Brotons, Lancaster University UK: I do agree with Hans Jansen suggestion.

On-farm manure treatment, environmental impacts

Arno Rosemarin, Stockholm Environment Institute: What about acidification to trap N.

Gary Lyons, Agri-Food & Biosciences Institute for Northern Ireland: Acidification?

Rok Mihelič, University of Ijubljana: What about plasma technology (N2 Applied) splitting N2 from air and mixing thus made NOx with slurry to make NH4NO3 and thus make N-enriched oxidized slurry or digestate?

Arno Rosemarin: What about risk of GHGs in storage like methane and nitrous oxide? Compost is also a major carbon dioxide emitter. Regarding the importance of N/P content of stored manure in its reuse you are welcome to see the linked article re pig and poultry farms. https://www.mdpi.com/2073-4395/11/11/2228

Daniel El Chami: It is very important to regulate the of digestates and/or manure and slurry on own land, because in intensive agricultural areas land is transformed into landfill and the practice is generating a lot of pollution.

Roberto Baigorri: I heard about human or animal health and water protection but what about soil health?

David de Chambrier, VunaNexus: Nitrification of animal urine?

Arno Rosemarin: Nitrification is a natural process in the soil.

Answer added by ESPP: The FPR FAQ document, <u>published</u> by the European Commission, is clear: "1.7 Does the FPR change the rules concerning the use of processed manure under the Nitrates Directive? No. The FPR lays down the conditions for the manufacture and making available on the market of EU fertilising products. If an EU fertilising product contains processed manure, as defined under the Nitrates Directive, then its use is subject to the requirements of the Nitrates Directive, irrespective of whether or not it is a CE-Marked fertilising product. The FPR does not change the rules applicable under the Nitrates Directive."



ESPP comment: Acidification of manure or plasma N-enrichment of manure is for local application, so not relevant for the FPR. Also, the FPR concerns the fertilising product, not its use / application. It also does not concern limits to manure or other fertiliser application, which are covered by environmental regulation (in particular the Nitrates Directive, Water Framework Directive).

Other waste streams

Vishal Zende, Prayon: Wastewater from the dairy industries which includes contaminated milk, milk products is treated widely using Fe/Al salts to precipitate phosphorus which causes post processing issues for phosphorus recovery. Will the commission consider regulating the use of salts and may be move to biological processes such as EBPR?

Answer added by ESPP: We are aware of the phosphorus potential of dairy processing wastes. It is unlikely that legislation would oblige one treatment route or another. If treatment processes generating marketable recovered P products can be developed, this may become interesting for dairy companies, to reduce treatment costs and improve LCA.

Anne-Kristin Løes: We would be interested to request an ABP End-Point (from DG SANTE), inclusion into the EU Fertilising Products Regulation (from DG GROW) and into the EU Organic Farming Regulation (DG AGRI) for fish processed bones from seafood processing.

Lucas van der Saag, ICL Fertilizers: Are mineral fertilisers such as SSP/TSP made from sewage sludge incineration ash considered safe?

Answer added by ESPP: Fertilisers produced by chemical processing of ashes are covered in the FRP CMC13 "Thermal oxidation materials and derivates".

Michael Brandl, Alzchem Group: Hello, I got a different question. What about dejecta of worms and insect frass-substrate mixtures with in case they are fed with animal manure; where do these fit in CMC 3, CMC 10...?

Answer added by ESPP: It is our understanding that work is underway to clarify the Animal By-Product Regulation status of insect frass and to define ABP End-Point criteria. See https://ipiff.org/ ESPP has asked that this material be considered for inclusion into the EU Fertilising Products Regulation.

Charles Butac, EAu2CA ecological sewage treatment: I think that separating wastewater at the source: liquid and solid (with Aquatron) and installing a filter material with a very high PH (like Polonite, P-filter, etc.) is suitable for transforming wastewater into resources for agriculture. The Polonite filter is based on research at The Royal Institute of Technology, Stockholm, Sweden. In addition, with a high PH, the nitrogen can be precipitated.

Precipitated phosphates from manure (CMC12)

Romke Postma, NMI Netherlands: Why does ESPP consider precipitated phosphates from manure (CMC12) not relevant.

Aaron Hardiman: Seems like a question on cost of solid conversion. pyrolysis vs liquid fraction. In areas where water is expensive might make sense.

Ravid Levy, MIGAL - Galilee Research Institute: We test P precipitation in pilot scale in Israel.

Charles Butac: It seems to me that we can precipitate (trap phosphorus) and increase the pH. With Polonite for example.

Answer added by ESPP: We consulted operators and stakeholders, and received information only of 2-3 installations in commercial operation recovering phosphate from manure or manure digestate or other Animal By-Products, by precipitation (of struvite, calcium phosphates). The sites identified as operating are all precipitating from digestate where the digestion process itself achieves Animal By-Product End-Point (the manure is already "sanitised), so that there is no need for an ABP End-Point for the phosphate precipitation process.

Daniel El Chami: We submitted an ERAMIN project (pending response) about the use of precipitated phosphorus from urban water treatment plants for fertilisers, so it would be interesting to consider this aspect in the regulations.



Håkan Jönsson, SLU-Swedish University of Agricultural Sciences: On STRUBIAS - Egtop has, as far as I know, recommended that struvite from wastewater treatment plants should be allowed for ecological production as soon as it is allowed by FPR. As far as I understand it, struvite will not be allowed in FPR. Is there any move to get struvite and stripped ammonia from wastewater treatment plants allowed?

Answer added by ESPP: Struvite and other precipitated phosphates from municipal sewage and other wastewaters in included into the FPR in (STRUBIAS) CMC12 "Precipitated phosphates and derivates". Publication in the EU Official Journal of this amendment to the FPR is expected before end 2021.

Ammonia salts recovered from wastewater (via stripping) should be covered by CMC15 current under discussion.

ESPP is also working with IFOAM and FiBL to request that recovered struvite be also added into the Organic Farming Regulation (2021/1165) list of accepted fertilisers.

Recycling to animal feed

Fiona Donaldson, Scottish Environment Protection Agency: Rules on animal feeds are very strict. will they allow nutrients from manure or will they need to be changed?

Arnaud Bouxin, FEFAC: Challenge of 0-tolerance for ruminant DNA in animal feed.

Maria Martinez, University of Bonn: What type of virus? this is not easy to define or test.

Arnaud Bouxin: There is no EU harmonized microbiological criterion for feed with exception of feed of animal origin. The EU ABP legislation was actually built to define processes that were able to eliminate viruses. A similar approach could be considered when it comes to recovered nutrients. Most critical viruses today are e.g. ASFv for pigs, avian flu.

Sara Stiernström, EasyMining: Is the next step to reach the feed market a dossier? (for e.g. the PCP from Ash2Phos?). And do you have a timeframe for this?

Answer added by ESPP: The Animal Feed Marketing and Use Regulation 767/2009 states in Art. 6.1: "Feed shall not contain or consist of materials The list of such materials is set out in Annex III" ... "Annex III: Prohibited materials - 1.1 Faeces, urine ... irrespective of any form of treatment or admixture - 1.5: All waste obtained from the various phases of the treatment of the urban, domestic and industrial waste water ... irrespective of any further processing of that waste and irrespective of the origin of the waste waters".

ESPP is currently in discussion with DG SANTE to obtain that incinerated manure or sewage sludge (i.e. ash) should not be considered as excluded by this article, because the incineration means that safety is ensured.

Arnaud Bouxin: What about chemicals generated during incineration (Dioxins?).

Maria Martinez: Safety includes also heavy metals?

Answer added by ESPP: Dioxins and other incinerator-generated contaminants (PAH) should particularly be considered. The FRP fixes specific limits for these for use of ashes in EU fertiliser production. Data is available (including in the JRC STRUBIAS report http://dx.doi.org/10.2760/186684). This should be included in an EFSA dossier.

Arno Rosemarin: Does EFSA have a well-described risk assessment protocol that they use?

Arnaud Bouxin: You can take as a reference for the type of EFSA requests for data the risk profiling performed in 2015 for insects (https://www.efsa.europa.eu/en/press/news/151008a).

Anne-Kristin Løes: For Arnaud: What kind of feed items could possibly be made from manure?

Josef Maroušek: what about use of manure as a feedstock for larvae of insects? (black soldier larvae etc.).

Ammonia recovery

Ruud Schemen, Water authority De Dommel, The Netherlands: Gas stripping by use of bipolar membranes and electrodialysis. Then the membrane form a filter.



Gholamreza Asadollahfardi, Kharazmi University, Iran: Ash content of horse used bedding mixed with waste are high. What can we do for energy production? Gholamreza Asadollahfardi: NOx produced by combustion of polluted used horse generated. What can we do?

Tommy Pepè Sciarria, Università degli Studi di Milano: I think the easier and safer system to recover ammonia is the production of ammonium sulphate from digestate. Concerning ammonia recovery see https://www.sciencedirect.com/science/article/pii/S0959652621016279 and https://www.sciencedirect.com/science/article/pii/S0301479721011373

Sara Stiernström: Easymining could also send data from the Re-Fertilize Project, now running a demo plant.

For recovered ammonia salts, ESPP proposes to constitute a dossier describing the processes and to collect data showing pathogen safety under the defined processing conditions. This is needed in order to request an EFSA opinion to support (a) possible authorisation of recovered ammonia salts (from sewage or manure origin) in animal feed (necessary if these salts are to be sold on the market as a commodity chemical) and (b) Animal By-Product End-Point for recovered ammonia salts (from manure processing, storage or digestate, or from livestock stable air cleaning) under FPR CMC15.

Håkan Jönsson, SLU-Swedish University of Agricultural Sciences: Has data on pathogens in recovered ammonium salts.

Algae and cyanobacteria

Diana Reinecke-Levi, Forschungszentrum Jülich GmbH: Has there been changes in the acceptance of algae/cyanobacteria (CMC7) in WWT?

Andres Felipe Rangel Becerra, Yara International: Has there been any changes in the acceptance of cyanobacteria?

Answer added by ESPP: There is no change. The exclusion of cyanobacteria was decided by the EU Parliament and Council and cannot be "undone" by the Commission. The Commission therefore has proposed to clarify in the FAQ: "CMC 2 excludes blue-green algae (cyanobacteria) and, therefore, such materials cannot be present in any detectable quantity as impurities either".

Francesco Gentili, Swedish University of Agricultural Sciences: What about pharmaceuticals and antibiotics in algae after manure/WWT treatment?

Diana Reinecke-Levi: Algal cultures in WWT have shown to reduce the pathogen, pharma, and nutrient levels, due to various algal-based mechanisms (adsorption, absorption.) and photooxidation.

Divers questions & other information

Arno Rosemarin: What are the regulations regarding source-separated urine?

ESPP comment added: Human urine is excluded from the Animal By-Product Regulation by 2009/1069 art. 2.2k. Human urine is not included in the authorised input materials to CMC3 and CMC5 (composts and digestates). Phosphates precipitated from separately collected urine are included in CMC12 ("Precipitated phosphates and derivates") only if recovered from "wastewaters and sewage sludge from municipal wastewater treatment plants" (by art. 1(a)).

Toyin Saliu, Adekunle Ajasin University, Nigeria: Are there methods that can totally recover nitrogen from wastewater.

Paul Bussmann, WFBR Wageningen Food and Biobased Research: What about chemicals produced from extracts.

Answer added by Laura van Schöll (NMI): All product that are derived from animal manure (including chemicals) remain under the scope of the ABP regulation till they have been declared to have reached the End-point of the manufacturing chain. The products with End-point are listed in the Implementation regulation 142/2011.

Md Raju Ahmad, Queen's University Belfast: Which condition is better for using struvite with compost.



Hajdu Zoltán, Soltub, Hungary: fertiliser products from manure (e.g. chicken) has any AMR restrictions (antimicrobial resistance)?

Arno Rosemarin: When it comes to anaerobic treatment of manure are there regulations concerning Clostridium levels worth commenting on?

Answer added by Laura van Schöll (NMI): the conditions and criteria for the processing of manure are laid down in the ABP regulation 1069/2009 and detailed in the implementing regulation 142/2011.

Manoochehr Farboodi, FARMIN: How could we standardize the physical, chemical and biological properties? please send me if it is possible, FARMIN Soil Sciences Laboratory (farminfarmlab@gmail.com)

Roy Durlave, Bangladesh Open University: https://www.linkedin.com/in/krishibid-durlave-roy/

Renske Verhulst, Netherlands Nutrient Platform: Meeting organised by the Netherlands Nutrient Platform on certification, 9th December, in Dutch: https://www.nutrientplatform.org/webinar-implementatie-europese-fpren-certificering-9-december/