

Conclusions of the STRUBIAS sub-group Final Meeting

JRC, Seville, 25-27 September 2018

(version adopted by the STRUBIAS sub-group on Thursday 27 September 2018, 18h30)

NOTE: highlighting and boxes are added by ESPP (not from JRC)

Tuesday 25 September (09:30 – 13:30)

Presentations by DG GROW & DG SANTE and videoconference with Brussels (DG GROW, DG SANTE, DG ENV)

- The sub-group had practical questions on the link between the Animal By-Product Regulation (ABPR) and the proposal for the revised Fertiliser Regulation (prFR), amongst others on the possible use of Article 32. There were also questions on the possible use of category 1 ABP. Matjaz Klemencic (DG SANTE) replied that the objective of the new legislative framework is to reduce administrative burdens, for instance on veterinary controls and traceability, and to provide free movement on the internal market.
- Matjaz Klemencic explained that "the co-legislator allows the production of Fertilisers from category 2 and 3, but not of category 1 ABP material".
- A question was raised as to whether the term organic in the title of Article 32 of the ABPR 1069/2009 in fact also covers inorganic materials, in particular STRUBIAS CMC YY.
- The CE marking of fertilising products requires that ABP have reached a defined end-point laid down in the ABPR, and this end-point should be assessed for risks related to animal health by the European Food Safety Authority (EFSA).
- There were some concerns on whether chemical reactions between different CMCs are allowed under the prFR. Johanna Bernsel (DG GROW) replied that the CMC criteria apply to the end-material of a manufacturing chain, not to the precursors. DG GROW is happy to engage in the discussion with industry to find solutions and to ensure that the intention of the proposed approach is in line with current fertilising material production practices. By no means is it the intention to exclude certain materials or processes.
- Optional harmonisation will still apply, so no existing products will be excluded from their current market. The CE marking is optional and has the intention to reduce administrative burdens.
- It is impossible to cover all fertilising material production processes and materials in the prFR because the COM has to ensure that all materials are safe for the environment and human health. The prioritisation of candidate materials will be based on their potential to contribute to the objectives of the Fertiliser Regulation.
- The Revised Fertiliser Regulation has not yet been adopted.

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JRC General Introduction

- There was a proposal from the JRC to modify the wording for the manufacturing of the derivatives by removing the reference to the term "intermediate" and by relying on the following principles:
 - A reaction shall take place that effectively consumes reactants or enforces a chemical reaction between the individual substances
 - By-products may be used (to be aligned with outcomes of by-product provisions in other CMCs currently being discussed to ensure a level playing field);
 - REACH registration for the output STRUBIAS CMC material should be required similar to the provisions for CMC1.

The STRUBIAS stakeholders were generally in favour of the proposal, but indicated a desire to enable the use of waste materials because the classification as either waste or by-products is subject to a national evaluation and there is no consistent EU wide framework, causing differences between practices across the Member States. STRUBIAS sub-group member representatives indicated that by-products within the meaning of the Waste Framework Directive are currently being used under the existing regulation, and would like to see continued use under the new legislative framework.

The JRC highlighted that they understand the concern, but that any waste material requires a detailed assessment of any contaminants and risks that could be present. Moreover, it is noted that the exclusion of waste is not a new element in the prFR, and thus, that on this matter no change is expected relative to the applicable 2003/2003 Regulation.

The proposal of a STRUBIAS sub-group member representative to require that a manufacturer should remove any additional contaminants brought in was raised, but the JRC indicated that this may introduce additional vagueness in the technical proposals. Instead it was argued that REACH could be a better mechanism to enforce producers to assess risks and contaminant profiles according to the specified use of the CMC as a fertilising material.

There was a large support for the following proposal: to maintain the revised formulation as proposed by the JRC, and to rely on the Regulation-wide framework for the implementation of by-products used in fertiliser manufacturing processes.

- The JRC outlined that there is not always a direct relationship between extractable P and agronomic efficiency. This brings along two different issues:
 - Possibly limit a market entrance for high quality innovative fertilising products with low chemically extractable P
 - Creating false quality expectations for low-quality fertilising products with high chemically extractable P

While the group agreed that only valuable fertilising products should be allowed on the single market under the future Fertiliser Regulation, different and contrasting views were recorded within the group on how to put this into practice. Some experts highlighted the need to standardise reliable and workable methods to assess plant nutrient availability of fertilising materials.

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JRC explained that its approach was based on technical requirements on input materials and/or process conditions that effectively impede the entering into the market of low quality fertilising materials, while highlighting that this does not imply that all fertilising materials should be effective under all possible European agricultural settings. Specific materials could contribute to the objectives of nutrient recycling and the recovery of waste based materials in a European agricultural market that focuses on diversification and tailor-made fertilising solutions.

It was agreed that regulating the nutrient availability aspect at the PFC level would enable the best possible implementation, as this is not only an issue specific to STRUBIAS CMCs and that, in principle, there is no limitation on which CMCs can be used in any given PFC.

- The JRC agreed that the formulations used on avoiding contact between input and output materials should be reviewed to avoid confusion (e.g. contact in reactor).
- Moreover, an input material should not be excluded because of unintentional contamination at the trace level.
- JRC agreed to consider the minor items included in the STRUBIAS sub-group feedback on the pre-final report for the elaboration of the final report.

Tuesday 25 September (14:30 – 18:30)

Technical proposals: precipitated phosphate salts and derivatives (CMC XX)

- Drawing up a positive list of input materials is an exercise of finding the right balance between inclusiveness and bringing in additional risk to this CMC. The sub-group highlighted some potential input materials that could be considered, such as materials from the feed industry and bio-ethanol. Waste waters from chemical industries were not proposed by the JRC because they could be considered under a different CMC, show low potential for nutrient recovery, or could adversely impact upon the consumers' confidence for this CMC. The optional harmonisation offers a possibility to market materials derived from very specific streams of interest.
- Some experts pointed to the need for a careful evaluation of allowed pre-processing techniques and wording related to food industry. The proposal of the JRC was to include wastewaters from the food processing, beverage and animal feed industries.
- There was a large support to use 16% P₂O₅ content as one of the material criteria to help demonstrate that the produced materials are in effect P-rich precipitates.
- JRC will review the processes listed in the literature review for this CMC, more specifically the P-ROC process
- In addition, the JRC demonstrated that the expansion from struvite to a wide range of precipitated phosphate mineral forms introduced the need for additional requirements to demonstrate that an effective precipitation of ions from the solution had taken place without the inclusion of impurities. The latter relates in particular to organic material which may either contain contaminants depending on the nature and origin of the input materials, or act as a substrate for adsorption of contaminants due to its high specific surface area. Such possible

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contaminants include emerging pollutants as well as biological agents. Testing methods for the broad spectrum of such contaminants are highly expensive and could thus introduce substantial additional compliance costs for manufacturers. For this reason, the JRC's proposal relied on minimising the risk as well as the compliance cost for manufacturers through a limit on organic carbon (3% O.C.). Some experts proposed to delete this O.C. limit and rely on the PFC limits, but amongst others for the above reasons it was agreed to maintain the JRC proposal. Taking into account this proposal, the group also agreed to lift any requirement on dry matter content, since biological recontamination is not considered an issue in this case.

- Several STRUBIAS experts requested to **specify the measurement method for O.C., and CEN 15936 was proposed.**
- Additional sterilisation methods were proposed during the discussions (irradiation, UV, ozone) but appear not to be fit for the CMC category for technical or economical reasons. The JRC will also clarify that hygienisation requirements can be fulfilled on either the input materials or the output materials.
- JRC highlighted the aspect of limited data for PAH in the phosphate salts and the documented occurrences of high PAH levels in certain sewage sludges and derived materials (e.g. sludge compost), leading it to apply the precautionary principle for setting PAH limits. The references of these works will be added to the final STRUBIAS report.
- The need to develop and test harmonised standard measurements for this CMC was discussed by the group.
- Focusing on the formulation for derivates, the following JRC proposal was made to circumvent the use of the word "intermediate", in order to avoid possible confusion with the REACH Regulation 1907/2006 :

A CE marked fertilising product may contain derivates from precipitated phosphate salts compliant with paragraphs 1 to 3 as produced through one or more chemical manufacturing steps that react precipitated phosphate salts with materials listed under point h) of paragraph 1 that are consumed in or used for chemical processing. The post-precipitation process shall be executed so as to intentionally modify the chemical composition of the precipitated phosphate salt.

- DG GROW explained that any physical mixing and coating could be done by combining different CMCs into a PFC.
- The reasoning of limiting the Al and Fe content in the finally manufactured CMC was discussed, highlighting the uncertainty on nutrient availability of Fe/Al precipitated phosphate salts.

Wednesday 26 September (09:30 – 13:30)

Technical proposals: thermal oxidation materials and derivates (CMC YY)

- On input materials, the STRUBIAS experts indicated that the list is complete, but may benefit from some additional clarification, for instance by **referring explicitly to sewage sludge and natural minerals.** The JRC supported this proposal.
- In addition, the JRC will clarify in its report that it has not assessed the risks resulting from the use of incinerated Category 1 ABP on animal health.

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- There was a discussion on the criterion of the 850°C temperature, and on what types of materials could be exempted from this temperature requirement. There was in principle agreement on keeping the category a ("living or dead organisms...") and adding a separate lettered item: vegetable waste from the food processing industry, fibrous vegetable waste from virgin pulp production and fibrous vegetable waste from production of paper from pulp. Nonetheless, JRC will check if any of those new materials could lead to the need for additional output material requirements.
- A minimum temperature requirement of 450°C and a residence time of 2 seconds was proposed for all materials exempted from the 850°C requirement. The reasoning behind this was to ensure that thermal oxidation materials and derivatives incorporated into the CE marked fertilising product has undergone a thermal oxidation process as intended in the scope of this CMC.
- The need to add auxiliary fuels as input materials to be exempted from the 850°C threshold was indicated.
- It was indicated that the restriction on non-biodegradable polymers should only apply to post-combustion processes.
- The proposal of the 3% OC limit in slags and bottom ashes is in line with the formulations from the Industrial Emissions Directive and ABPR and serves as an indicator of proper combustion process conditions. JRC explained that it should be merely seen as a processing criterion and not be interpreted as a material characteristic for the CMC.
- It was proposed to change the wording of "plant" in point 3, e.g. by referring to "thermal oxidation unit"
- Focusing on the formulation for derivatives, the following JRC proposal was made to circumvent the use of the word "intermediate", in order to avoid possible confusion with the REACH Regulation 1907/2006 :

A CE marked fertilising product may contain derivatives from thermal oxidation materials that have been produced from the input materials listed in paragraph 1 and compliant with paragraph 4 and that have been manufactured according to a thermal oxidation process compliant with paragraphs 2 and 3. The post-combustion manufacturing process shall be executed so as to intentionally modify the chemical composition of the thermal oxidation material, and be of following nature:

a) Chemical manufacturing: derivatives as produced through one or more chemical manufacturing steps that react thermal oxidation materials with materials listed under point h) of paragraph 1 that are consumed in or used for chemical processing

b) Thermochemical manufacturing: processes that thermochemically react thermal oxidation materials with reactants listed in paragraph 1 a) – h) that are consumed in or used for chemical processing. Thermochemical process conditions shall be compliant with paragraph 2 and 3, and the thermal oxidation material derivate shall meet conditions listed in paragraph 4.

- It was proposed and supported to apply the conditions that relate to the mixing of hazardous substances also to by-products, as follows:

Thermal oxidation materials and by-products that display one or more of the hazardous properties listed in Annex III of Directive 2008/98/EC shall not be mixed or reacted, either with waste, substances or materials with the intention of reducing hazardous substances to levels

ESPP proposal: replace "by-products" by "wastes"

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below the limit values for the hazardous property as defined in that Directive. Using a mass balance approach, manufacturers that use thermal oxidation materials and by-products with hazardous properties must demonstrate the removal or transformation of the contaminants to levels below the limit values as defined in Annex III of Directive 2008/98/EC.

Nonetheless, it is proposed to align the formulation with any provisions on by-products included in the final text of the future Fertiliser Regulation

- There was wide support within the group to maintain PAH and PCDD/F measurements to test for persistent organic pollutants
- A STRUBIAS sub-group expert indicated that the long-term application of Al/Fe-rich thermal oxidation materials and derivatives could lead to a considerable build-up of Al and Fe in the soil, possibly resulting in P-fixation.
- It was agreed that the pH requirement is redundant, taking into account the broad range of pH for fertilising materials, including liming materials
- The **risk associated to Thallium was highlighted by several experts**, and it was proposed to further lower the limit value (e.g. 1-2 ppm). It was proposed to revise the input materials under paragraph 1 for which testing should be required on the resulting CMC, based on the risks associated to each type of input material.
- There was a lengthy discussion on the approach based on soil screening values. The JRC outlined that a two-step approach was applied, where soil screening values were applied to flag certain elements that may be associated to a build-up of elemental concentrations to levels above relevant soil quality standards established by individual Member States. The Table of soil screening values will be checked against the latest background values to be shared by the STRUBIAS sub-group. Afterwards, a more qualitative assessment was performed for some flagged elements, also taking on board other end points (e.g. aquatic organisms). Whereas it was outlined that in recent times much more importance is given to natural capital and long-term focus beyond short-term risks, also studies taking place under realistic agricultural settings should be considered. **Possibly different availability of contaminants in derivatives should be taken into account.** Several MS have concerns related to the accumulation of Cr(total) and V. The JRC will take on board the latest studies shared by the STRUBIAS sub-group experts that focus on relevant tests in agricultural fields, highlighting that the starting point of its assessment was to avoid unacceptable accumulation in soil, rather than the actual risk to all the different specific end points that should be considered in an in-depth assessment. It was proposed to include a footnote referring to the discussions at trilogue level on Cr and to align the STRUBIAS proposals with the outcome of those discussions.

Wednesday 26 September (14:30 – 18:30)

Technical proposals: pyrolysis and gasification materials (CMC ZZ)

- The name of the CMC was discussed, and several experts suggested adding the word "biochar" to the name of CMC ZZ. The JRC highlighted that the approach applied for the naming of the

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different CMCs is to refer to the production process applied, in an as neutral as possible manner, similar as to the other CMCs.

- On input materials, there was a proposal to include also biomass materials (as defined under Article 3(31) of the Industrial Emissions Directive), a term which also includes material not covered as living and dead organisms (e.g. virgin pulp from the paper industry). However, it was pointed out that there is both some overlap between the terms "biomass" and "living and dead organisms ..." and that at the same time some requirements in the "biomass" definition are not related to material properties (e.g. on heat recovery). **It was hence proposed to include specific items from the biomass definition into the CMC ZZ input material proposals (and to include those as well into CMC YY, but not CMC XX, see above):**
 - **vegetable waste from the food processing industry, and**
 - **fibrous vegetable waste from virgin pulp production and from production of paper from pulp**

It was discussed if the inclusion of non-virgin pulp, e.g. de-inking pulp, could lead to risks for this CMC. It was indicated that the prevalent risks relate to the formation of PAH and PCDD/F, but those parameters are already listed as testing parameters. A further evaluation of any other possible risks should be completed prior to making a final decision on this matter.

- There was a discussion on a request to include sewage sludge as eligible input material, with diverging views on the possible incorporation of this material under this CMC. The major argument against including this material relates to the lack of a strong and well-developed knowledge base to demonstrate the effective removal of the set of emerging contaminants, and the associated risk of undermining consumers' confidence for this CMC and by extension to other STRUBIAS materials. Moreover, it was pointed out that the STRUBIAS proposals already included two safe recovery routes for sewage sludge. Eventually, it was proposed to exclude sewage sludge from the input material list, but **to state that more research is desired to evaluate the safety of pyrolysis and gasification materials derived from sewage sludge in order to support a possible future re-evaluation,** and to include already some missing publications that focus on this specific topic in the final STRUBIAS report.
- The issue of up to 25% additives was discussed. It was indicated that the proposal for a Regulation aims to reduce limitations on the precursors used, and that the same principle could apply here. It was also highlighted that low value materials such as waste are excluded as additives. In addition, it was proposed that the use of more than 5% of additives relative to the input material should require testing of the output material for thallium, with the same limit value applying as for CMC YY.
- A minimum temperature requirement was discussed for this CMC and, finally, there was a proposal to add following formulation:
"The pyrolysis and gasification process shall take place under oxygen limiting conditions in such a way that a temperature of at least 180°C for at least two seconds is reached in the reactor."
- There was a profound **discussion on the need for the molar H:Corg ratio as a criterion.** The JRC outlined that the reason for this criterion especially related to material safety and to enforce a low volatile organic compound content in the charred material. Volatile organic compounds can be phytotoxic, and also toxic to soil and aquatic organisms. JRC stressed the lack of a strong knowledge database on the safety of materials with a molar H:Corg ratio > 0.7, and indicated that the optional harmonisation could apply for these materials. Additionally, there was also

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some discussion on the need to make a reference to the dry and ash-free fraction. JRC indicated that they will revise the correctness of this aspect during the elaboration of the final report.

- It was indicated that there is a need to formulate the requirements for the processing methods for animal by-products in such a manner that any updates in the animal by-products regulation (e.g. additional processing methods) become incorporated in the CMC ZZ requirements.
- There was a large support to remove the pH criterion, similar to CMC YY.
- It was indicated that PCBs could be produced taking into consideration that Cl-rich feedstocks are on the input material list. Giving the different technological configurations that could be applied to make pyrolysis and gasification materials, the need was indicated to maintain PCB as a testing requirement.

Thursday 27 September (09:30 - 13:30)

Technical proposals: quality management system

- Questions were formulated on the responsibility and implementation of the quality management system (QMS) in case of different actors along the manufacturing chain located in different geographical locations, including different Member States. JRC explained that the responsibility lies with the operator that brings the CE marked fertilising material on the market. The notified body has the possibility to verify compliance at different sites, including in different MS.
- During the discussions, it was explained that **any actor handling CMC materials derived from waste that have not yet become a CE fertiliser (PFC, labelling requirements, and conformity assessment) is subject to waste legislation** including possible restrictions on transport, permit requirements, etc. JRC will stress this in the report.
- Discussions were held on the testing frequency proposal, where experts suggested to **base testing frequency on output tonnage rather than input tonnage**. JRC suggested to evaluate the proposal, as indeed input material tonnages can be several orders of magnitude higher than output material tonnages for STRUBIAS materials, contrary to e.g. compost/digestate which served as inspiration for the proposals. A discussion ensued on whether adaptations are needed in the frequencies when making the link to output tonnage, also taking into account possible variability in input materials and process changes. JRC will look into the matter, taking into account workability and cost efficiency, consistency with similar materials in the prFR as well as national schemes for e.g. sewage sludge or similar materials. It will be evaluated whether it would be useful to require the storage of retainer samples for materials that can vary substantially in composition over time (e.g. batch production) for traceability purposes in case of non-compliance events.

Market study

- The STRUBIAS work indeed supported the added value of STRUBIAS CMCs in CE marked fertilising materials, although it should be highlighted that not all STRUBIAS materials are as effective as P-rock derived mineral fertilisers under all circumstances. This highlights the need to consider both quality and management aspects, when assessing agronomic efficiency.

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- STRUBIAS CMCs offer the possibility to produce novel tailor-made fertiliser applications, e.g. by combining material combinations with different nutrient release patterns.
- The JRC acknowledged that STRUBIAS materials may have other properties than P fertilisation, but explained that its meta-analysis was performed on materials with high P content. To assess the agronomic value of other types of STRUBIAS materials, a qualitative literature assessment was also documented in the report.
- It was discussed that it is very difficult to make estimates on the future development of STRUBIAS markets as this will depend on a wide spectrum of factors, including policies on waste management, water quality, geo-political events, etc.
- It was suggested by several experts to take P-eutrophication on board of the LCA study, as a shift to STRUBIAS materials may impact upon P leaching and run-off. This impact category was considered as one of the most important ones by several experts.
- There was a request from experts to provide feedback to manufacturers on how their raw data were used.
- The discussions revealed the need to stress that the LCA results heavily depend on the used assumptions and boundary conditions, including e.g. N availability in organic and mineral fertilisers, the type of displaced nitrogen sources, etc.
- Some experts questioned whether the evolution of STRUBIAS markets would indeed remain without effect on the livestock production, as assumed in the JRC analysis.
- A market development for STRUBIAS materials could reduce the dependency on imports of mineral P.