# The importance of developing products and markets for the Circular Economy


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# Questions to be addressed

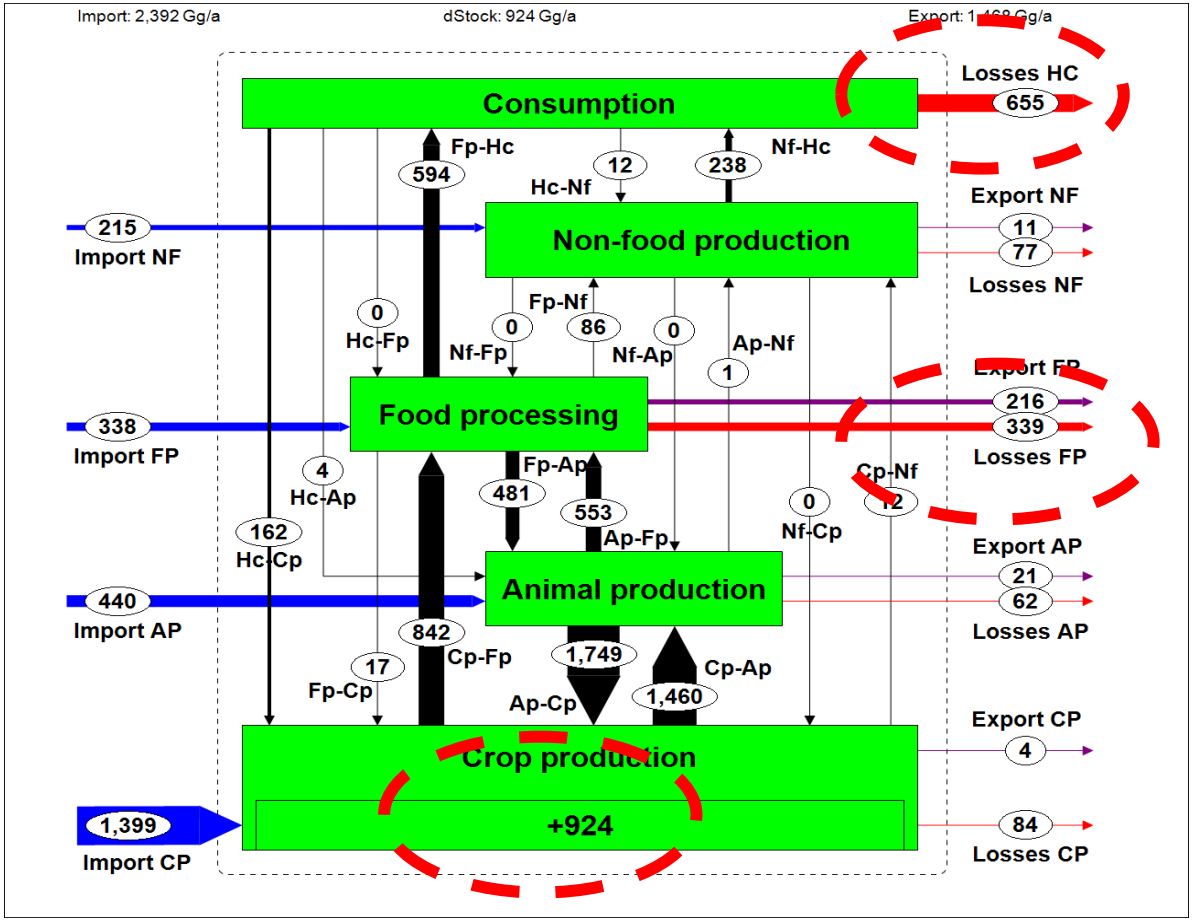
- Why is this necessary?
- What kind of fertiliser products are needed?
- How to develop markets?
- Alternatives for fertilisers?

# Phosphorus cycle of food system in EU 2005, in Gg

***Van Dijk et al., 2015***

How to close the cycle:

- What does society need?
- Further optimizing recycling
  - Product development
  - Developing markets




| | Import | Export | Losses | Acc |
|---|---|---|---|---|
| **Consumption** | | | 655 | |
| **Non-food** | 215 | 11 | 77 | |
| **Food processing** | 338 | 216 | 339 | |
| **Animal production** | 440 | 21 | 62 | |
| **Crop production** | 1399 | 4 | 84 | 924 |
| | | | | |
| **Total** | **2392** | **252** | **1217** | **924** |

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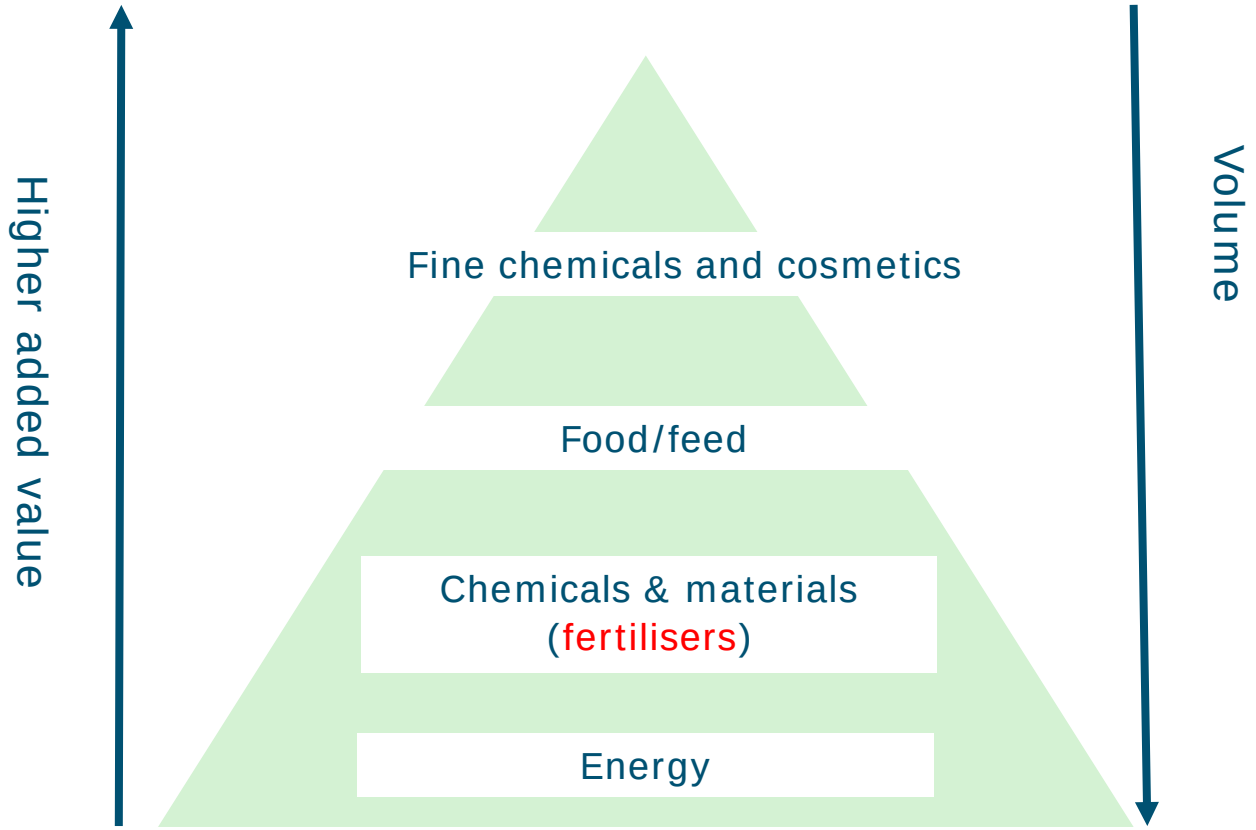
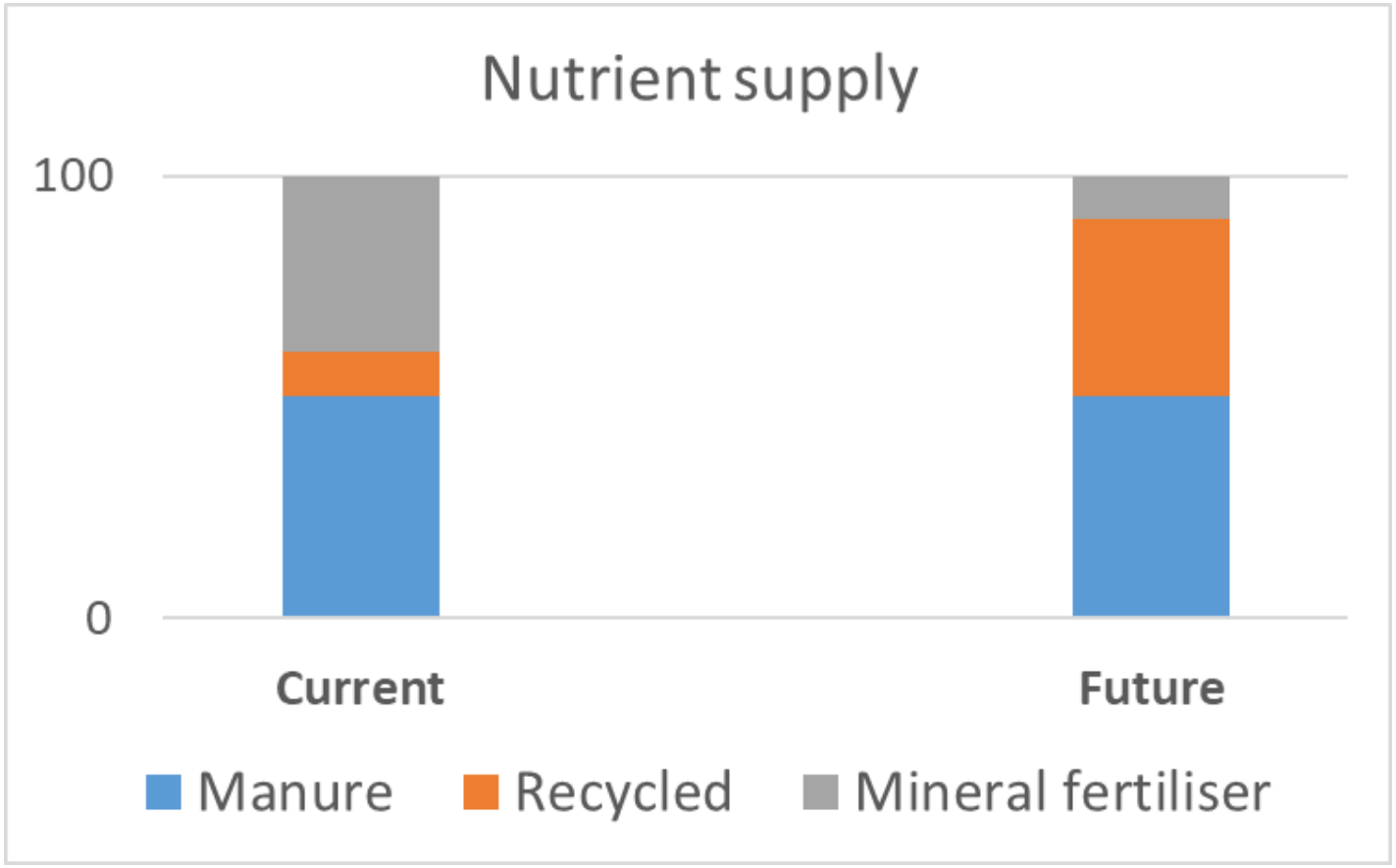
# Valorisation of side streams



# CE Challenge fertilisers

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# What do farmers demand?

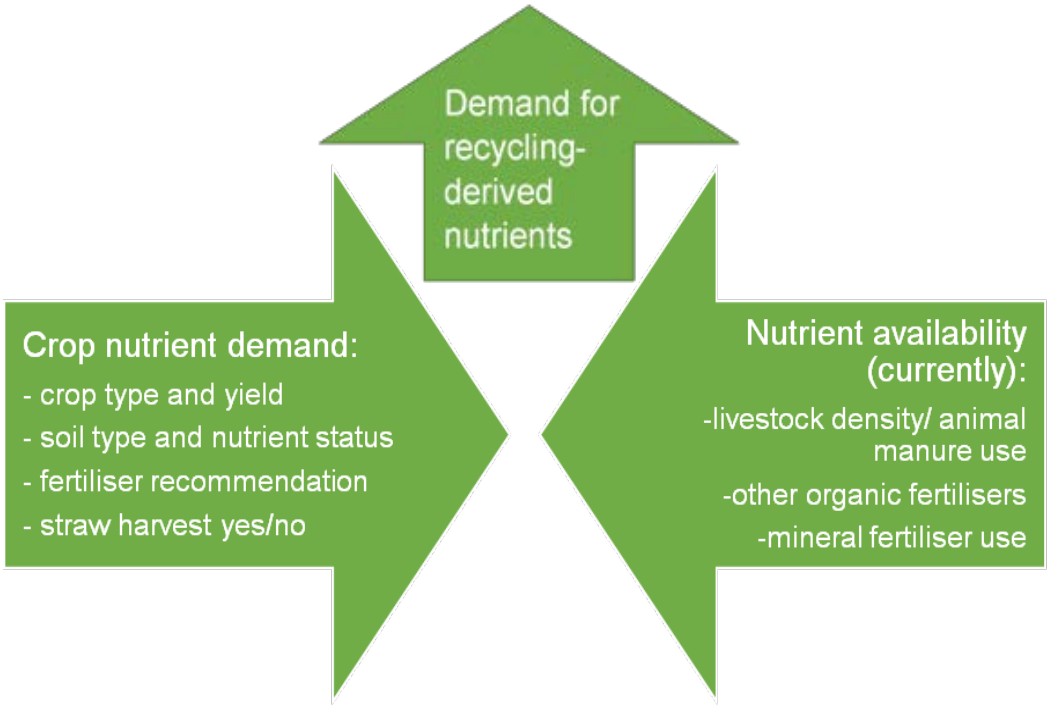
- Composition products meets nutrient demand crops/rotation
  - Nutrients, organic matter, lime value
- Homogeneous product
- Fixed/constant nutrient concentration
- Known composition
- Form
  - Liquid/solid
  - Spreading properties
- Free of contaminants
  - Heavy metals, micro-pollutants, micro-organisms

# Common practice of crop fertilisation

- **Basis fertilisation before planting (NPK, organic matter)**
  - CNPK concentration and ratio
  - Application technique
  - Effectiveness of nutrients as compared with mineral fertilisers

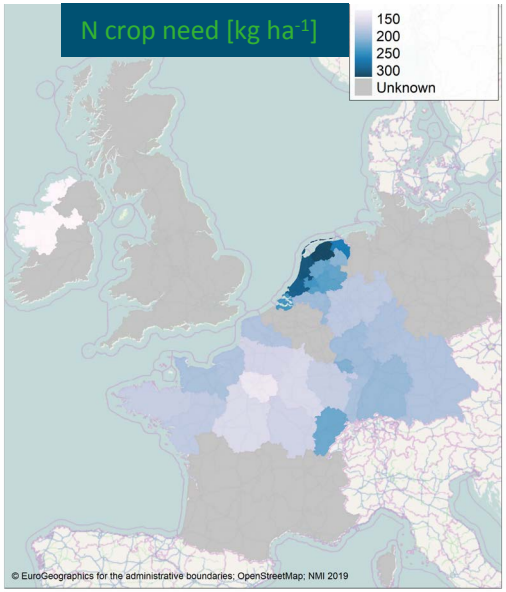
- **Supplementary dressings during growing season (N)**
  - Application technique (need for concentrated products)
  - High N availability

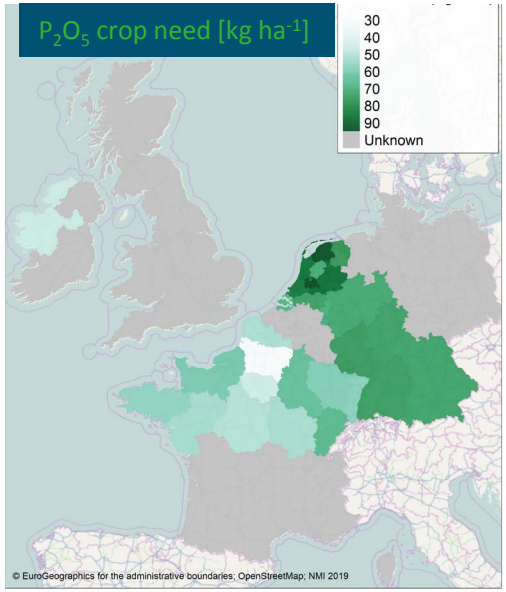
# Method

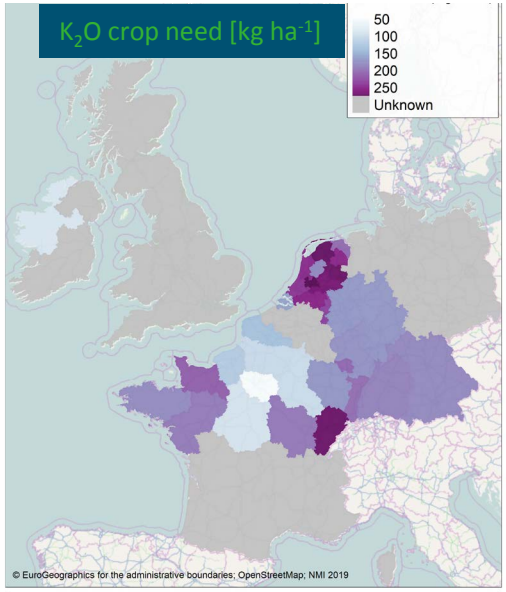

Demand for recycling-derived nutrients
Crop nutrient demand:
- crop type and yield
- soil type and nutrient status
- fertiliser recommendation
- straw harvest yes/no
Nutrient availability (currently):
-livestock density/ animal manure use
-other organic fertilisers
-mineral fertiliser use

# Crop nutrient demand

Interreg North-West Europe
ReNu2Farm
European Regional Development Fund

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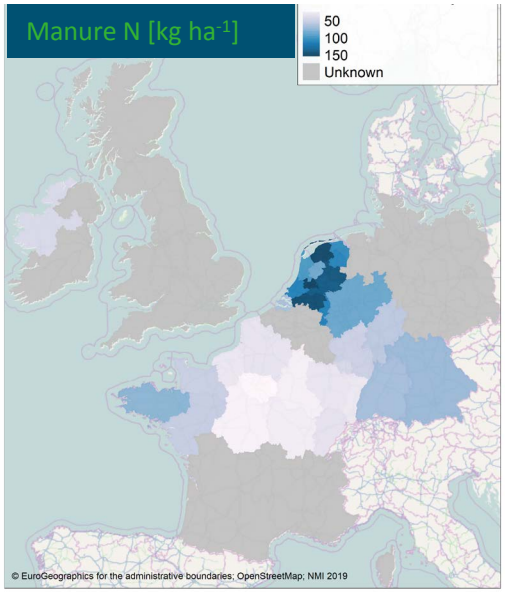
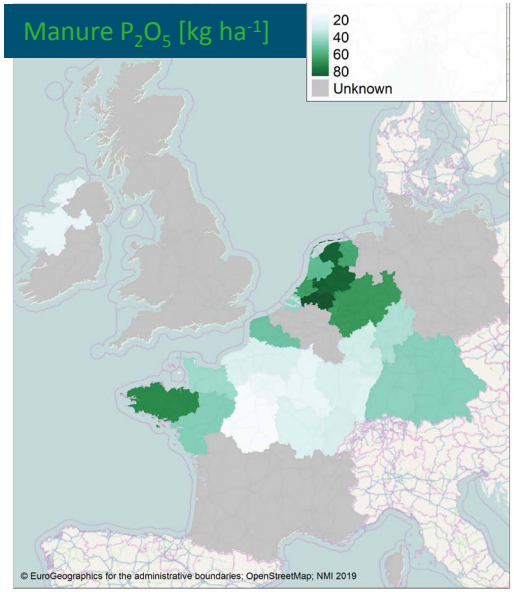
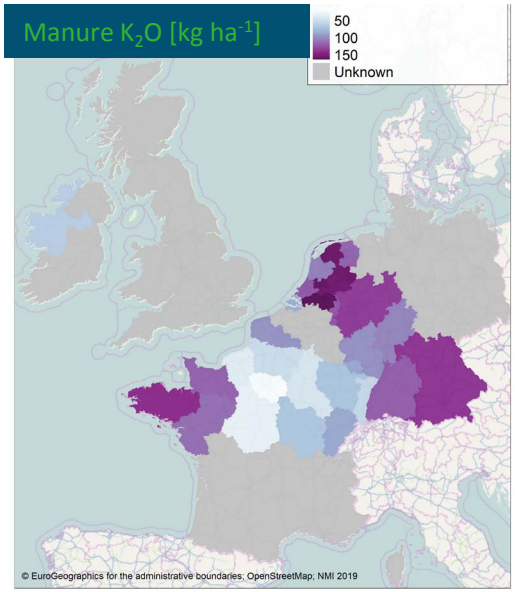
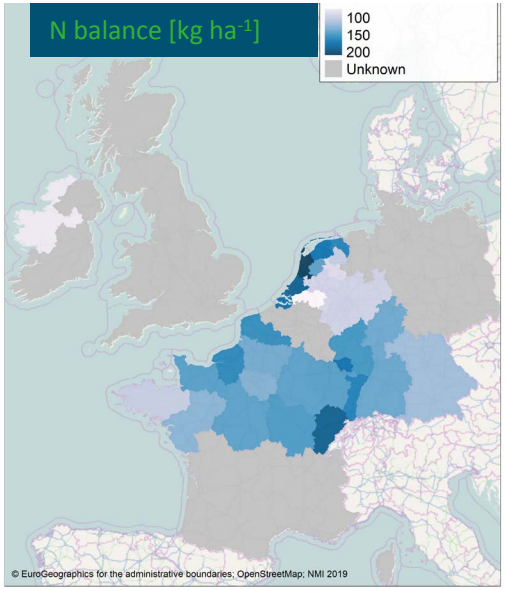
# Nutrient availability: animal manure

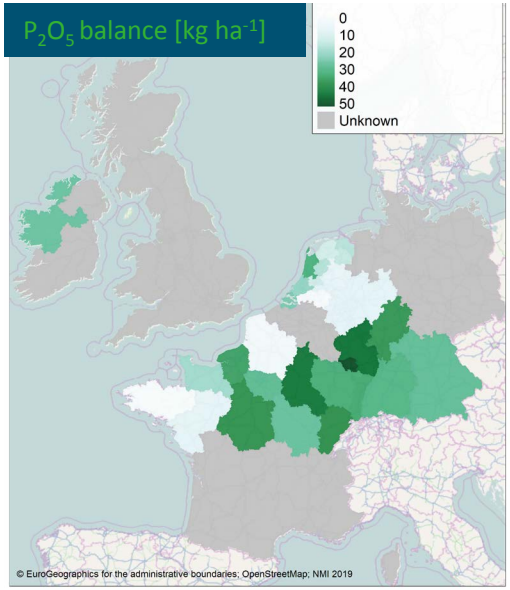


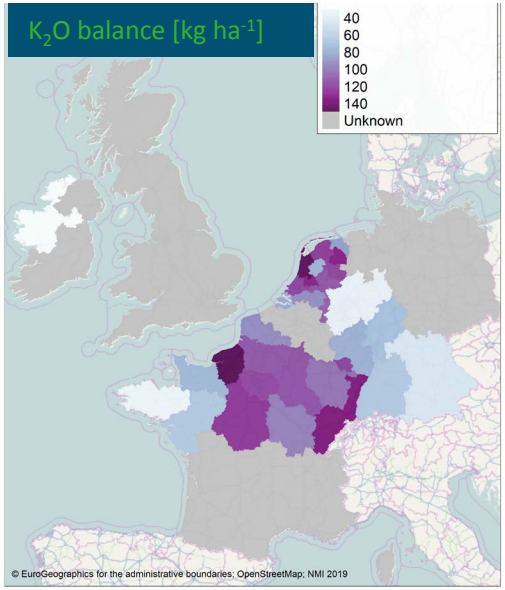



# Balance: demand recycled nutrients



## Conclusions

- there is demand for recycled nutrients **everywhere** but different composition required

| | Grassland region | Cereal region | Rootcrop region |
|---|---|---|---|
| High availability manure | Concentrated N | Concentrated N | NK |
| Low availability manure | / | N-P-K | N-P-K + Carbon |

# Examples of recycling products

- Products of societal side streams
  - Sewage sludges
  - Struvite (sewage sludge,
  - Ashes (sewage sludge, manure, wood)
  - Composts (food residues and wastage)

- Products of processed manure
  - (Dried/composted) solid fractions - exported
  - Liquid fractions – used nearby

# Challenge to recycle side streams

- Great number of side streams
- Bulky and relatively low nutrient contents;
- Some (manures, wastes) have high water content
- Some have high pollutant content
- Hence,
  - High transportation costs;
  - Often restrictions on its use in agriculture
  - Processing needed
- Further, producers are often not well-organized
  - Free-riders dilemma

**New business models needed**
**Incentives needed**

# How to develop markets?

- Measures
  - Certification of fertiliser products
  - Legislation should allow to use recycling products
  - Supporting research and demonstrations

- Sometimes reluctance for organic fertilisers/recycling products
  - Unknown product
  - Composition (nutrients and contaminants)
  - Current application machinery suitable?

# Financial value product

- Intrinsic value: value of ingredients
  - Nutrients
    - Reference: fertiliser price, correction for effectiveness
  - Organic matter
    - Stability: EOM (residual OM after 1 year, 0.2-0.9)
    - How to assess the price:
      - Prices for alternatives
        - Green manures/leaving straw: €0,20 - €0,30/kg EOM
      - Extra yield due to non-fertiliser effect
- Supply versus demand (market situation)

# Alternative products

## Alternative biomass

Microalgae

Duck weed

(Compost)worms

## Biorefinery

- Materials, chemicals, fibers
- Rough material for substrates in horticulture
- Nutrients still remain

# Conclusions

- Big potential market for recycled fertiliser products
  - Required composition (CNPK) depends on crop and soil demand and the availability of manure
- Challenge
  - Strong variation in size and composition of side streams
  - Markets have to be developed

# Thanks for your attention!!

- Questions?

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