ECN
Compost and Digestate for a Circular Bioeconomy

Dr. Stefanie Siebert

# Importance of biowaste for the Bioeconomy - EU Policy Initiatives

# Outline

ECN
Compost and Digestate for a Circular Bioeconomy

01 Introduction ECN

02 Biowaste & Circular Bioeconomy

03 EU Policy Initiatives

# EUROPEAN COMPOST NETWORK - ECN

ECN
Compost and Digestate for a Circular Bioeconomy

**Vision** — Living well within the limited resources of the planet and respecting the organic cycle

**Mission** — Leading the organic recycling industry through our focus on separate collection of biowaste, quality assurance for compost and digestate and to keep our soils healthy

**Values** — Care; Internet & Networking; Simplicity

**Pillars** — Quality Assurance; Advocacy; Market; Innovation

**Circularity & Sustainability is at the heart of everything we do**

66 Members from 28 European Countries

≈ 48 M tpa Treatment Capacity

> 4.500 Composting & Anaerobic Digestion Plants

# BIOWASTE & CIRCULAR BIOECONOMY

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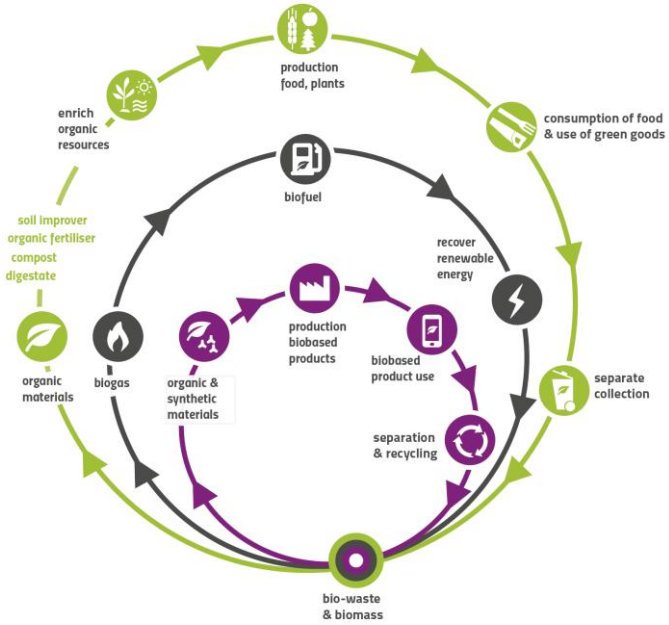
## BIOWASTE

## A Cross-Cutting Resource

- European Green Deal
- Bioeconomy Strategy
- Biodiversity Strategy
- Farm to Fork Strategy
- Soil Strategy
- Waste Framework Directive
- Zero Pollution Action plan

## BIOWASTE in the Circular Bioeconomy

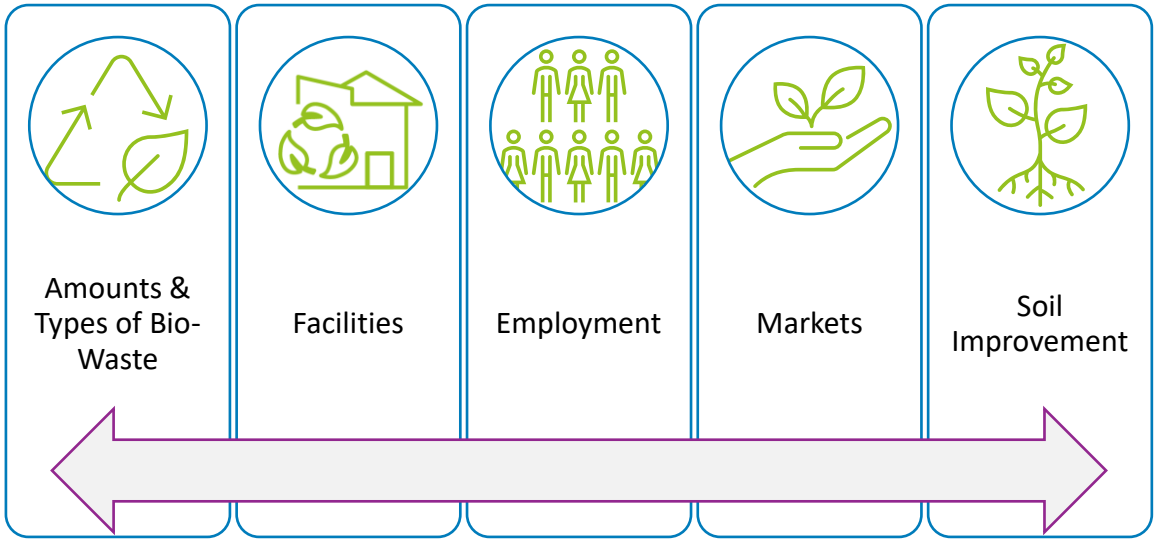




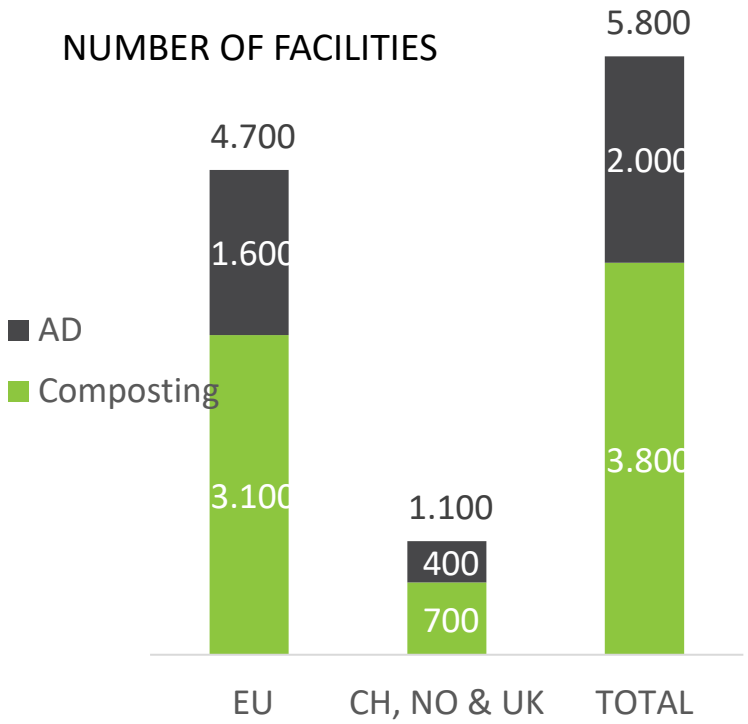

www.compost-digestate.eu

# ECN DATA REPORT 2022

## Comprehensive survey in 2021




# Biowaste Treatment – FOR PEOPLE – JOB CREATION



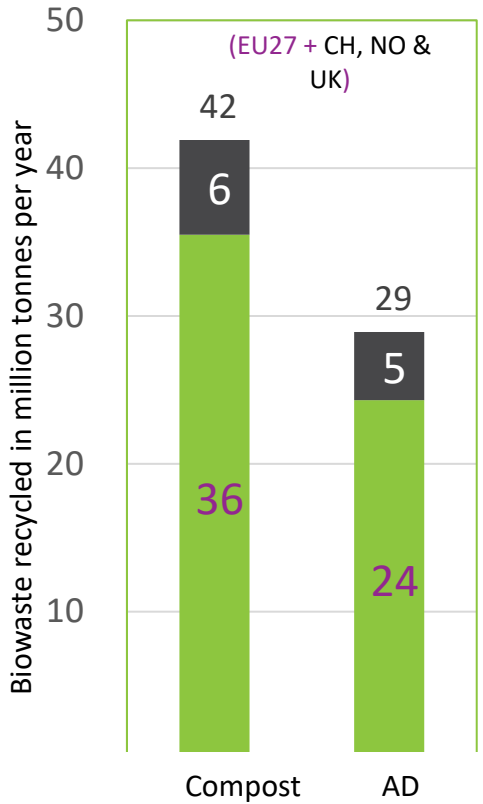

| | FTEs PER FACILITY | TONNES PER FTE |
|---|---|---|
| COMPOSTING | 4.7 | 4,200 |
| ANAEROBIC DIGESTION | 4.9 | 5,300 |

**11,000 - 18,000 FTEs**
COMPOSTING

**2,000 - 5,500 FTEs**
ANAEROBIC DIGESTION

FTE – Full Time Equivalent Employees

# Biowaste Collection – COMPOST & DIGESTATE PRODUCTION




**71 M tpa**
BIO-WASTE RECYCLED

**21 M tpa**
COMPOST PRODUCED

| Surface area (million ha) | Fraction of Arable Land | Fraction of Mod./ Severely Eroded Land |
|---|---|---|
| 2.1 | 2% | 16% |

**ESTIMATION FOR 2035**

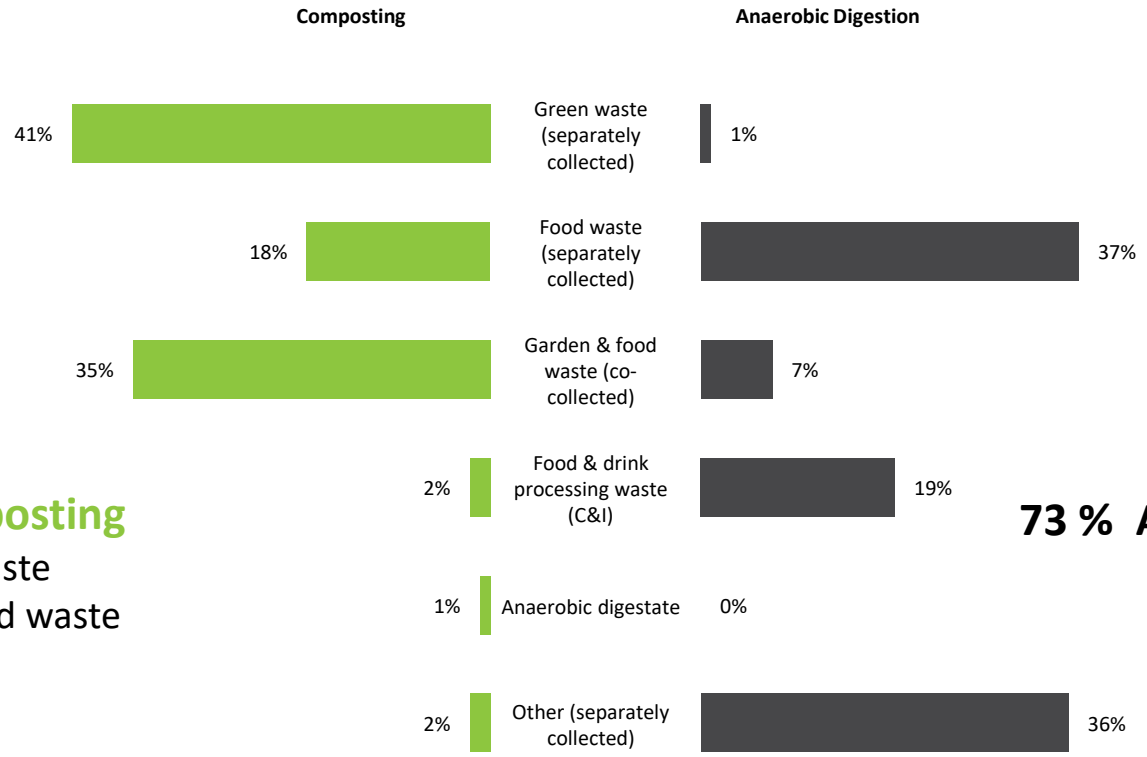
**46 M tpa**
COMPOST PRODUCED

# Biowaste – SOURCES FOR COMPOST & DIGESTATE PRODUCTION

**76 % Composting**

Green waste

Garden & food waste




**73 % Anaerobic Digestion**

Food waste

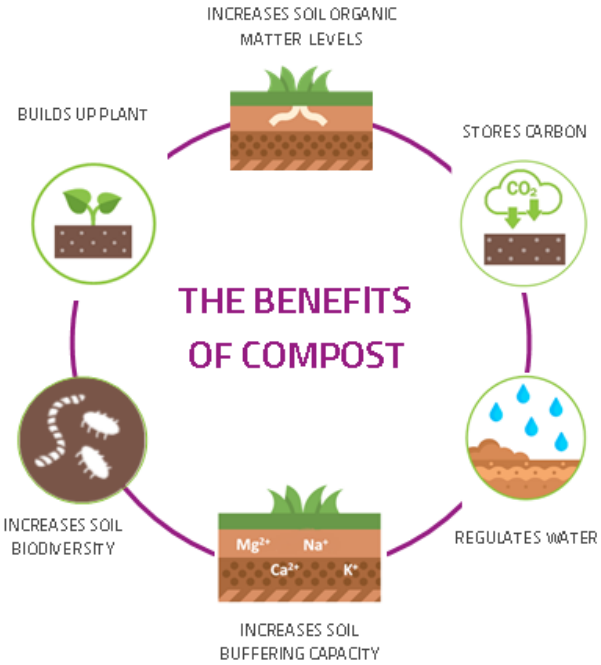
Other

# Compost & Digestate – SUSTAINABLE SOIL MANAGEMENT

## AGRICULTURAL IMPACT ON SOIL ORGANIC MATTER DECREASES

- Soils are less productive;
- Soils hold onto less water;
- Soils store less carbon and nutrients.

➢ **Recycling of carbon and nutrients from bio-waste by applying high-quality compost and digestate plays a key role in improving soils keeping soils healthy and productive and to contribute to climate change by saving primary resources and carbon sequestration.**



# Compost & Digestate – NUTRIENT & ORGANIC MATTER VALUE

**11.7**
Million tonnes of compost

**4.1**
Million tonnes of digestate

## Nutrients


**129**
Thousand tonnes of NITROGEN RECYCLED


**42**
Thousand tonnes of PHOSPHATE RECYCLED

(Theoretical estimates)

## Carbon

**3.5**
Million tonnes (dry mass) organic carbon recycled

**1.8**
Million tonnes (dry mass) humic substances recycled

**15,7 Mio. Tonnes of Compost and Digestate can replace**

- **1.5 % of Total Inorganic Nitrogen***
- **4.3 % of Total Inorganic Phosphorus***

**Application of 30 tonnes of fresh compost per hectare**

- **9 tonnes of organic matter is added to the soil**

# Compost – STORES CARBON IN THE SOIL

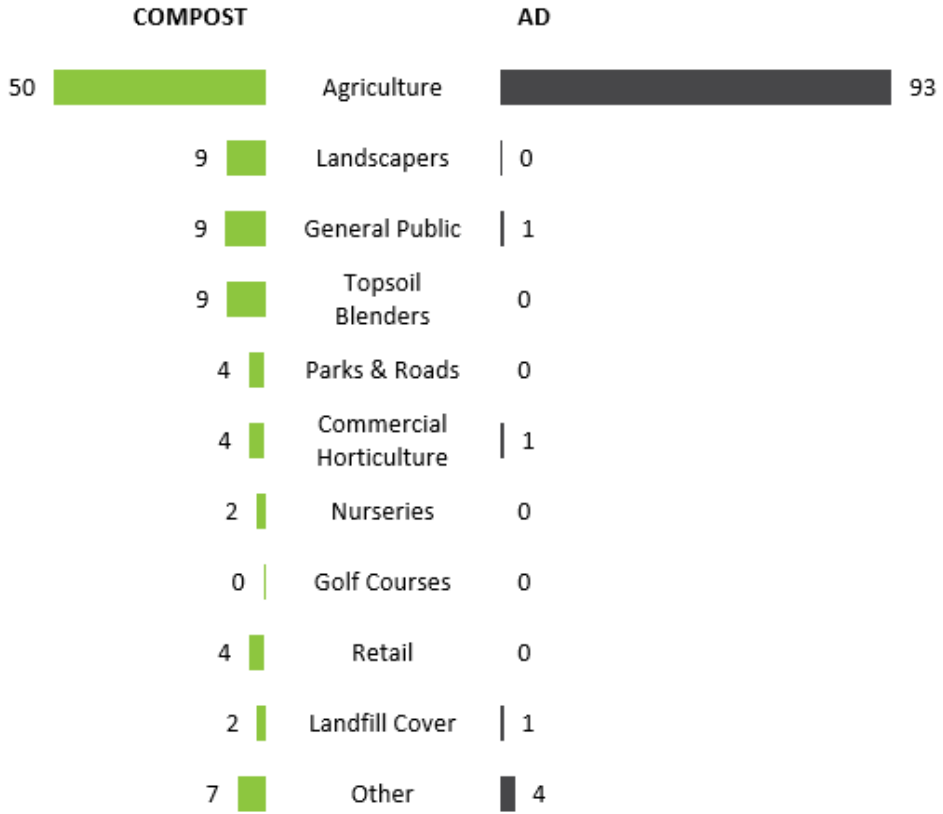
Soils can be improved by regular applications of quality compost.

- A fraction of the organic matter in compost is converted into a stable form called **'humus'** - this remains in soil for many years.

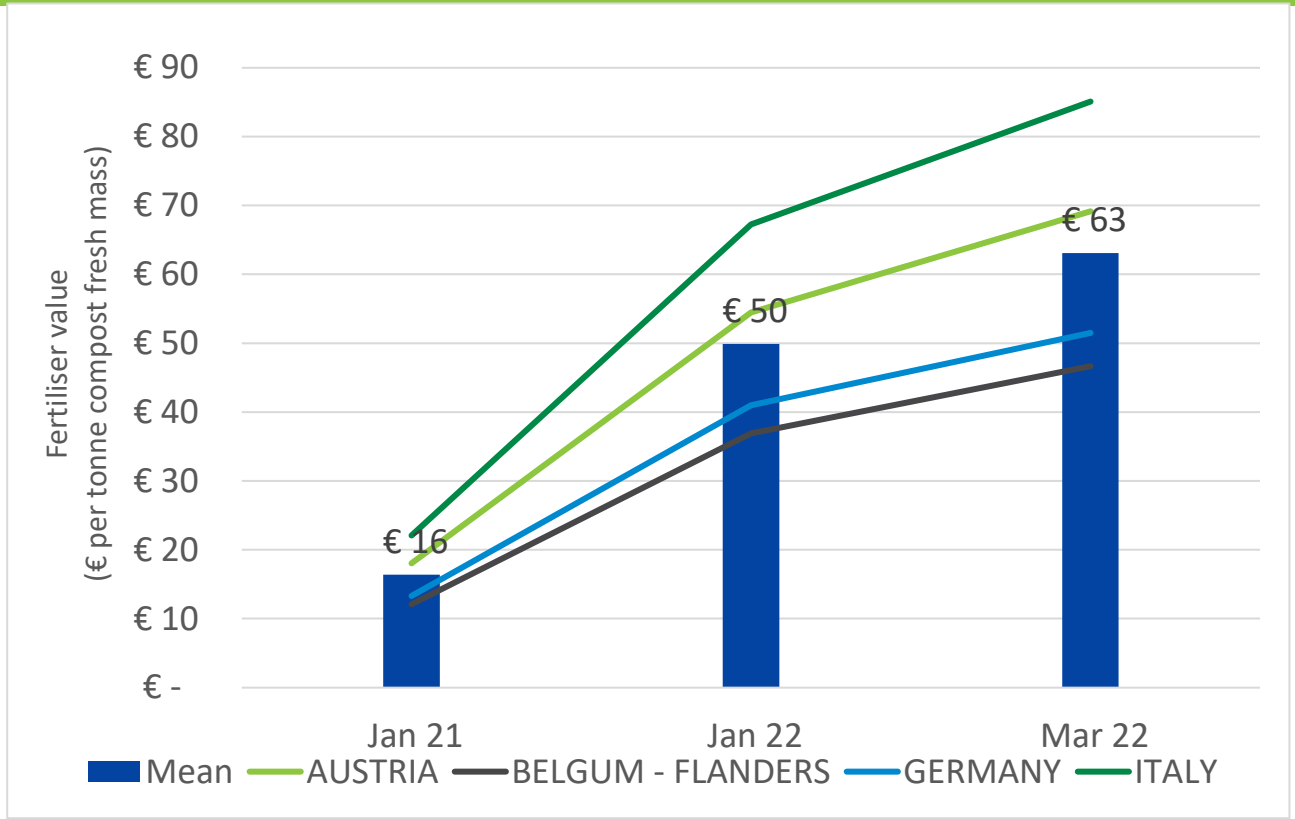
**1 tonne of compost (fresh mass) sequesters**
**30 kg soil organic carbon**
**110 kg $CO_2$ equivalents**
**(equivalent to 11% of its mass)**

Source: ECN Factsheet 1: Soil Structure & Carbon Storage. www.compostnetwork.info

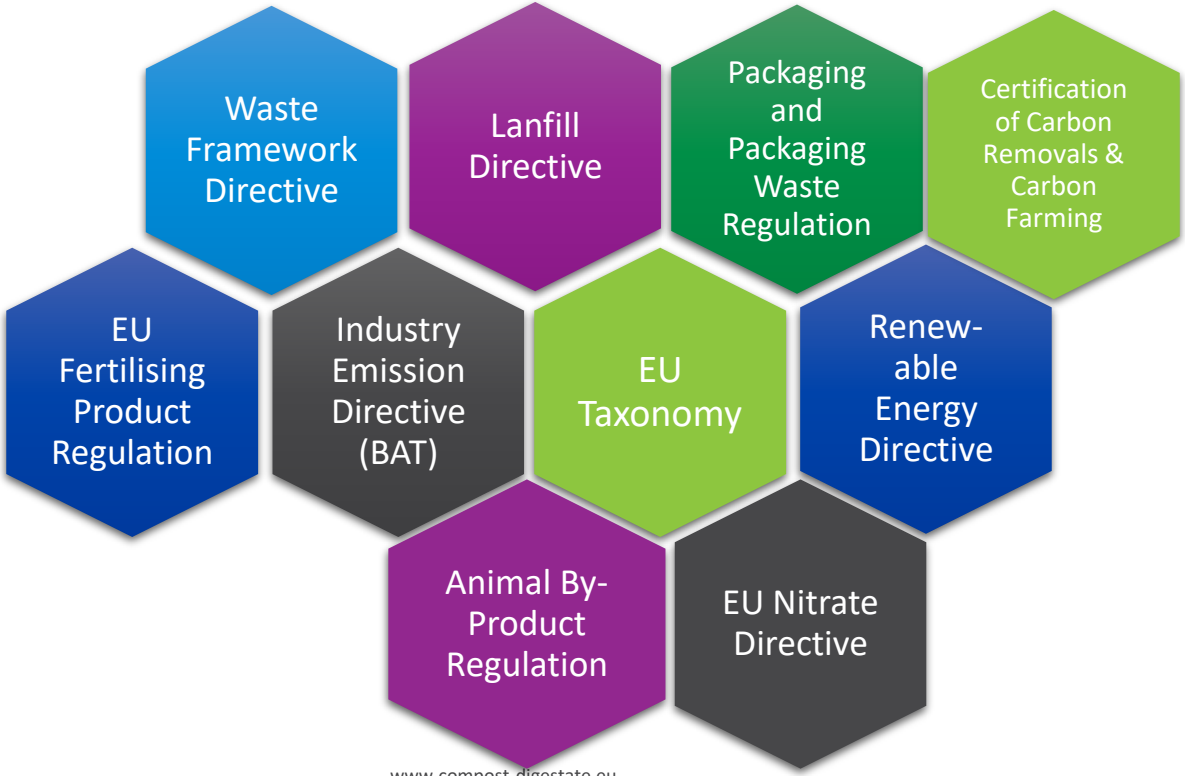
# Compost & Digestate – MARKETS (%)



# Compost & Digestate – FERTILISER VALUE



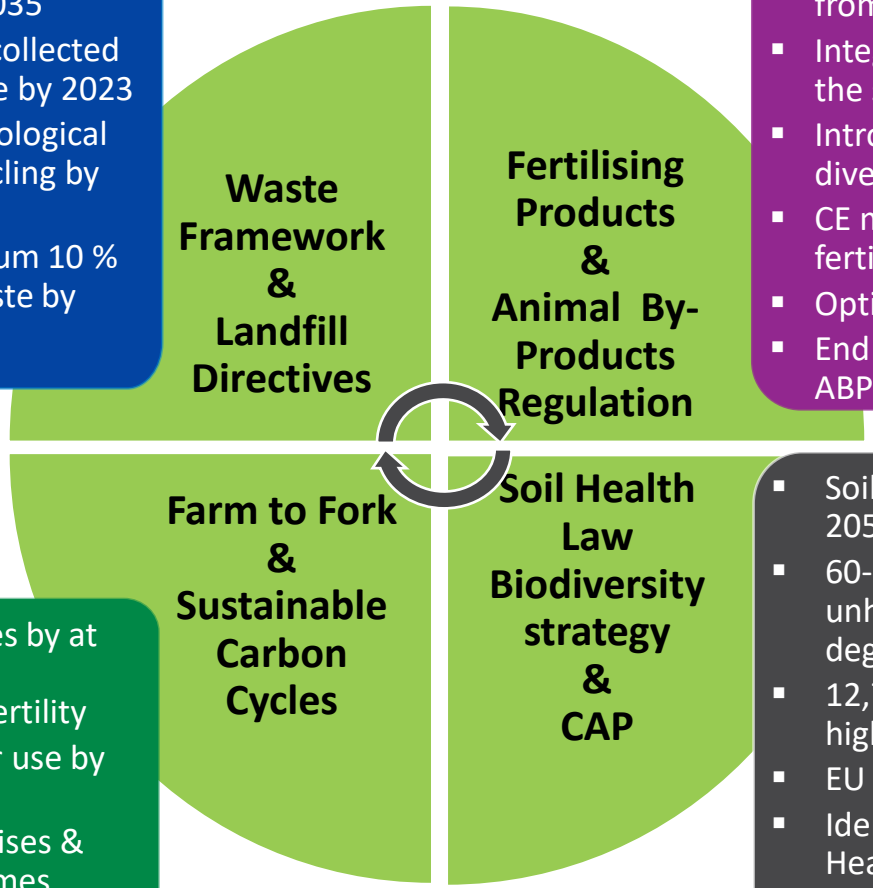
# EU POLICY INITIATIVES



# EU GREEN DEAL & CE

- 65 % recycling target for municipal waste by 2035
- Mandatory separate collected or separated at source by 2023
- Ban on Mechanical biological Treatment from Recycling by 2027
- Landfill target Maximum 10 % of municipal solid waste by 2035

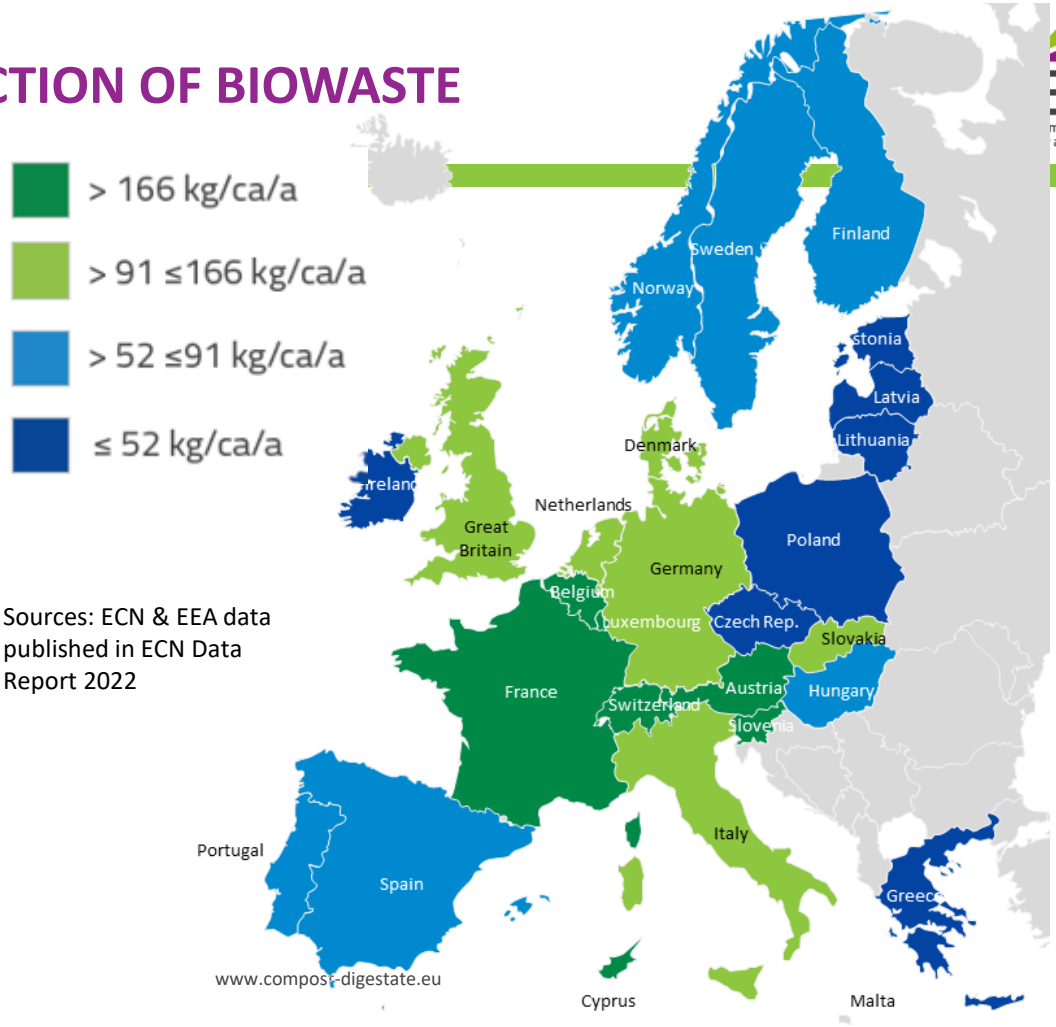
- Boosting organic matter (biowaste) recycling from biowaste
- Integration of organic fertilising products into the scope of the new Regulation
- Introducing harmonised EU rules for products diverting from organic waste materials
- CE marking and free trade for organic fertilising products across EU
- Optional harmonisation
- End point in the manufacturing chain for ABP-derived materials




- Reduce nutrient losses by at least 50 % without deterioration in soil fertility
- Reduction of fertiliser use by at least 20 %
- Carbon farming practises & carbon removal schemes

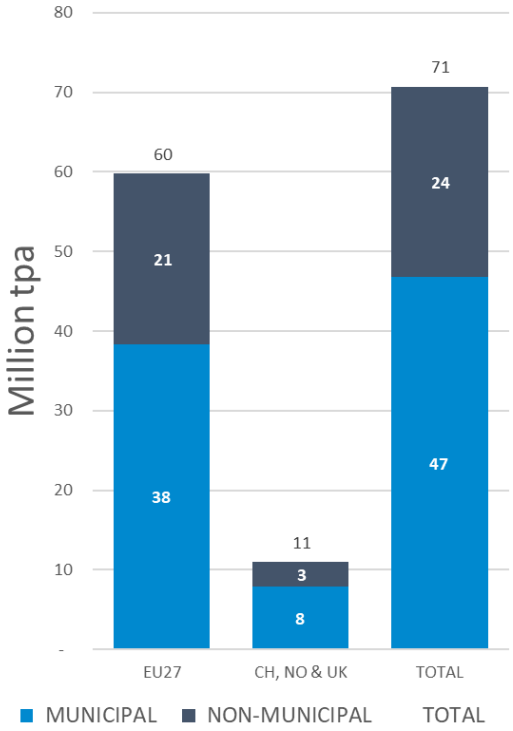
- Soils should be in a healthy condition by 2050
- 60-70 % of soil ecosystems in the EU are unhealthy and suffering from continuing degradation
- 12,7 % of Europe is effected by moderate to high erosion
- EU Soil Monitoring Law 2023
- Identifying Soil health indicators & Soil Health Certificate
- 30 % restoring land and increasing organic farming (25% organic farmland by 2030)

# Europe - SEPARATE COLLECTION OF BIOWASTE




Sources: ECN & EEA data published in ECN Data Report 2022

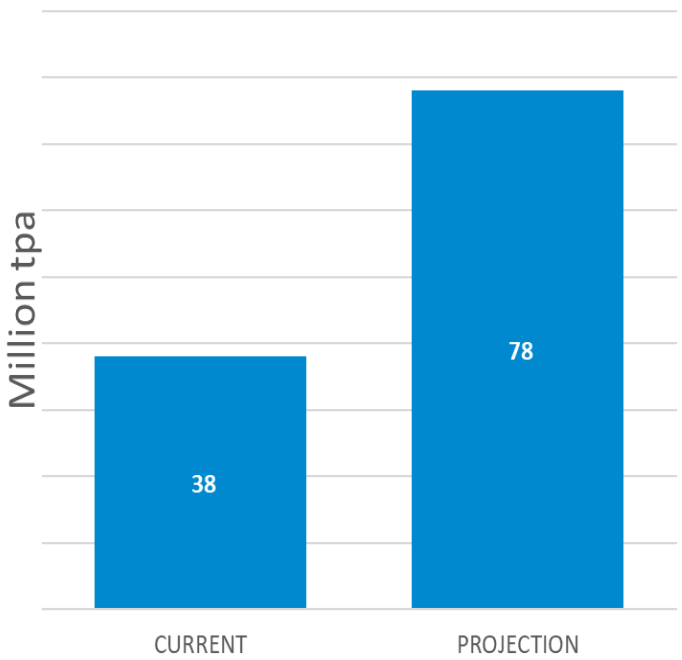
# Municipal Biowaste – RECYCLING POTENTIAL




**EU TARGET TO RECYCLE 65% MSW BY 2035**

**17% to 35% needed through bio-waste**

**Extra 40 M tpa <u>MUNICIPAL BIOWASTE</u> has to be separately collected**



# Biowaste – HIGH QUALITY RECYCLING

Separate Collection of Biowaste & Quality Assurance are pre-conditions for placing compost- or digestate-based fertilising products on the European Market


**25 % Quality Compost**

produced in the EU 27, CH, NO; UK was certified to the ECN-QAS

=

**5.3 Million tpa out of 21,7 Million tpa**

**Nutrient value**

**41 € per tonne compost (FM)**

# Use of compost and digestate in the EU agricultural sector - Product regulation and market perspective

Dr. Stefanie Siebert

# Outline

01 ECN-QAS for Compost & Digestate

02 EU Fertilising Products Regulation

03 Market perspectives

# Biowaste – HIGH QUALITY RECYCLING

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# ECN-QAS – QUALITY ASSURANCE FOR COMPOST & DIGESTATE

Targets of the European Quality Assurance Scheme for Compost and Digestate ECN-QAS

- Harmonisation of the compost and digestate quality and requirements across Europe
- Harmonisation of quality assurance schemes across Europe
- Assistance to build up national quality assurance schemes
- Assurance and monitoring of high quality compost and digestate products in Europe

➢ **Promotion of recycling of organic waste materials «from waste to product»**

# ECN-QAS




- Suitable input material → Positive-list
- Operation quality (plant) → Check-list
- Product quality (compost) → Product control
- Product use (good practice) → Application recommendation

**National-QAS (Quality label)**
- plant certificate
- product certificate
- annual quality report

and

**ECN-QAS**
- certification of conformity
- conformity label

# EU FERTILISING PRODUCTS REGULATION

- CE marked fertilising products: free trade on the EU market
- Boost for circular economy in Europe: Waste materials => end-of-waste status included
- Quality Assurance and Certification is the basis (audit, independent sampling+analysis, certificate)
- Limit values for biological, physical and chemical hazards can be met

**EU End-of-waste criteria for compost and digestate**

- EU Fertilising Product Regulation entered into force on 16/07/2022 Consolidated Version of EU FPR 16/03/2023
- Frequently Asked Questions - as implementation guidance
- Blue Guide on the implementation of the product rules (29/06/2022)
- Guidance document labelling EU fertilising products and Annexes to Guidance document labelling EU fertilising products (17/02/2021)
- Delegated act (COM 2023/1605) on the End point of the manufacturing chain for animal by-product derived compost and digestate (22/05/2023)

# EU Fertilising Products Regulation (FPR) - STRUCTURE

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## Exhaustive list of Component Materials Categories CMC (11)

- Quality
- Safety

**CMC 3 Compost**
**CMC 4 Fresh crop digestate**
**CMC 5 Digestates other than CMC 4**

## Exhaustive list of Product Function Categories PFC (7)

- Quality
- Safety
- Declar

**PFC 1 A. Organic fertiliser**
**PFC 3 A. Organic Soil Improver**
**PFC 4 Growing Media**
**PFC 7 Fertilising Products Blends**

## Conformity assessment procedure related to 'CMC/PFC' combination

- Modul A - D1
- Declaration of conformity

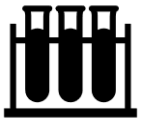
**Modul D.1**
**Quality Assurance of Process & Products**

# EU FPR – REQUIREMENTS FOR COMPOST & DIGESTATE

| Criteria | Fertilisers Reg. Digestate | Fertiliser Reg. Compost |
|---|---|---|
| | (CMC 5) | (CMC 3) |
| $PAH_{16}$ (mg/kg dm) | 6 | 6 |
| Weed seeds (seeds /L) | - | - |
| Impurities (% dm) | ≤ 0,5[x1] | ≤ 0,5[x1] |
| Stability | | |
| Oxygen Update rate [OUR] (mmol $O_2$/ OM *h) | 25 | 25 |
| OUR/Rotting degree /Residual Gas potential (liter biogas/g volatile solids) / organic acides (mg/l) | -/≤0,25/- | III/-/- |

[x1] no more than 3 g/kg (DM) of macroscopic impurities above 2 mm in any of the following forms: glass, metal or plastics, and from 16/07/2026 plastics above 2 mm shall be no more then 2,5 g/kg (DM), and re-asseed fby 16/05/2029

- Compost and digestate have lower amounts of impurities.



- Additional analyses on organic pollutants ($PAH_{16}$)
- Threshold of the Stability criteria ‚OUR' for digestate difficult to meet
- Method for residual biogas potential time consuming and costly

# EU FPR – INPUT & PROCESS REQUIREMENTS

| | COMPOST (CMC 3) & DIGESTATE (CMC 5) |
|---|---|
| Input material | Bio-waste, source separated, ABP cat. 2 & 3, excluding sewage sludge, industrial sludges and mixed municipal waste<br>Plus a liquid or non-liquid microbial or non-microbial extract made out of compost; and<br>Unprocessed and mechanically processed residues from food production industries, except ABPR materials |
| Process criteria for digestate | a) Thermophilic at 55 °C/24 h/hydraulic retention time of 20 days<br>b) Thermophilic at 55 °C incl. pasteurisation step 70 °C-1h<br>c) Thermophilic at 55 °C followed by composting<br>d) Mesophilic at 37-40 °C incl. pasteurisation step 70 °C-1 h<br>e) Mesophilic at 37-40 °C followed by composting |
| Process criteria for compost | 70 °C ≥ 3 days<br>65 °C ≥ 5 days<br>60 °C ≥ 7 days<br>55 °C ≥ 14 days |

# EU FPR – REQUIREMENTS FOR ORGANIC FERTILISERS & SOIL IMPROVERS

| | PFC 1 (A)(I) | PFC 1 (A)(II) | PFC 3 (A) |
|---|---|---|---|
| Criteria | Solid Organic fertiliser | Liquid Organic fertiliser | Organic soil improver |
| Corg | ≥ 15 % | ≥ 5 % | ≥ 7,5 % |
| Nitrogen (N) | ≥ 2,5 %* | ≥ 2 % | |
| Phosphorus ($P_2O_5$) | ≥ 2 %* | ≥ 1% | |
| Potassium* ($K_2O$) | ≥ 2 % * | ≥ 2 % | |
| SUM (NPK) | (1/1/1) ≥ 4 | (1/1/1) ≥ 3 % | |
| Dry matter | | | ≥ 20 % |

All values based on fresh matter
* As a minimum one of the three nutrient contents have to been reached

- Digestate will unlikely fulfil the minimum nutrient content for organic fertilisers
- Compost as well not

# LIMIT VALUES FOR COMPOT & DIGESTATE

| Limit value [mg /kg] | Cd | Cr $_{total}$ | Cu | Pb | Hg | Ni | Zn | As |
|---|---|---|---|---|---|---|---|---|
| EU Fertiliser Regulation | (2) / 1.5 | 2 (CrVI) | 300 | 120 | 1 | 50 | 800 | 40 |
| EoW Criteria (EU JRC 2014) | 1,2 | 100 | 100 | 120 | 1 | 50 | 400 | |
| ECN-QAS | 1,5 | 60 | 300 | 130 | 0,45 | 40 | 600 | - |
| **Values in Compost/Digestate** | | | | | | | | |
| Compost (green waste) | 0,36 | 18,35 | 30,70 | 26,00 | 0,09 | 11,55 | 140 | 4,9 |
| Compost (bio-waste) | 0,38 | 19,80 | 42,80 | 29,00 | 0,08 | 12,00 | 168 | 6,7 |
| Digestate Liquid | 0,35 | 16,00 | 57,20 | 5,00 | 0,05 | 12,86 | 251 | 7,7 |
| Digestate Solid | 0,20 | 15,01 | 26,90 | 8,00 | 0,05 | 7,20 | 133 | |

# Market Perspective – COMPOST & DIGESTATE

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- Compost and digestate are on the markets!
- More recycling will boost compost, biogas (biomethane) and digestate production in Europe
- Need for stable organic matter and nutrients:
  - Compost is a solution for increasing soil organic matter,
  - Digestate is a solution to provide nutrients and replace mineral fertilisers
- EU Policy encourages the use of compost & digestate for recovering nutrients and organic matter from recycled organic materials (Carbon farming practices) and the production of renewable energy (biogas, biomethane)
- Good quality compost and digestate are needed!
- Quality Assurance and Certification is essential to support the markets for compost and digestate (agriculture, landscaping, topsoil blending, growing media)
- Apply compost and digestate in a sustainable way

# RESEARCH & DEVELOPMENT

- **EU Life BIOBEST** Project 'Guiding the mainstreaming of best biowaste recycling practices in Europe'

Co-funded by the European Union

LIFE BIOBEST

- **EU Interreg project CORE** 'Composting in Rural Ecosystems'

- Objectives
  - Mainstreaming composting in rural areas
  - Develop best practices
  - Promoting circular bioeconomy
- Project website https://www.interregeurope.eu/core-0#
- Social media: **#COREinterreg**


Interreg Europe

Co-funded by the European Union

CORE

# FER-PLAY Seminar I Brussels I 18 April 2024

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## CIRCULAR FERTILISRERS FOR HEALTHY SOILS

fer play

| AGENDA | Register: here |
|---|---|
| 13:40 – 14:00 | Welcoming and registration |
| 14:00 – 14:05 | Opening remarks |
| 14:05 – 14:15 | Presentation of the Fer-Play project |
| 14:15 – 14:45 | ECN-QAS and LBB guidelines – ECN (20 min.)<br>Q/A session (10 min.) |
| 14:45 – 15:15 | Compost from bio-waste - RETERRA (20 min.)<br>Q/A session (10 min.) |
| 15:15 – 15:30 | Coffee Break |
| 15:30 – 16:00 | Digestate from manure –<br>Q/A session (10 min.) |
| 16:00 – 16:30 | Struvite from wastewater treatment - NURESYS (20 min.)<br>Q/A session (10 min.) |
| 16:30 – 16:50 | Panel discussion |
| 16:50 – 17:00 | Conclusions and closure of the event |

# FURTHER INFORMATION

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## Compost and Digestate
for a Circular Bioeconomy

**IMPROVING SOILS**

**RECYCLING FERTILISERS**

**TACKLING CLIMATE CHANGE**


www.compost-digestate.eu

https://cutt.ly/D1ceQ2u

# Thank you

Do you have any questions?
Contact details: European Compost Network ECN e.V.
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Website: https://www.compost-digestate.eu

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**www.saveorgasnicsinsoil.org**