Nutrient Recycling & the Fertilisers Regulation

How to ensure quality & safety?

January 25th, 2017 | European Parliament
<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
<th>Speaker Name</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.30</td>
<td>Welcome</td>
<td>Jan Huitema</td>
<td>MEP ALDE, Rapporteur on the Fertilisers Regulation, AGRI</td>
</tr>
<tr>
<td>13.35</td>
<td>Economic and industry potential of nutrient recycling from wastewater</td>
<td>Aalke Lida de Jong</td>
<td>Aqua Minerals</td>
</tr>
<tr>
<td>13.45</td>
<td>How manure fits into the Fertilisers Regulation proposal</td>
<td>Emilie Snauwaert</td>
<td>Flemish Coordination Centre for Manure Processing (VCM)</td>
</tr>
<tr>
<td>14.00</td>
<td>Quality and safety of nutrient recycling</td>
<td>Christopher Thornton</td>
<td>European Sustainable Phosphorus Platform (ESPP)</td>
</tr>
<tr>
<td>14.15</td>
<td>Key position pitches by stakeholders</td>
<td>Bertrand Vallet</td>
<td>EurEau</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Benoît Planques</td>
<td>ECOFI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nicolas Vega</td>
<td>EBA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Antoine Hoxha</td>
<td>Fertilizers Europe</td>
</tr>
<tr>
<td>14.35</td>
<td>Discussion</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Economic and industry potential of nutrient recycling from wastewater

Aalke Lida de Jong | Aqua Minerals
Economic and industry potential of the nutrient recovery from waste water

Aalke Lida de Jong
Kimo van Dijk, Jan Peter Lesschen, Oene Oenema, Wageningen University, 2014
P-recovery from waste water

From sludge and sludge dewatering centrate

From ashes of sludge incineration
Sludge/Sludge water

- Full-scale
  - PEARL Struvite
  - NuReSys Struvite
  - Crystalactor Struvite, CaP
  - Airprex Struvite
  - LYSOGEST Struvite
  - REPHOS Struvite
  - PHOSPAQ Struvite
  - Gifhorn Struvite, CaP
  - KREPRO FeP
  - FIX-PHOS CaP/CSH
  - Ecobalans Struvite, NPK
  - ANPHOS Struvite

- Full-scale (planned)
- Demonstration (planned)

Budenheim DCP

Ash/simultan to incineration

- Leaching
  - ELACHPHOS P-mineral
  - Fertilizer Industry MineralGünger
  - P-bac (INOCRE) Bio-P
  - ECOPHOS DCP
  - TetraPhos H₃PO₄
  - RECOPHOS DE MCP

- Thermal
  - MEPHREC P-slag
  - AshDec (Outotec P-mineral)
  - THERMPHOS P₂O₅
  - RECOPHOS-PP7 H₃PO₄
  - KUBOTA P-slag

- Full-scale
- Demo
- Lab/pilot
1. Waste status
2. Fertiliser regulations
Waste is nasty
By-product

End-of-waste
End-of-waste
National Fertilisers Regulations

EU Fertilisers Regulation
Strubias: struvite, biochar, ashes
Recommendations

Fast track criteria struvite, biochar and ashes
Recommendations

Flexible & fast procedure to add new innovative secondary fertilisers
Recommendations

Don’t exclude (inorganic) by-products and end-of-waste products as raw material for fertiliser production
Recommendations

Add other ready to market secondary nutrients:

– minerals concentrate
– other inorganic recovered phosphates (calcium phosphate, potassium phosphate etc.)
– calcium carbonate from drinking water
– dried hygienised manure pellets
– (..)
How manure fits into the Fertilisers Regulation proposal

Emilie Snauwaert | VCM
POSITION VCM ON PROPOSAL EU2003/2003 REVISION

EMILIE SNAUWAERT
25 JAN 2017, BRUSSELS
VCM – Flemish Coordination Centre for Manure Processing

- intermediary between government and sector concerning all aspects of manure processing.
- supported by a great variety of members (Flemish and Provincial governments, farmers union, consultancy, bank sector, manure processing sector, animal feeding sector, research- and knowledge institutes, constructors, etc.)
  → independent position = no Flemish position
Why recovery of nutrients from manure?

In many cases: manure as main source of fertilisation for farmers
↔ use of surplus of nutrients affects the environment
→ demand of tailor-made fertilisers according to the plant needs

Mineral P-fertiliser production
→ P-scarcity (extracted from P-rock)
→ highly dependent on a few countries

Mineral N-fertiliser production
→ energy intensive process

Sustainable nutrient recovery from manure, as available resource?
Use as mineral fertiliser, or as raw material for production of mineral fertilisers
Why recovery of nutrients from manure?

Next to N, P, K, also carbon!

Maintain the organic matter content in the soil → current depletion of carbon

Need of organic fertilisers / soil improvers

For fertilisation in regions with nutrient surplus: low in nutrients
For fertilisation in regions with nutrient demand: high in nutrients

Current export from Flanders to countries in and outside EU (2014):
1,398,632 tonnes pasteurised manure products (according to EU1069/2009)
Main remarks concerning trade of Flemish products derived from manure
Biuret

Regarding organic fertilisers (PFC1 A & B):
- for PFC 1A, it is needed to prove that biuret is not present in the EU fertilising product;
- for PFC 1B, a limit has been fixed.

The analysis of biuret should only be needed for production of ureum fertilisers (by heating of ureum). This analysis should therefore only be necessary in the case biuret could be present because of the process. This needs to be clarified in the text.
Limits for bacteriology in PFC’s

Proposed Council Presidency amendments of 7/9/16

Ascaris spp and Toxocara spp

Regarding organic fertilisers (PFC1 A and B) and organic soil improvers (PFC3B), the “absence of resistant parasites such as eggs of Ascaris spp. and Toxocara spp. shall be demonstrated”.

Reference is made to Annex XI, chapter I, section 2 (c) (iii), second indent of Regulation (EU) No. 142/2011 → only eggs of Ascaris spp. are mentioned in the case the processing method needs to be validated (alternative method for heat treatment of 60min at 70°C).

So today these parameters are not analysed for organic fertilisers/soil improvers based on manure (according to EU 142/2011). Problems with these parasites have never been occurred. This extra analysis means an extra cost.
**GENERAL REMARKS**

- Revision should be a stimulant for the use of minerals from animal manure, this in the framework of the circular economy.
  - All liquid fertilising products, derived from manure cannot obtain a CE mark: high nutrient values are not realistic

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<thead>
<tr>
<th></th>
<th>Raw digestate</th>
<th>Liquid fraction digestate</th>
<th>Evaporated LF digestate</th>
<th>Mineral concentrate digestate</th>
<th>Effluent biol. treatment digestate</th>
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</thead>
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<tr>
<td><strong>LIQUID ORGANIC FERTILIZER</strong></td>
<td>NO (C, N and K too low)</td>
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</tr>
<tr>
<td><strong>LIQUID INORGANIC MACRONUTRIENT FERTILISER</strong></td>
<td>NO (Nutrient content too low)</td>
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Use of authorised CMCs as input materials to composting and anaerobic digestion

If materials such as plant parts (CMC2), food industry by-products (CMC6), appropriately sanitised animal by-products (CMC11) are eligible directly as CMCs, then they should also be clearly authorised as inputs to compost (CMC3) and digestate (CMC5). Also, digestate is often composted, and there is no reason to exclude the converse.

Proposed amendment to Annex II – Component Material Categories
Add to CMC-3-1 and CMC-5-1:
“materials conform to CMC2, CMC3, CMC4, CMC5, CMC6, CMC11”
Input for composts and digestates (CMC 3 & 5)

Proposed Council Presidency amendments of 7/9/16

→ only sanitised animal manures could be used as input materials to (EU labelled) compost and digestate production (CMC3, CMC5).

This is not logical as the composting/anaerobic digestion process itself can, subject to respecting Animal By-Product Regulation (ABPR) end point operating conditions, ensure sanitisation. Pre-sanitisation of manures before their input into composting or digestion would effectively mean processing twice and paying twice, and would result in pointlessly duplicated energy consumption and uneconomic costs.

The text should be modified to specify clearly that the composting / digestion process must ensure ABPR end point sanitisation if non-sanitised animal manure is an input material.
Component material category 11

In Flanders the largest amount of nitrogen is processed with a biothermal drying process (see report VCM-enquiry 2014). However the biothermal drying process does not comply with the temperature-time profiles, described in CMC3 ‘compost’.

It is therefore necessary to include the pasteurised products, derived from manure (according to Regulation (EC) No 1069/2009), within the component material category 11, as this table is lacking at the moment.

→ Which products derived from ABP (EU1069/2009) will be included in the list of CMC11?
→ What will be the “end point” to be reached?
Extra: ammoniumsulphate/nitrate from stripping/scrubbing of manure/digestate

In Flanders, as well as the Netherlands, France, etc., the technique of ammoniumstripping/scrubbing is used in practice for processing of manure and digestate. This results in ammonium sulphate, or in the case nitric acid is used, the end product is ammonium nitrate.
Extra: ammoniumsulphate/nitrate from stripping/scrubbing of manure/digestate

As this end-product is generated from gas/air, this does not contain any carbon/contaminants.

Can this be seen as a **liquid inorganic fertiliser** \( \text{(PFC1(C)(I)(b)(i),} \) which consist of a **CMC1 material** (= air), or would this product be seen as derived from animal by-products (CMC11) (end point to be reached)?
Free movement

“Member States shall not impede the making available on the market of CE marked fertilising products which comply with this Regulation.”

It is important that, next to ‘making available on the market’, the use of the CE marked fertilising product cannot be impeded by Member States. Therefore it is needed to make the direct link to the Nitrates Directive, in order to have a direct relation with the use of the EU fertilising products.

Nitrates Directive defines a chemical fertilizer as a fertilizer manufactured by an industrial process and livestock manure as waste products excreted by livestock, even in processed form (art. 2(g) Nitrates Directive). Consistency between the Nitrates Directive and the EC Regulation 2003/2003 would therefore be necessary to create a level playing field between chemical fertilizers and the manure based alternative.
Thank you for your attention

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Quality and safety of nutrient recycling

Christopher Thornton | ESPP
Fertilisers Regulation revision: Quality and safety of recycled nutrients

Chris Thornton - European Sustainable Phosphorous Platform

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Fertilisers Regulation revision: Quality and safety of recycled nutrients

Objectives:

• Nutrient and carbon recycling
• Safety
• Consumer and farmer confidence
• Agronomic value

Regulatory requirements:

→ sufficient, not excessive
→ Clear, workable
Contaminant limits

Essential for safety ... but over-precaution → unnecessary processing → energy/chemicals use, costs, risk to block recycling

Questions:
- Chromium $\text{Cr}_{\text{total}}$ and/or $\text{Cr}_{\text{VI}}$?
- Pathogens – not stricter than ABP (Animal By Products) requirements (what safety benefit to add Toxocara or Ascaris? What testing standard?)
- Copper, zinc:
  - are micro-nutrients – address through labelling not limits?
- Biuret, perchlorate:
  - pointless to require testing in materials where not present
- Arsenic, lead, nickel, cadmium
  - too low levels may block recycling of some materials
  - limits should be supported by risk assessment
Safety

Safety should be required of products, not of input materials

Sanitisation of manures:
- not useful where manure is input material for compost or digestate, where composting/digestion process ensures ABP endpoint → double processing & energy use → will block manure use

Contaminants in input materials:
- intro. Annex II CMCs: not limit contaminants in input materials if CMC process ensures removal (not dilution) to achieve PFC criteria
- Art. 42.1 (definition new CMCs) – risk should be assessed for the CMC after processing, not for the raw material
- Example: sewage sludge incineration ashes may contain heavy metals. This should not exclude use as raw materials, subject to processing & monitoring to remove contaminants down to PFC safety levels.
Traceability

... of possible organic contaminants: pathogens, pharmaceuticals
- for farmer and consumer confidence
- to limit risk in case of contamination

- Traceability back to source for organic material inputs
- For all products susceptible to contain organics
  → not necessary after incineration, chemical treatment, etc.
- Traceability of batch back to supplier farm, food factory, sewage works
  → goes beyond surveillance traceability (only back to product producer)
- Coherence with current dispositions for Animal By Products*

Need for more information:
- monitoring data, risk assessment, reductions in recycling processing

* article 22 from EC regulation n° 1069/2009 and article 17 from EC regulation n° 142/2011
** draft Fertilisers Regulation proposal text: Art. 6(5) – 6(7), ‘Whereas’ (29)
**Definitions** = *clarity for farmers*

Definitions of “*mineral*” and “*organo-mineral*”
- *mineral* should have < 1-2 % organic carbon
- *organo-mineral* should have at least 7.5-10 % organic carbon
- what about products in between
  (this does not modify the criteria of Annex I (PFCs) but requires appropriate vocabulary)

Define “*sufficiently effective*” in Art. 42,1

Phosphorus: require labelling of total P, water soluble, $P_{\text{NAC}}$

Add: $C_{\text{org}}/N_{\text{org}}$ ratio in labelling requirements (PFCs 1A, 1B, 3C)

Clarify all specifications % dry matter or % wet weight

Prefer solid/liquid definition (rather than by % dry solid content)
Fertilisers Regulation revision:

A major opportunity to enable:
- Nutrient circular economy
- Recycling technology deployment
- Soil carbon enrichment/storage

But proposal text needs work to ensure:
- coherence of safety guarantees with recycling
- clarity of wording → confidence for investors, farmers
Fertilisers Regulation revision: Quality and safety of recycled nutrients

Chris Thornton - European Sustainable Phosphorus Platform

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European Water Services vision
Fertiliser Regulation
European Water Services vision

Bertrand Vallet
EurEau – European Federation of Water Services

*Nutrient Recycling & the Fertilisers Regulation
How to ensure quality and safety?*
Introduction

• Waste water treatment is removing nutrients from waste water not to pollute water courses.

• End-up with sewage sludge full of C, N and P.

• Used as fertiliser already in many European countries for nutrient and structure.

• Heavy, difficult to transport, not suitable for European market as it is

• However, compost and digestate might

• Struvite and ash-based product also.

• Max potential for recycling: 10% of P imported for min. fertiliser production (full recovery)
Position Fertilisers Regulation

• Main point: no exclusion of input materials for CMCs, especially compost and digestates
• 20-30% of EU demand of phosphate fertilisers very ambitious without sewage sludge.
• Exclusion of sewage sludge for compost and digestate: why?
  • Most sewage sludge comply with actual requirements and has increased quality due to control at source
  • Innovation could bring solution for not yet compliant sewage sludge
  • Traceability and source control are more and more implemented (REVAQ example, Metals concentration improvement).
  • Important to clarify the fate of org. contaminant in soils: impact?
Recommendations

• **No exclusion of input material** but quality requirement on the final product.

• Both CE-fertiliser and national fertiliser should remain in the same treatment plant with **identification** and **control** of separate treatment lines.

• Adding **traceability** instrument to identify batches and their origin.

• Business model?
  • Can we justify the investments required by an uptake of the market?
  • Blending regulation like biofuel?
  • Need for multiple solution, especially in remote areas
ECOFI perspective on contaminants in the Fertilisers Regulation proposal

Benoît Planques | ECOFI
ECOFI perspective on contaminants in the draft EU regulation on fertilising products

25 January 2017 – Workshop organized by Jan Huitema, MEP, the Netherlands Nutrient Platform and the European Sustainable Phosphorus Platform

Benoît PLANQUES – ECOFI representative to DG GROW’s FWG ITALPOLLINA S.p.A. - Regulatory Manager
About ECOFI

• Producers of organic fertilizers, organo-mineral fertilizers and organic soil improvers
• Members active in most European countries, the Mediterranean and the Middle East
• Accounts for roughly 60% of the European market in organic-based fertilizers, which is worth about €250 million euros
• The industry is dominated by SMEs
An abbreviation

- Throughout this presentation, we use the term “organic-based fertilizers” to mean organic fertilizers, organo-mineral fertilizers and organic soil improvers
FUTURE FERTILISING PRODUCTS REGULATION

Each CMC and PFC must meet specific requirements outlined in the future fertilising regulation.

Component Material Categories (CMCs)

Product Function Categories (PFCs)

In accordance with Reg EU 1025/2012, CEN standards for relevant processes, analytical methods, etc. can be used for presumption of conformity.

How the fertilising products regulation relates to other legislation and requirements

Some issues are better managed by downstream regulation, such as the Nitrates Directive 676/1991 that adapt constraints on use to local conditions.

Products used in organic agriculture also need to meet the requirements of Regs. EC 889/2008 & COM 889/2009.

Decision COM 2015/2099 imposes conditions for ecotags on growing media, soil improvers and mulch.


Foodstuffs value chain (Reg. EC 178/2002)

Plant protection products value chain (Reg. EC 1107/2009)

Requirements for fertilising products shouldn’t be stricter than for other value chains served by the same manufacturers because this would require segregated production, packaging and transport, which would raise costs. In addition fertilising products are not immediately consumed in the same way the food and feed are.
Pathogens

[Annex I, Part II, PFC 1(A)(4), PFC 1(B)(5), and PFC 3(A)(3)]

• Organic-based fertilizers may contain raw materials from processed Animal By-Products (CMC-11)

• Therefore, the draft text proposes limits for *Salmonella spp.* and *Escherichia coli* or *Enterococcaceae*

• However, in order to qualify for use in a fertilizing products, these materials will have to reach an endpoint and exit the requirements of the ABPR

• Therefore, *this requirement should be deleted at the product level to reduce cumulative regulatory burden because the relevant Component Materials will already have been tested for the pathogens*
Harmonise the heavy metal limits across the PFCs to facilitate market surveillance of mixed products.

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>PFC 1(A) Organic fertilizers</th>
<th>PFC 1(B) Organo-mineral fertilizers</th>
<th>PFC 3(A) Organic Soil Improver</th>
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</thead>
</table>
| (Proposed)           | 1,5 mg/kg                    | (1) Total phosphorus (P) content <5 % P₂O₅: 3 mg/kg dry matter, or
| CADMIUM              |                              | (2) Total phosphorus (P) content >5 % P₂O₅: 60/40/20 mg/kg       | 3 mg/kg                      |
| (ECOFI’s position)   |                              |                                    |                               |
|                      |                              | (1) Total phosphorus (P) content <5 % P₂O₅: 3 mg/kg dry matter,
|                      |                              | (2) Total phosphorus (P) content >5 % P₂O₅: [Levels agreed for mineral fertilizers] |
| CHROMIUM VI          |                              | 2 mg/kg                            |                               |
| MERCURY              |                              | 1 mg/kg                            |                               |
| NICKEL               |                              | 50 mg/kg                           |                               |
| LEAD                 |                              | 120 mg/kg                          |                               |
| BIURET               | Biuret 12 g/kg               | When urea is a raw material - Biuret (C₂H₅N₃O) 12 g/kg          | --                            |
Virgin substances & materials REACH requirements

[Annex II, Part II, CMC]

Delete the requirement to impose Annex VI, VII & VIII requirements regardless of tonnage and the chemical safety report and reinstate all exemptions mentioned in REACH.

• Imposing the 10t-100t data requirements that apply under REACH for any substance even if it's produced in very small quantities would add at least 100,000 euros to manufacturers’ costs
  – It would thus make it very difficult to find suppliers willing to assume these additional costs.
  – It would become virtually impossible to develop and market products at a low volume, which is often the case with innovative products before they gain traction in the market. This would effectively interrupt the innovation cycle.
  – It would shift the logic behind REACH from a risk assessment to a hazard-based approach.

• It would shift REACH requirements from the company placing substances & materials on the market to downstream users who purchase them. This would disrupt the basic functioning of REACH.

• Co-formulants used in PPPs that are REACH registered are not subject to these additional requirements even though they are also used in the food chain.

• Some REACH key exemptions are not included in the Commission’s original proposal, including for natural polymers.
Thank you for your attention

- For more information, including ECOFI’s detailed comments on the draft regulation: http://www.ecofi.info/2016/05/ecofi-responds-eu-commissions-proposal-regulation-fertilising-products/
- Contact the speaker benoit.planques@italpollina.com
- Contact ECOFI’s secretariat c/o Kristen Sukalac, kristen@prospero.ag
Digestate in agriculture: getting quality and safety right

Nicolas de la Vega | EBA
Digestate in agriculture: getting quality and safety right

European Biogas Association
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Nutrient Recycling & the Fertilisers Regulation
How to ensure quality and safety?
Introduction

About the European Biogas Association:

• Represents digestate & biogas sectors
• 90+ member in 25 European countries
• Gathers companies, national associations and academia
• Based in Brussels since 2009
Position on Fertilisers Regulation

Safety requirements applied to digestate:
• Heavy metals - digestate samples well within values proposed for PFC 1(A); PFC3
• Animal pathogens – digestate processing requirements effective and feasible (CMC4 & 5)
• Glass, metal & plastics – reasonable requirements, few input streams are of actual concern

Quality requirements:
• Organic fertilisers (PFC 1(A)) – most digestates excluded by high nutrient and organic carbon requirements in fresh matter
• Organic soil improvers (PFC 3) – most digestates excluded by high dry matter and Organic carbon requirements in fresh matter

→ Therefore digestate falls out of the scope. This is a lost opportunity for nutrient recycling!
Recommendations of the digestate sector

**Change quality requirements** in Annex 1:
- PFC 1(A) & PFC 3 – following nutrient & organic carbon requirements, substitute words “by mass” to “in dry matter” (labeling of products to stay in fresh mass)
- PFC 1 (A) (i) & (ii) – change dry matter requirements to:
  - “DM ≥ 20%” for solid organic fertilisers
  - “DM ≤ 20%” for liquid organic fertilisers
- PFC 3 - Split organic soil improvers into 2 categories in dry matter content:
  - “DM ≥ 20%” for solid organic soil improvers
  - “DM ≤ 20%” for liquid organic soil improvers

**Safety requirements for animal by-products:**
- Maintain coherence with existing ABP legislation
- COM and EFSA to keep up with ABP processing technology (e.g. pasteurisation alternative)
- Add manure & straw (crop residues) to inputs list of CMC4 “Energy crop digestate”
Contaminants in mineral fertilizers

Antoine Hoxha | Fertilizers Europe
Contaminants in mineral fertilizers

Dr. Antoine Hoxha
Fertilizers Europe

Nutrient Recycling & the Fertilisers Regulation
How to ensure quality and safety?
Introduction

Phosphorous inputs to EU agriculture

- From organic sources
  about 5.5 Mio Tons $P_2O_5$

- From mineral fertilizers
  about 3 Mio Tons $P_2O_5$
### Cadmium limits

<table>
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<tr>
<th></th>
<th>Commission proposal (mg/dry matter)</th>
<th>EU Presidency draft (mg/dry matter)</th>
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<tbody>
<tr>
<td>Cr VI</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Cr Total</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Hg</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Ni</td>
<td>120</td>
<td>100</td>
</tr>
<tr>
<td>Pb</td>
<td>150</td>
<td>120</td>
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<tr>
<td>As</td>
<td>60</td>
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</tr>
<tr>
<td>Cu</td>
<td></td>
<td>600</td>
</tr>
<tr>
<td>Zn</td>
<td></td>
<td>1500</td>
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Cu and Zn are micronutrients! These limits will limit recycling.