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# INCREASED UTILIZATION OF RENEWABLE RESOURCES: DILEMMAS FOR ORGANIC AGRICULTURE

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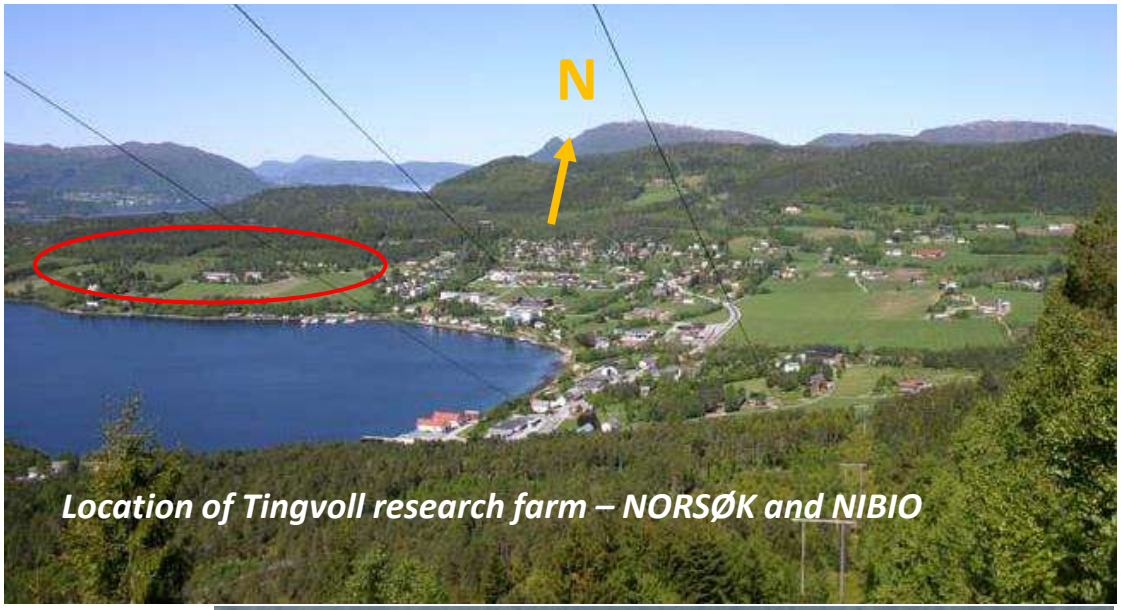
2nd International GRAB-IT workshop, Capri, Italy 27 June 2018

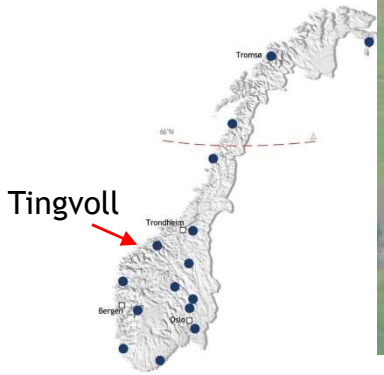
Session *Transitioning to Circular Economy: the role of organic agriculture*

# My background

- Researcher at Norwegian Centre for Organic Agriculture (NORSØK) since 1988
- Soil science and plant nutrition
- Studying various organic fertilizers from green manures and mulches to fish residues and anaerobic digestate
- Also experience from social science and food procurement projects
- Projects leading to this presentation: CYCLE, HØNE, RESTOR, IMPROVE-P, Organic PLUS





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# Organic agriculture (OA): Pure, or sustainable?


Riding two horses--
- how long can we
manage--?

# Economy: Circular, linear and bio

Circular economy = **regenerative system**: inputs of resources, and outputs of wastes and pollution are minimised by **closing the loops** of materials and energy

Linear economy = not always regenerative: resources and energy are converted in a **'take, make, dispose'** model of production

Bio-economy = part of circular economy; biological resources are used to **replace finite inputs** and provide products, processes and services, and innovations are driven by the rapidly growing body of **biotechnological** knowledge

*Even renewable resources are not infinite!*

# Bioeconomy research gives new foods, feeds and fertilizers

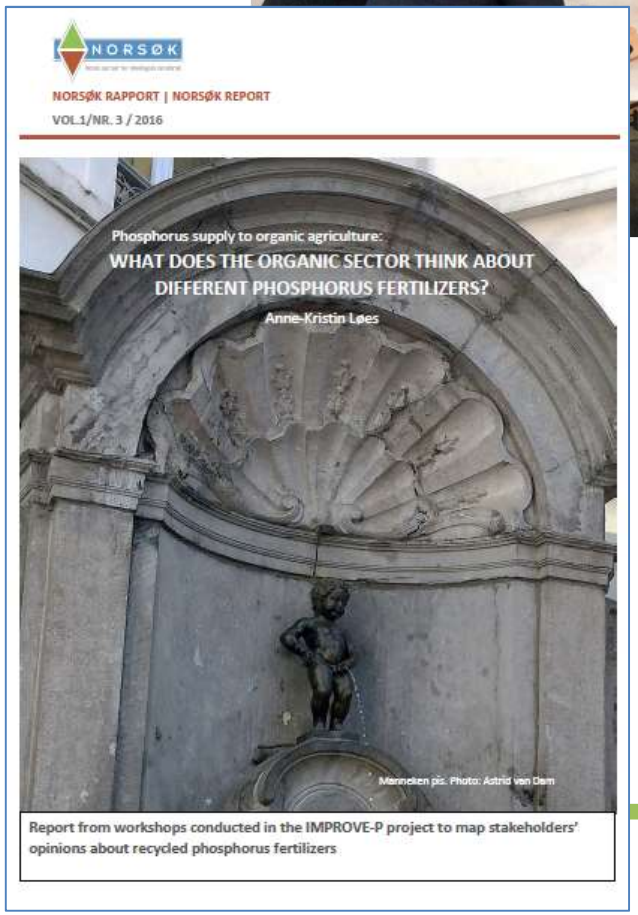
Industrial
food co-streams
(CYCLE)

Marine
residues
(RESTOR)

Discarded laying hens (HØNE)

# Opinions of organic stakeholders

Participants in Improve-P workshop, IFOAM congress Istanbul oktober 2013

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**Nutrient supply to organic agriculture as governed by EU regulations and standards in six European countries**

Anne-Kristin Løes · E.K. Bünemann · J. Cooper · S. Hörtenhuber · J. Magid · A. Oberson · K. Möller

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**Abstract** Organic farming systems need to replace nutrients exported via farm products, especially phosphorus (P) which may otherwise become depleted in soil in the long term. In Europe, EU regulations for organic production are shaping the farming systems with respect to inputs of nutrients. Permitted off-farm P sources include conventional animal manure, composted or anaerobically digested organic residues, rock phosphate, and some animal residues such as meat and bone meal. The recent proposed revision of EU regulations for organic production (2014) puts less emphasis on closing nutrient cycles and instead aims at minimizing off-farm inputs, to reduce the risk of importing contaminants. This development, which has received little attention from the organic sector so far, is explained here. The paper further explores the regulatory conditions that govern the P supply to organic agriculture in six European countries: Austria, Denmark, Germany, Great Britain, Norway, and Switzerland. Organic farmers are subject to substantial variation in standards arising from the interpretation of EU regulations into national laws, restrictions imposed by private actors such as retailers, and private standards which may be stricter than EU regulations. In several countries, the majority of organic farmers are certified by private, stricter standards. We propose that EU regulations and private standards for organic production should not limit the use of recycled fertilisers in organic farming systems, as long as means are taken to ensure the quality and safety of these inputs. Awareness of the need to close nutrient cycles may contribute to adapting regulations and private standards to support recycling of nutrients from society to organic agriculture. A better definition of the term "natural substance" in organic regulations is required.

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**Keywords** Fertilizer · Human excreta · Organic waste · Phosphorus · Recycling · Soil amendment

Springer

IMPROVE

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# Recycled fertilisers: What to choose?

Table 3. Average degree of acceptance for fertilizer products and substrates for composting or anaerobic digestion studied among organic sector stakeholder in various workshops, ranked from most to least accepted

| 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 |
| Ashes from incinerated sewage sludge | 56 |
| Conventional poultry manure | 56 |
| Conventional pig manure | 55 |
| Rock P: 54% | 54 |
| Basic slag: 43 % | 43 |
| Conventional manure from fur animals | 31 |

IMPROVE


**Struvite: Much better yields**

**Tingvoll farm, June 2018**

# Food and feed-dilemma

Requests for naturalness collide with sustainability-driven demands for recycling

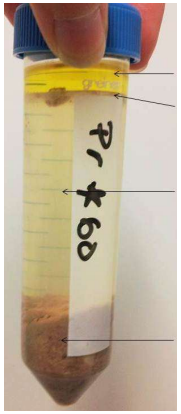
Egg shells

Bone meal

Feather meal

Hydrolysed proteins

Food grade oil




Animal feed only to be derived from milk, eggs or fish

Egg products only permitted for poultry

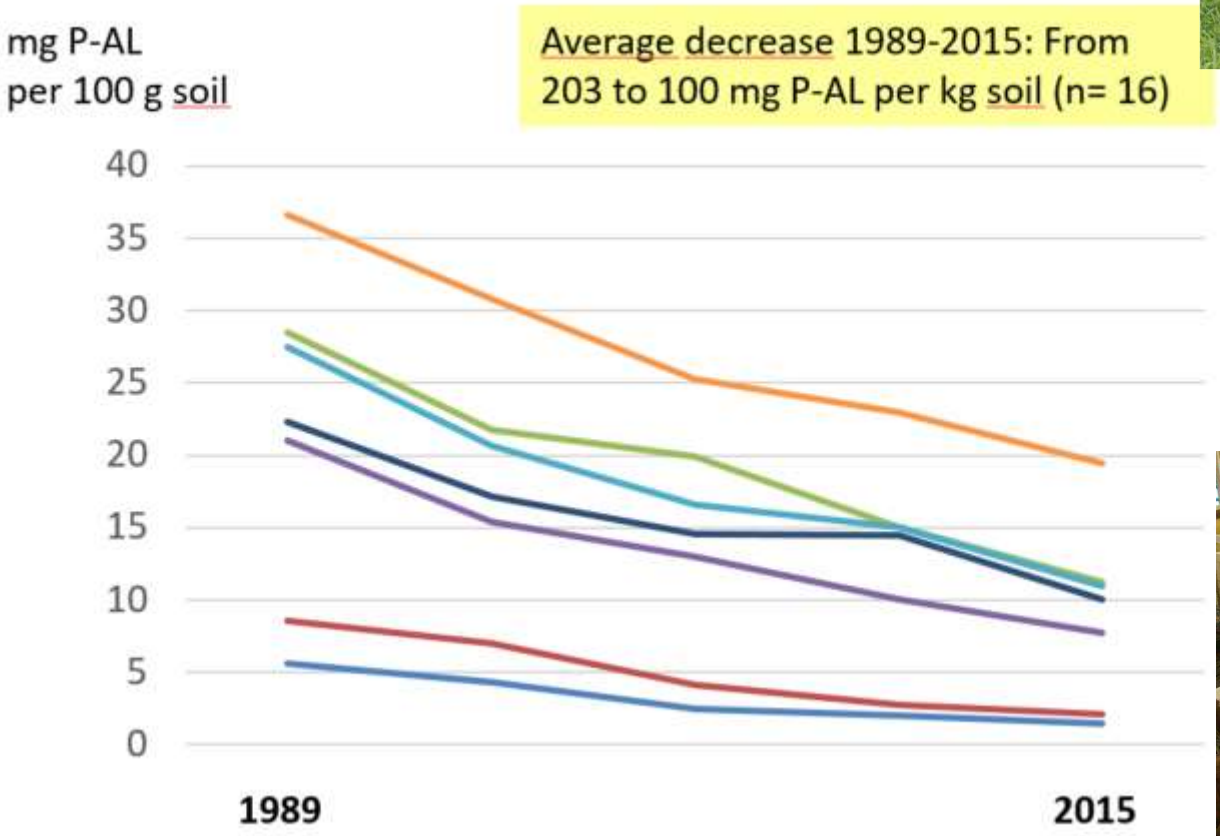
Fish products only for non-herbivores (fish, pigs, poultry)

Hydrolysed proteins is not a natural substance

Chemical extraction is not accepted

# Fertilizer dilemma

Demand for low solubility fertilizers and non-polluted products challenges the use of recycled fertilizers




- Tingvoll farm, Norway
- Organic dairy cows
- Importing 40% of energy demand
- Soil P status declining
- We need to recycle nutrients!

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# Severe restrictions on recyling of nutrients in organic agriculture

$NH_4MgPO4x6H_2O$ = struvite = 5% Nmin

Human-derived fertilisers have so far not been permitted; struvite and calcined phosphate now about to be allowed – but then what about no allowance for mineral N?

Substrates for composting or digestion must be listed in Annex 1; in practice excluding most digestates from being used in OA (source-separated household waste excludes waste from shops, catering and often industry)

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# Processing and preservation dilemma

Demand for non-chemical processing challenges the use of natural resources

- Nutrients and organic matter are leached; hence organic materials from the sea (and lakes) should be included in recycling
- Seaweed extract permitted for use
- Pure fish bones from wild fish = permitted for use
- Residues after extraction (strong acid) NOT permitted
- Conserved fish bones (formic acid, antioxydants) NOT permitted

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# Regulations for processing and nutrient supply in organic agriculture

- Chemical processing is not accepted
- Physical or mechanical processing is accepted
- Synthetic compounds are not accepted
- Mineral fertilizers must be of low solubility

- Inputs should be natural or naturally derived substances or materials
- Natural substance = If not identical to their natural form, materials must be of plant, animal, microbial, or mineral origin
- Approved inputs listed in Annexes
- No Annex yet developed for processing agents

Not possible to draw a distinct line between physical and chemical processing
(e.g. boiling is both!)

What is actually a synthetic compund?

How low solubility? Nutrients in organic slurry are water-soluble!

All physical objects are of some of this origin
This definition does not account for nature = being related to life, being part of nature (not separate from), or «promoting» the true nature of an entity

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# Dilemmas expressed

***Food and feed dilemma***

*Can OA defend its position as the best way towards sustainable production, if innovative food and feed products, processed by chemical methods, are not accepted? Where to put the limit to avoid "meat" produced from yeast and $NH_4$? (Quorn ++ )*

***Fertilizer dilemma***

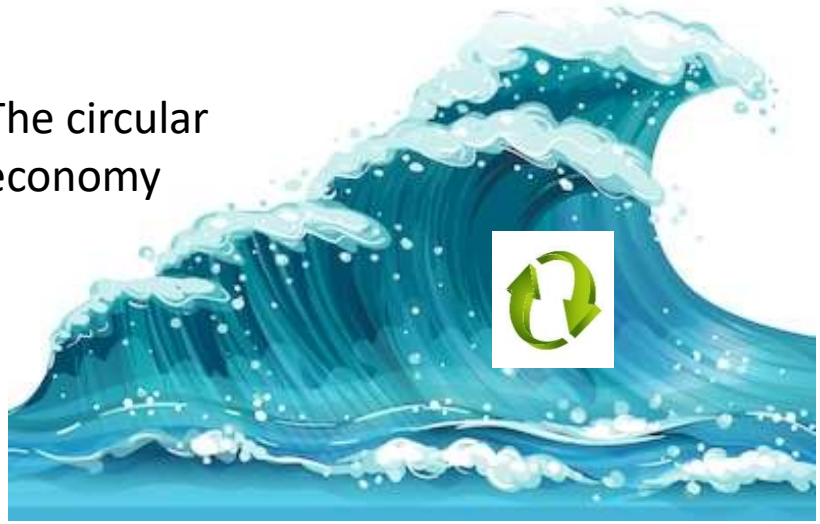
*OA aims for a higher integrity, hence restricting non-organic (and) animal-derived fertilizer inputs. What about long-term soil fertility? A living soil is dependent on nutrients feeding not only plants, but also soil biota. Concurrently, OA cannot become a dumping site.*

***Processing and preservation dilemma***

*By-products from processing of biological materials may contain, or demand, chemicals not allowed by current regulations. Concurrently, we need to be restrictive to maintain high product quality.*

# The risk, and various reactions

The circular economy



Organic agriculture

Drown in sustainability actions, new standards, labels?

Wait for the wave to pass– stop growing?

Conduct critical studies of regulations and standards governing inputs, to strengthen their scientific foundation and facilitate equal and easy interpretation.
Ensure growth while maintaining high soil, food and feed quality

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# One possible option: more diverse regulations?

- Organic + animal welfare
- Organic + recycled fertilisers
- Organic + local processing
- Organic + biodiversity
- Etc
- Etc
- Etc

# Main take-home message

- Do not use Organic 3.0 visions as an excuse for working on the current and actual standards and regulations!