



A study on organic farmer acceptance of recycled fertilisers (Improve-P), FiBL European Input List, and a FiBL project on recycled fertilizers from sewage sludge

Else Bünemann (else.buenemann@fibl.org)

Organic farming: closing nutrient cycles and uptake of recycled fertilisers

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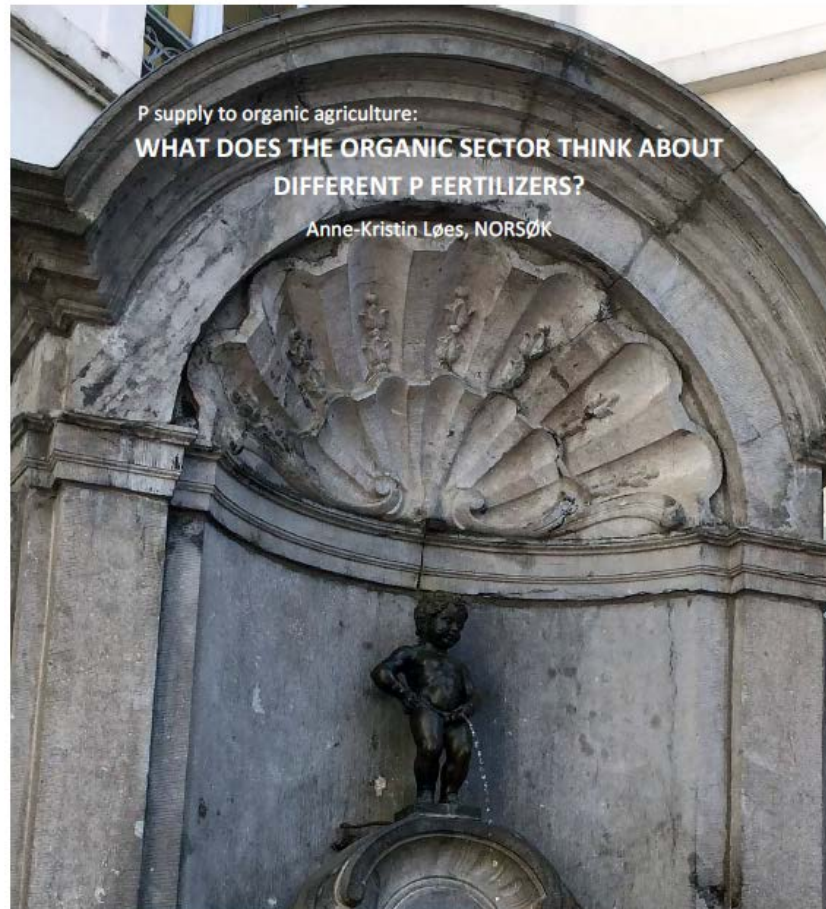
Outline

1. Organic farmer acceptance of recycled fertilisers (Improve-P)
2. FiBL European input List
3. A FiBL project on recycled fertilizers from sewage sludge

I. Organic farmer acceptance of recycled fertilisers (Improve-P)



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Report from workshops conducted in the IMPROVE-P project to map stakeholders' opinions about recycled P fertilizers

213 questionnaires filled in during 9 workshops in 7 countries

Facing up to the phosphorus challenge in organic farming *Some key facts and questions*



Many organic farmers use phosphorous fertilizers from off-farm sources. We refer to these as 'alternative P fertilizers'. There are many different sources of 'alternative P fertilizers', some are allowed under specific circumstances and others are currently not allowed. This questionnaire is to assess organic sector attitudes to a range of allowed and currently not allowed 'alternative P fertilizers'.

Conventional animal manure

Conventional animal manure (from high welfare and non GMO feed systems) is currently allowed, usually with a composting treatment. Several organic stakeholders argue that conventional manure should be banned due to risks of pesticide residues, GMO, animal welfare issues and the need for organic farming to be independent from conventional systems. However, many organic farmers are dependent on this input, and conventional manure is a good P resource.

Urban organic waste

Waste from food production and consumption, as well as waste from gardens and recreational areas, contain significant amounts of P. When such waste is treated e.g. in compost plants or by anaerobic digestion it is sanitised and stabilised. Currently, only compost or digestate exclusively derived from specific slaughter wastes ('meat and bone meal'), recreational areas ('green waste') and/or sorted household waste is allowed in organic farming, which significantly limits the use of urban waste P. Catering food wastes, animal manure from factory farming and sewage sludge are potential further sources of substrate for compost and AD plants.

Human "manure"

Human urine and faeces, currently banned in organic farming, contain significant amounts of P and organic matter, but also may contain pathogens, heavy metals, pharmaceuticals and toxic residues. During treatment, various chemicals may be added e.g. to facilitate dewatering or precipitation.

Questionnaire to assess stakeholders' opinions about P fertilization in organic farming, as a part of the Improve P project

In which country do you work?Gender:Age:Profession (please tick or circle one)

Farmer/producer Advisor Certification sector Scientist Business sector Other, please specify:



Workshop outline

- Experts described the need for P input to organic farming
- Experts described pros and cons related to different permitted and currently non-permitted fertilizers
- Stakeholders discussed
- Stakeholders filled in questionnaires about the acceptability of permitted and non-permitted recycled fertilizers



In the questionnaires, fertilizers were grouped into

- Conventional animal manure (different animals)
- Urban waste products (green waste, household, catering, animal residues included or not)
- Products originating from human waste (precipitated, sludge, ashes)
- Other products (rock P, MBM..)

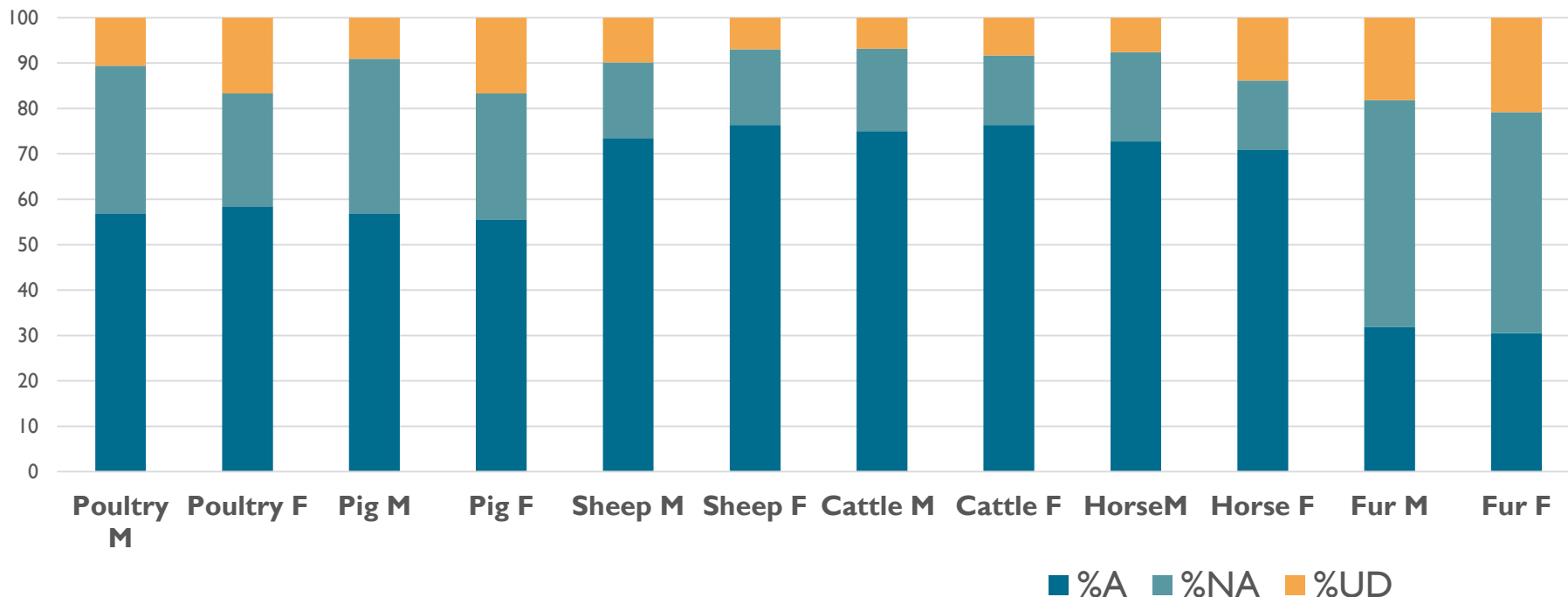
Stakeholders: Close to 40% farmers



- Aged 15 – 81 years, average 44
- 62 % male, 38 % female
- 38 % farmer, producer, gardener
- 23 % scientist
- 11 % advisor
- 28 % other (certification, student, NGO, information officer...)



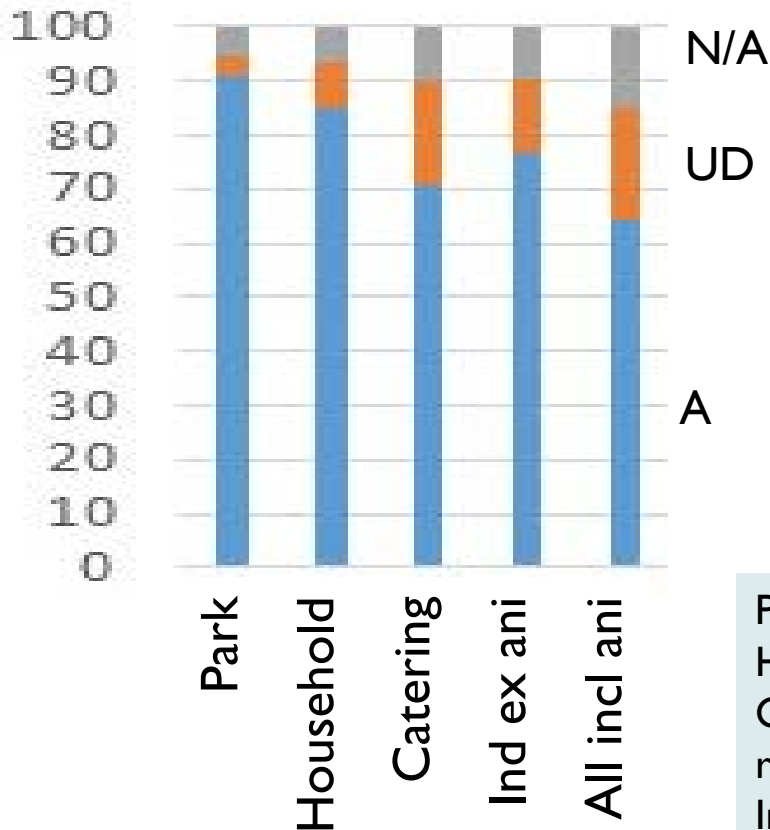
Acceptability of conventional manure



For conventional manure in OF, stakeholders preferred manure from ruminants and horses, across gender

A = acceptable, NA = not acceptable, UD = undecided

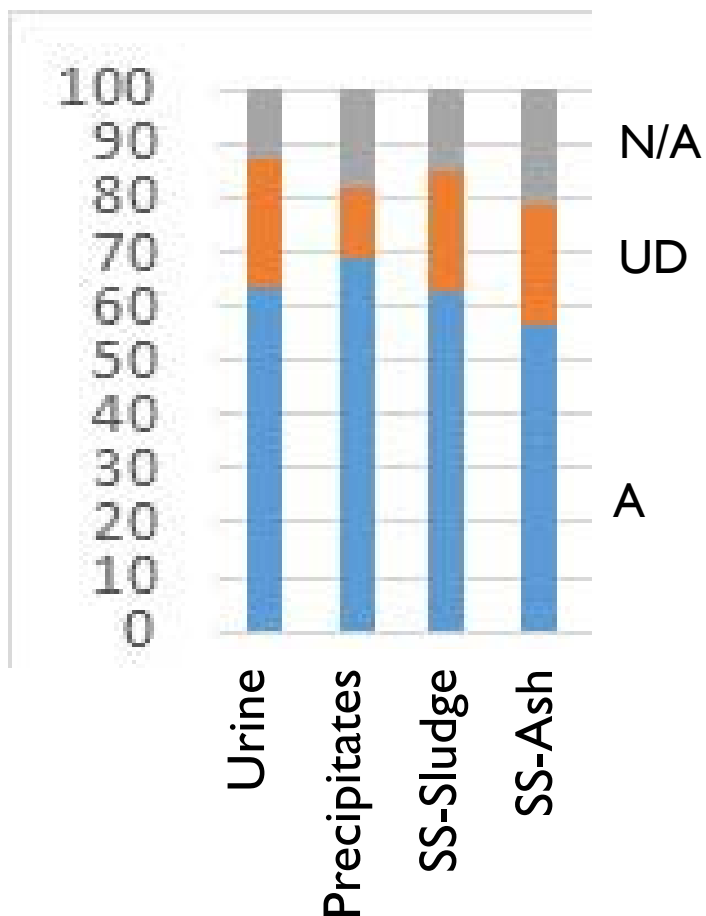
Acceptability of urban waste



Greater acceptability of park and household waste than of food waste with/without animal products

Park = Green waste from recreation areas
Household = Source separated household food waste
Catering = Catering food waste (e.g. institutional, restaurant trade)
Ind ex ani = Food waste from food processing industry, excluding animal products
All incl ani = Food waste from animal products e.g. abattoir

Acceptability of human excreta



- >55% accept human excreta as inputs to OF (for comparison, rock phosphate was acceptable for 50%)
- For sewage sludge: large differences between countries

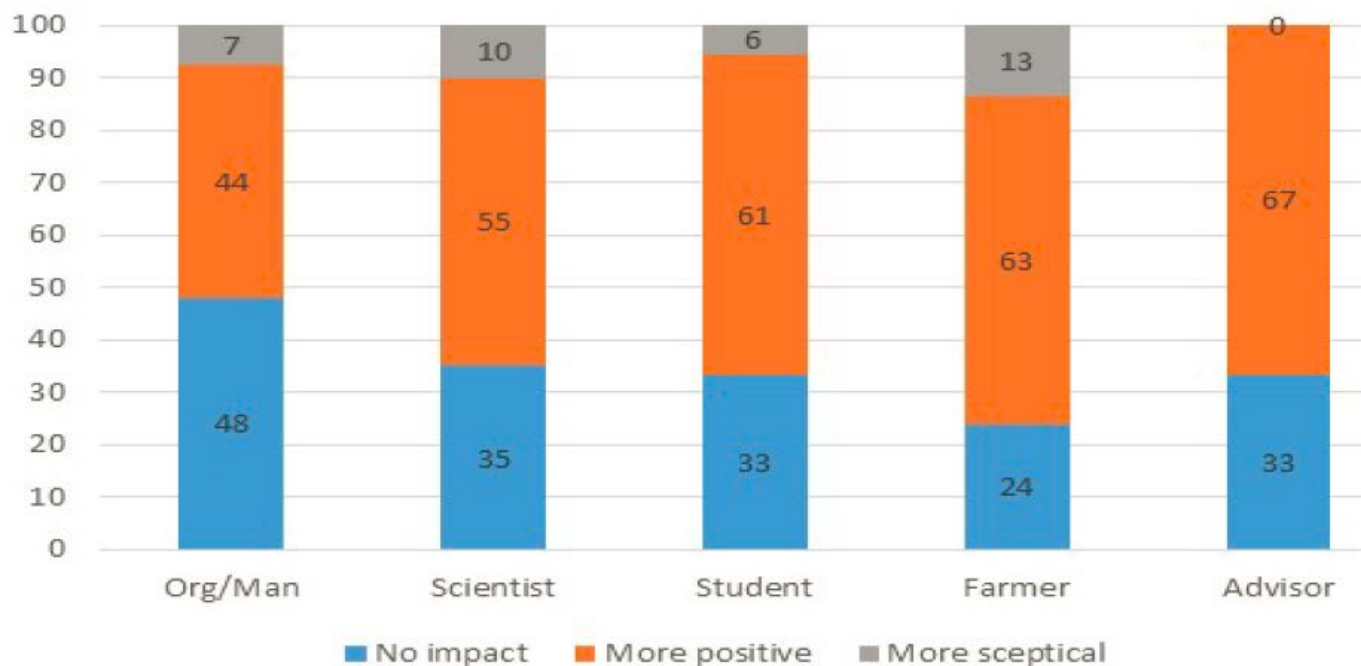
Effect of information



Changed opinion during the workshop?

Do you think that your opinions about P fertilization in organic farming have changed after attending the Improve-P workshop and answering these questions?

- The workshop did not have any impact
- The workshop made me more positive about the use of recycled P fertilizers in organic farming
- The workshop made me more skeptical about the use of recycled P fertilizers in organic farming



Most acceptable types of recycled fertilizers

Type of fertilizer product or substrate	% Acceptability by all stakeholders (average value)
Green waste (from recreational areas)	91
Source separated household waste	85
Food industry residues excluding animal residues	77
Conventional cattle manure	75
Conventional sheep and goat manure	73
Conventional horse manure	72
Meat and bone meal	72
Catering food waste	71
Precipitated P from human excreta	69
Food industry residues including animal residues	64
Human urine	64
Sewage sludge	63

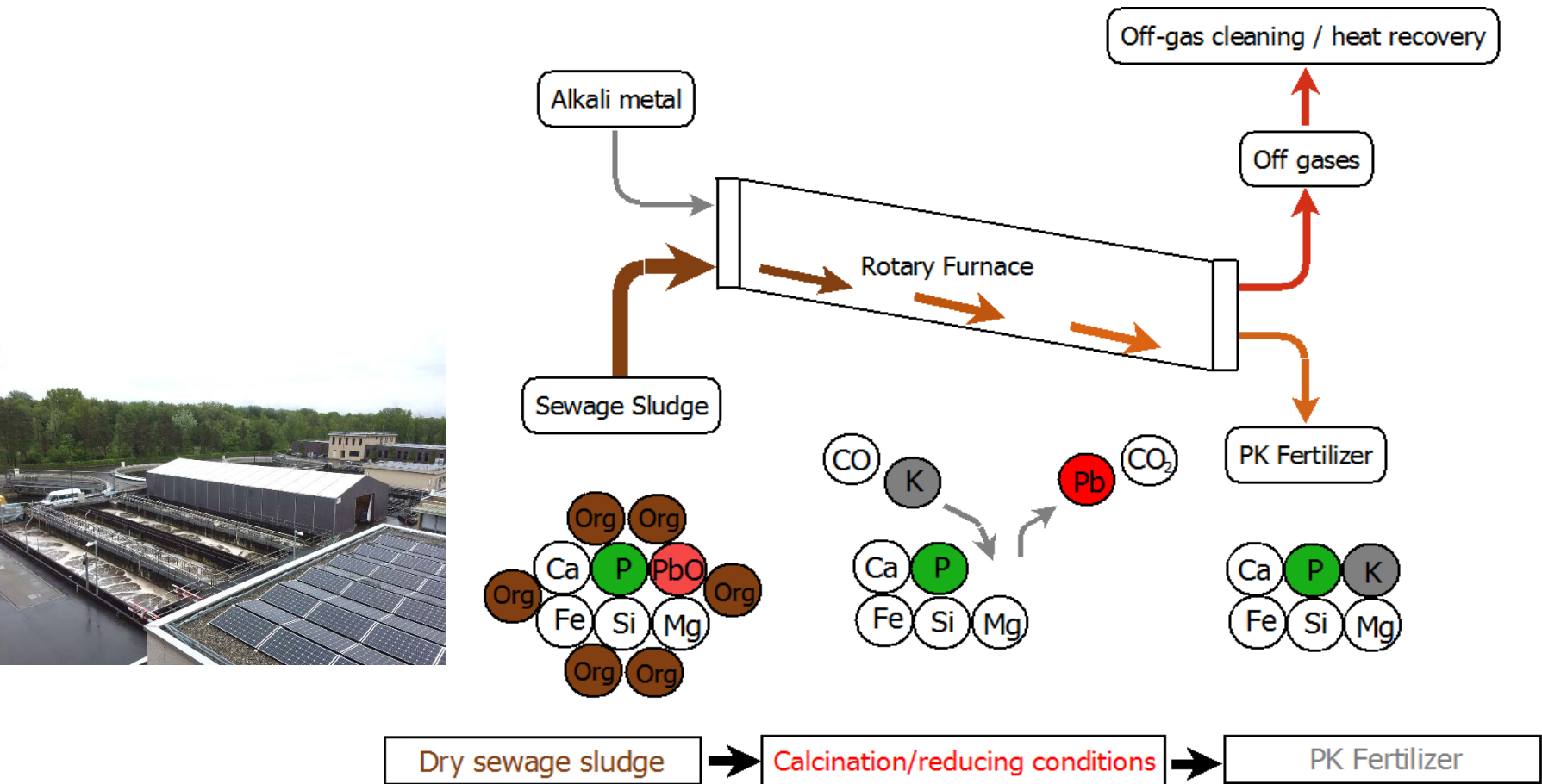
2. A short comment on Input Lists

- FiBL publishes 'input lists' for several countries (Switzerland, Germany, The Netherlands).
- Input lists are lists of commercial 'inputs' (e.g. fertilizers) which comply with the organic farming legislation.
- The FiBL inputs team applies the existing legislation to commercial products.

Therefore:

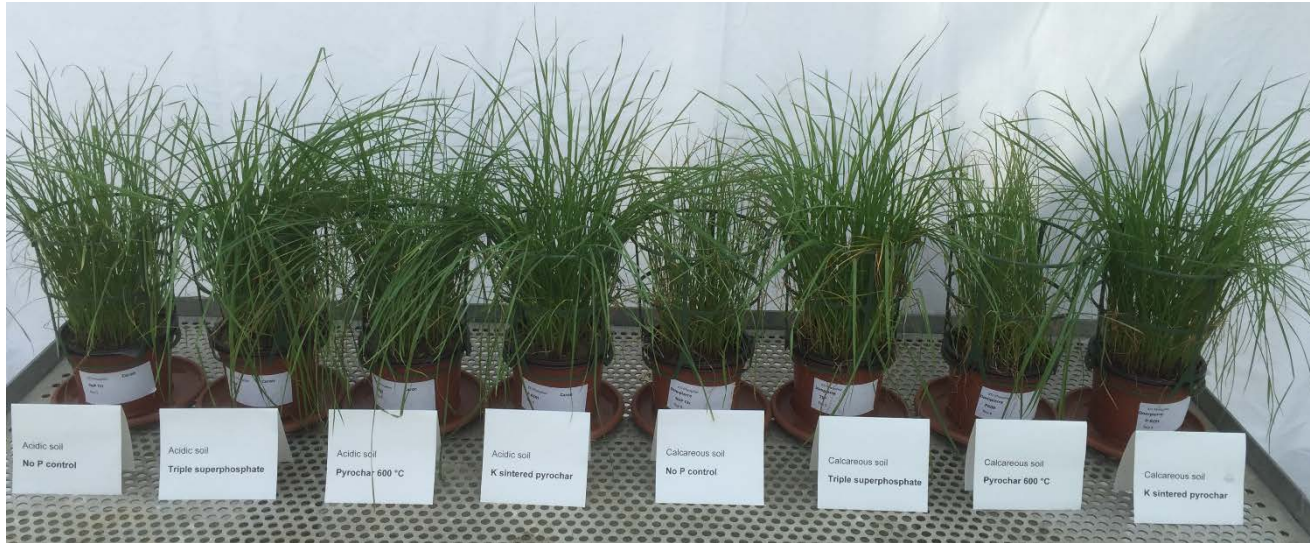
- As soon as recycled fertilizers are included in Reg. 889/2008 Annex I, commercial products will be eligible for the FiBL input lists.

3. A FiBL project on recycled fertilizers from sewage sludge



Alkaline pyrolysis
(after Stemann et al. 2015 Waste Management;
Herzel et al. 2016 Science Total Environment)

Pot experiment with *Lolium multiflorum*



Soil	pH _{H2O}	Clay/silt/sand
		%
Acid	5.3	31 / 63 / 6
Alkaline	7.7	16 / 21 / 63

ca. 0.9 g PK / kg soil

Application dose: 50 mg P / kg soil

All other nutrients supplied in sufficient amounts

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Main findings

- P use efficiency of rock phosphate and of meat and bone meal highly pH-dependent: reasonably effective only in the acid soil while completely ineffective in the alkaline soil
- Fertilizer produced by alkaline pyrolysis of dried sewage sludge: P use efficiency similar in both soils

=> High P use efficiency across different soil pH values is an important asset of recycled P fertilizers (organic agriculture is in need of P fertilizers suitable for alkaline soils)

Conclusions

1. Acceptability of recycled fertilizers is generally high and improves with information on need and processes.
2. Input lists comply with existing legislation.
3. pH-independent P fertilizers are needed: can we accept input of chemicals such as KOH to produce safe and efficient recycled fertilizers from sewage sludge for application in OF?

