WUR – WENR

pre-final STRUBIAS End report

This document gives general comments of Wageningen University & Research – Wageningen Environmental Research (WUR –WENR) on the pre-final STRUBIAS End report:

Dries Huygens, Hans Saveyn, Davide Tonini, Peter Eder & Luis Delgado Sancho, 2018. DRAFT STRUBIAS recovery rules and market study for precipitated phosphate salts & derivates, thermal oxidation materials & derivates and pyrolysis & gasification materials in view of their possible inclusion as Component Material Categories in the Revised Fertiliser Regulation

This document meets the request of JRC not to reiterate comments on the sections of the previous reports that were distributed for review in previous written consultation rounds. General comments are given which are in line with and follow the detailed reviews by WUR - WENR on the background document, the interim reports on recovery rules and market aspects.

General remarks

WUR – WENR complements the authors with the impressive document. The pre-final report reads well and the index is logical and transparent. The report does support reuse of renewable sources for the production of fertilising products within the European Union.

Some general remarks are made.

A report of 442 pages excluding the annexes is impressive but has as a consequence the drawback that is an attack on available time of reviewers which coincide with the holiday season. Therefore, not all feedback of the reviewers is available or sufficiently crystallized given the deadline of September 14th, 2018. During the discussions at JRC on 25-27 September, possibly additional remarks can be brought in by WUR – WENR. This document focusses on the practicability of the proposals.

1. Trialogue between the European Commission, European Parliament and European Council

Regrettably the trialogue has not reached an endpoint yet. This hampers the review of the proposals of JRC for the STRUBIAS materials. Information on the agreement for amendments which have an effect on the STRUBIAS materials lacks in the public domain (*e.g.* criterions for solubility of phosphorus in designated extraction agents (NAC, citric acid, formic acid, water), criterions for heavy metals and metalloids (Cu, Zn), etc.). WUR – WENR hopes that JRC can give, preferably before the actual meeting in Seville, an update on those issues that address the STRUBIAS materials.

2. Cohesion with other component material categories (CMC's)

The study serves to propose recovery rules for three new CMC. The report correctly states that end-of-waste criterions only apply on product function categories (PFC's). Although references are made to other CMC's the report is vague on the coherences of the proposed recovery rules with the recovery rules of the CMC's proposed by the European Commission (e.g. CMC 11).

3. Proposals for precipitated phosphate salts & derivates (CMC XX)

The proposals for minimum dry matter and phosphate (P_2O_5) content, organic carbon (Corg), maximum iron and aluminium content, impurities and pathogens are in principle based on precipitated phosphate salts and derivates from treatment of municipal waste water regardless the input material. By not regarding the input material, established or currently being established routes of phosphorus recovery from other input materials will not benefit of the proposed recovery rules. Moreover, phosphate salts from other input materials are obliged to comply with criteria on TOC though the input materials may not possess any risks in terms of organic pollutants.

a. A criterion for dry matter content is perhaps needed although the fertiliser industry is keen in giving themselves the specifications for the materials used for their fertiliser production. Fact is that currently struvite with lower dry matter contents than 90% are used for producing organic fertilisers, organo-mineral fertilisers as well as inorganic fertilisers. Pelletilisation of organic fertilisers and granulation of inorganic fertilisers occurs with slightly moist materials implying that drying of the phosphate salts to 90% dry matter does not serve any purpose in the production process. As a consequence, the 90% dry matter criteria will lead to the unnecessary use of thermal energy for drying of phosphate salts
b. Most precipitated phosphate salts & derivates will meet the criterion for phosphate content. A focus on high phosphate content is strictly not needed as materials can also be used for the production of organic fertilisers of organo-mineral fertilisers.
c. The proposal for a 3% Corg criterion is a point for debate. Perhaps this criterion is needed for precipitated phosphate salts of input material consisting of municipal waste waters. It is questioned if this criterion is needed for:
    i Wastewaters of food industry, e.g. potato processing plants, biowaste composting plant. Clearly pharmaceutical residues are not to be expected. Annex 1 of the report shows that two out of three samples do not meet the 3% Corg criterion. It is recommended to differentiate the input list more to the origin of the input materials;
    ii The remark on cohesion between CMC's can be exemplified with the application of the 3% Corg criterion for precipitated phosphates salts recovered from animal manure. In contrast to pharmaceuticals for humans, veterinary pharmaceuticals follow registration procedures based on EU directives (2001/82/EC, 2004/28/EC, 2009/9/EC, 470/2009/EC and 37/2010/EC[1]). Directive 2009/9/EC gives explicit directions for the environmental risk assessment (part 3 D). This raises the question whether a criterion of 3% Corg for phosphate salt is needed if a veterinary pharmaceutical is allowed and has thus passed an environmental risk assessment. And if so, how does this relate to e.g. CMC 11? It is recommended to differentiate the input list more to the origin of the input materials;
    iii The rationale behind this question is that fine-grained struvites, which are typically precipitated in simple stirred reactors, and amorphous precipitates, in particular calcium-phosphates, may not meet the TOC criteria due to complexation of organic matter with the above mentioned amorphous precipitates. The organic matter content of these materials cannot be lowered by a simple washing step as is supposed in the report (line 2962). The proposed criterion may thus exclude fine-grained or amorphous

1

Directive 2001/82/EC of the European Parliament and of the Council of 6 November 2001 on the Community code relating to veterinary medicinal products, Official Journal L 311 , 28/11/2001 P. 0001 – 0066,

Directive 2004/28/EC of the European Parliament and of the Council of 31 March 2004 amending Directive 2001/82/EC on the Community code relating to veterinary medicinal products (Text with EEA relevance) Official Journal L 136 , 30/04/2004 P. 0058 – 0084

COMMISSION DIRECTIVE 2009/9/EC of 10 February 2009 amending Directive 2001/82/EC of the European Parliament and of the Council on the Community code relating to medicinal products for veterinary use Official Journal 14/2/2009 L 44/10

REGULATION (EC) No 470/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 6 May 2009 laying down Community procedures for the establishment of residue limits of pharmacologically active substances in foodstuffs of animal origin, repealing Council Regulation (EEC) No 2377/90 and amending Directive 2001/82/EC of the European Parliament and of the Council and Regulation (EC) No 726/2004 of the European Parliament and of the Council Official Journal L 152/11

COMMISSION REGULATION (EU) No 37/2010 of 22 December 2009 on pharmacologically active substances and their classification regarding maximum residue limits in foodstuffs of animal origin. Official Journal L15/1 20.1.2010

phosphate salts recovered from animal manures or other wastewaters despite that fact that these input materials may be free from organic pollutants.

d. Sanitation is according the proposal not needed if a derogation has been given. Who gives this derogation: the national authority of an appointed European body or ... ?

4. Proposals for Thermal oxidation materials & derivates (CMC YY)

The proposals have two points that raises attention:

a. The proposed pH-H_2O range is 4-12. For materials based on poultry litter the pH-H_2O determined by EN 13037 (1: 5 v/v) is 12.5-12.6 and thus does not meet the proposed pH-H_2O range (line 686). Materials with calcium oxides and/or calcium hydroxides will have a pH of approximately 12.5. These oxides and hydroxides are components of ashes. It is proposed to increase the pH range from 4-12 to 4-13.5.
b. For the solubility of phosphorus a reference is made to the proposal for a new European regulation for fertilising products. The trialogue has not reached an endpoint yet. Thus it is not known yet in the public domain which solvents will be allowed. Are these water, citric acid, neutral ammonium citrate or formic acid?

5. Proposals for Pyrolysis & gasification materials (CMC ZZ)

[no remarks yet]

6. Regarding the risk assessment approach as described in chapter 17 and applied to some of the product categories (notably Thermal oxidation materials and Pyrolysis and gasification materials) the report would benefit from some additional clarification/information on four issues:

    a. The model used here does not consider plant uptake even though this is suggested (L 200, page 395). If there is a reason for not including plant uptake please provide this. Also since crop quality and changes therein due to accumulation with time is considered as one of the relevant risk assessment endpoints, an aspect not elaborated on in the present version.
    b. Secondly, in its present form (model described in chapter 17) only inputs from atmosphere and application of fertilisers (P395/396), presumably since this is not defined, are included but it is not quite clear to what extent the inputs reflect the total inputs resulting from all sources (including manure, regular fertilisers, compost etc.). If the total inputs (minus the ones from atmosphere) to fill up the gap between background and target levels for metals are attributed to the products assessed here this would lead to an overestimation of the acceptable content in the products considered since part of the load is already covered by other inputs used in farming systems.
    c. Aside from predicted changes in the plant content at t=100, also changes in the quality of water leaching from soil are not presented/discussed, and considering the approach followed to predict changes in soil and water concentrations, these (changes) can be considerable. Since water quality is another (aside from crop quality) environmental endpoint to be considered, some remarks on the impact of accumulation seem justified.
    d. The reason for not deriving maximum limits based on this approach as described in tables 4 (P104) for a number of elements for which measured contents are far below the calculated critical limits seems arbitrary. Considering the potentially large range of contaminant levels in combination with limited data would suggest that for the benefit of completeness it is better to provide maximum limits for all metals independent of the absolute value.

Detailed remarks

The table gives detailed remarks.

Observation	Location in document	Correction/alternative proposal	Techno-scientific rationale that supports the comment raised	Reference to techno-scientific data
chlorine	362, 2080	chloride	When addressing combustion processes chlorine is correctly used. In some cases however chloride (as a precursor of chlorine) is present.	
Food and animal safety issues	374	Yet to be included in risks assessment approach	Plant uptake (food safety) not included in current model used to assess risk	
similar agronomic efficiency to mined phosphate rock and processed P-fertilisers	385	Similar broad range of agronomic efficiency to mined rock and processed P-fertilisers	In general phosphate rock has a lower efficiency compared to water soluble, citrate soluble or NAC soluble P-fertilisers	http://www.mdpi.com/2071-1050/10/4/1166 https://www.agriculturejournals.cz/publicFiles/229790.pdf https://www.hindawi.com/journals/tswj/2010/680793/abs/
Reduction bioavailability upon processing	472	Not addressed in current assessment, possibly experimental data to be included to strengthen this point	The assumption is that metal availability is reduced in products assessed but no such information is provided	Examples on reduction of availability for metals is given in Regelink et al. (2018) in case of processed sludge. http://edepot.wur.nl/420057
Article 15 of Regulation (EC) No 1069/2009	520-523	Role of DG Sancto is not clear. Should CMC xx also have a reference to CMC 11?	The new regulation on fertilising products will cover a range of materials based on animal manure. These materials are found in CMC 3, 5 en 11. CMC 11 will (probably, not clear yet) also cover materials based on animal manure having reached an endpoint of 1069/2009 and 142/2011. DG Sancto directs this process	

Range 4.0 – 12.0	686, 4867	4.0 – 13.5	Materials with CaO and/or $Ca(OH)_2$ will lead to higher pH (~12.5)	e.g. https://www.lime.org/documents/lime_basics/lime-physical-chemical.pdf
Range 4.0 – 12.0	751, 5979	4.0 – 13.5	Materials with CaO and/or $Ca(OH)_2$ will lead to higher pH (~12.5)	e.g. https://www.lime.org/documents/lime_basics/lime-physical-chemical.pdf
IV, V & VI	850-856	I, II & III		
Commission is free	878-880	Currently (September 14, 2018) the trialogue has not reached a final phase. It is not known yet which body is authorised to amend the new regulation on fertilising products.		
not lead to overall adverse environmental impacts or human health risks	1026-1027	A condition lacks: Good Agricultural Practices		
for instance, the blending of compost (CMC 3) with a triple superphosphate (CMC 1 – virgin materials) to produce an organo-mineral fertiliser belonging to PFC 1 B.	1112-1113	Moist compost contains ammonium nitrogen which reacts with magnesium to struvite. Example given is a chemical process.		https://www.sciencedirect.com/science/article/pii/S1878535213003047X
STRUBIAS material Triple Superphosphate (TSP)	1181	Dicalcium phosphate (DCP) is also made from animal bones: EU Regulation 2003/2003, Annex 1.A.2.4		https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32003R2003&from=NL
end-materials should have a high P content	1320	Products with low P contents can have a better distribution in the field. The statement is conditioned by fertiliser spreaders for inorganic fertilisers and cannot be generalised. What counts is the choice of the right type of equipment for application of the fertilising product.		

low levels of contamination	1334-1335	references lacks (probably STOWA publications on struvites of only municipal waste water treatment plants		
preferable as low as possible	1341	depends on the type of fertilising products. Organic fertiliser and organo-mineral fertilisers benefit from the organic C.		
proposed to set no criteria to regulate plant P availability for STRUBIAS materials if the nutrient value of fertilising products is regulated at PFC	1550-1551	As the trialogue has not reached an endpoint yet, the impact of the proposal cannot be evaluated.		
propose alternative conditions	1860-1870	Thus the proposal has to be submitted to EFSA and being approved by EFSA? If so, what is the connection with CMC 11? Is a reference needed to connect CMC 11 with CMC xx, CMC yy and CMC zz?		
tetracycline	1941	Doxycline a tetracline is found in the struvite crystal		https://www.rivm.nl/Documenten_en_publicaties/Wetenschappelijk/Rapporten/2018/maart/Medicijnresten_pathogenen_en_antibioticaresistentie_in_struviet_uit_Nederlands_huishoudelijk_afvalwater
Knowledge base	2001-2004	Knowledge base is conditioned by struvites recovered from municipal waste water processing		
Product function Category I – Fertilisers, thanks to their high P content.	2232-2233	Struvite is currently also used for the production of organic and organo mineral fertilisers.		
STOWA	2271	This study focusses only on struvite from municipal waste water and not recovered from animal manure!		

P	2315, 2358	These materials are in general sources of N and K. P is (at least in NW Europe) removed by using burnt lime. Statement is probably true for molasses of sugar cane processing...		
chlorine	2345	hypochlorite ?		
4.2.2	2386	Wrong reference: Status of industrial by-products and polymers		
as long as the temperature of such processes is not raised above 275°C.	2440	Reference is missing for this condition.		
CMC 9 and CMC 10	2488	For evaluation information on the state of the art of the trialogue is needed.		
Rich in silver nitrate	2519	? silver mine ! ? precipitate ?		
criterion on the minimum P2O5 content	2524	Condition serves the production of inorganic fertilising products but is strictly speaking not required for the production of organic fertiliser or organo mineral fertiliser		
ADEME - Naskeo Rittmo Timab, 2016	2906	Corg > 3%: 6% Conclusion does not follow from this publication.		
STOWA 2015	2920	Study only reports on struvites of municipal waste water treatments		
Effectiveness thermal treatment on pathogen presence	3011	Statement on effectiveness of treatment is inconclusive: 'some pathogens are killed....but not all' which can raise questions on the risks of such pathogens		

Effectiveness thermal treatment on pathogen presence	3011	Statement on effectiveness of treatment is inconclusive: 'some pathogens are killed....but not all' which can raise questions on the risks of such pathogens		
CEN method under development - vacuum drying at 40°C.	3255-3256	Focusses only on struvite containing materials. For calcium and magnesium phosphates not necessary.		
Dry conditions	3286	See general remark on 90% dry matter		
chemical constituents	3321	Ashes may contain next to carbonates also oxides and/or hydroxides of Ca and Mg		
Boron soluble	3954	Calcium borate is slightly soluble in water		
Heading tables 4 and 5	4222/5698	Heading of table needs to be improved since it now can be interpreted as if the values relate to soil rather than the products. In addition it needs to be stated if the values relate to dry matter or product (fresh matter) if relevant		

Sensitivity of outcome to Kd	4234	1. The model in itself is inherently insensitive to the level of Kd for those metals where Kd > 150 (approx.) which is the case for most metals. Hence for As and Se the impact of variable Kd may be substantially larger as suggested. 2. The Kd approach may be suitable for stabilized systems (pH) but not so much to predict short term effects (leaching) for ashes at high pH since the chemical equilibrium between soil and solution is inherently non-linear in response to changes in pH (see general remark)		See for example Komonweeraket et al 2015 https://www.sciencedirect.com/science/article/pii/S095605353X14005686?via%3Dihub
Choice of 25th percentile of EU soil standards as indicative soil protection levels	4374	In order to be consistent in the risk assessment, the soil screening levels used across the EU can be assessed to identify those which have a risk basis (which not all have) and use only these. The choice for the 25th percentile somehow seems arbitrary	Not all screening levels in EU have a sound risk basis and using all values to select the 25th percentile therefore means that a true risk based level is not obtained. This is illustrated a.o. by the choice for the level for V where the Dutch (risk based) level of 67 is not used but rather the 25 percentile of 125.	
C-rich biochar	5463	Also used as carrier NPK fertilisers		https://www.hornbach.nl/shop/FLORASELF-Bodemgoud-1-kg/6206776/artikel.html#artikeldetails https://www.topagrar.com/news/Energie-Energienews-Duenger-aus-Pflanzenkohle-soll-Veredelungsregionen-entlasten-8456521.html

Dioxine, PCB	5743	Depending on the production conditions mineral oil like substances may be produced. There is no need for an environmental risk assessment for these types of contaminants?		
chlorine	5758	? chloride		
Annual input	6638, 6458-6459	Production of STRUBIAS materials follow quite often production lines with lower volumes. How often is the volume per production location larger than 3000 ton/annum? Conformity assessment per lot will lead to an (expensive) significant administrative burden.		
chlorine	6635	Chloride and chlorine		
Value giving components (not in the text)	6992	A review on the neutralising value lacks.		
latitude	7056-7058	Perhaps valid for field trials, not for pot experiments		
Neglectable impact soil moisture	7069-7072	Soil moisture is a key factor in supplying P to the crop as it affects the rate of diffusion of P in the soil.		https://www.sciencedirect.com/science/article/pii/B9780128001387000024 http://www.publish.csiro.au/en/pdf/EN09010 https://www.sciencedirect.com/science/article/pii/S0065211306940036
Raw ashes	7200	Poultry litter ashes normally have a post treatment, e.g. addition of water, to increase safety (prevention of dust). The terminology of 'raw ashes' is not justified.		

16-23% P_2O_5	7257	Literature shows a broader range: 17.4 median, minimum-maximum: 0.1-31.9.		Ehlert (2017) Agronomic Effectivity of Poultry Litter Ash Comparison of results of pot- and incubation experiments with data from literature. Wageningen University.
Figure 15	7485	Y axis confuses: two units: ton and P		
EU13	7544, 7546	EU15?		
that that	7606	that		
Chemical blend	7683	What is meant: derivate?		
Similar price setting	7732	A similar price setting is not to be expected (see comment review market study).		
Mono-incineration	7854	100% mono-incineration is possible if the feedstock has a constant composition. But feedstock's composition can be too wet sometimes which require an additional fuel (e.g. wood). However this does not affect the composition of the ashes normally as the quantity of ashes of wood is low.		
Other initiatives (not in the text)	7863	Another initiative is the Green Mineral Factory (In Dutch: Groene mineralen centrale).		http://www.groenemineralencentrale.nl/nl/groene-mineralen-centrales-0
Last report		See link		http://ec.europa.eu/environment/water/water-nitrates/pdf/Closing_mineral_cycles_final%20report.pdf
lack of detailed results	8355	Details are given by Ehlert & Nelemans 2015a, 2015b		
Other initiatives (not in the text)	8414	Another initiative is Ecochar		http://edepot.wur.nl/452704
TSP etc.	8541	DCP lacks		
NL	8807	Less than 1% of sewage sludge production in the Netherlands is used as fertiliser		

EBPR	8906	Focus is fully on EBPR and therefore not rightfully ignoring other P recovery processes		
Other processing (not in the text)	8936	Another process converts struvite into Mg-P after which an NPK fertiliser (EU label) is produced.		
Table 11	9149	Mass balances differ, why?		
Ca	9395	Ca is confused with acid neutralising value		
Not in the text	9535	Radioactivity of rock phosphate is excluded		
Consequential production system	9825	Definition lacks		
P1	10217	Results for P1 suggest that alle activities are focussed on P production. If so, this is not justified. Waste treatment is the core business, not struvite production.		
Not in the text	10510	Speculation was a driver for the increase in price		
Table 17	10636	Reference to table 17 is missing. Data in table 17 need clarification: what is causing these differences?		
exemption	10728	Is an exemption possible? Most likely not: one company has to pay for registration whilst the others benefit. E.g. Berlin Wasser has the REACH registration for struvite and has a financial arrangement for other companies. This arrangement follows volume.		
Without administrative burdens	10756	A CMC can still be a waste and thus EVOA applies. Meaning lengthy administrative burdens.		

Soil quality standards listed in table 34	99 (Chap 17)	Data for NL in table 34 refer to Intervention values and are not to be used as risk limit values for arable soils. Separate advisory values have been derived for a limited number of metals next to target values for agriculture. In addition some values appear not to be in line with current Intervention values	See current list of IV values in Dutch legislation. Alternatively advisory levels to warrant crop quality have been derived (Römkens et al., 2007, next to national target values for agriculture (Wezenbeek et al., 2008) Römkens P. F. A. M., J. E. Groenenberg, R. P. J. J. Rietra, W. de. Vries, 2007. Onderbouwing LAC-2006 waarden en overzicht van bodem-plant relaties ten behoeve van de Risicotoolbox : een overzicht van gebruikte data en toegepaste methoden ISSN: 1566-7197 ; OCLC Number: 1016596401, http://edepot.wur.nl/39087) Wezenbeek, 2008. Nobo: normstelling en bodemkwaliteitsbeoordeling. Onderbouwing en beleidsmatige keuzes voor de bodemnormen in 2005, 2006 en 2007. Uitgave Ministerie van VROM en Grontmij Nederland bv., Houten.https://www.bodemplus.nl/onderwerpen/wet-regelgeving/bbk/instrumenten/nobo/	Intervention values: http://wetten.overheid.nl/BWBR0023085/2018-07-19#BijlageB Target levels for agriculture ('Maximale waarden' as in Weezenbeek et al., 2008): https://www.bodemplus.nl/publish/pages/91751/rapportage_nobo_normstellling_en_bodemkwaliteitsbeoordeling_24_263999.pdf Advisory levels for agriculture not to be exceeded in order to protect crop quality, animal health (Römkens et al 2007): http://edepot.wur.nl/39087 (In Dutch)
Plant uptake not considered in model	L165/P394	Plant uptake is not included in the current model presented in chapter 17		

Default leaching rates	L182/P394	Use of default value of 200 seems high compared to actual EU average value of 128 as used by de Vries et al.		
Vague definition of acceptable accumulation	L226/P396	Acceptable accumulation is defined as 'lower than the soil screening acceptable limit' which seems arbitrary: what target value is then used as acceptable end-point at t=100 if not equal to the 25th percentile?		