Compost and digestate in organic farming in Flanders: quality control and research to create opportunities

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Composting and Compost use in Organic Farming - Estonia
1970-1980
How can we get rid of our waste in an environmentally sound way?

Landfill

↓

Separate collection
1990 • Start separate collection and treatment of greenwaste and vfg-waste

1992 • Establishment of Vlaco npo: organisation to promote the production and use of quality compost in Flanders

1998 • Promotion home composting
      • Start education of compost masters
Flemish Compost and Digestate Quality Organisation

- Established in 1992, non-profit, independent organisation

Members

- More than 90 members, with activities related to organic waste management
  - Prevention
  - Collection
  - Waste treatment

- Representatives of the Flemish Government, together with public and private stakeholders:
  - OVAM (Public Waste Agency of Flanders)
  - Treatment plants (composting, anaerobic digestion)
  - Intercommunalities, some municipalities
Mission of Vlaco

Development and implementation of Policy

- Marketing
- Research
- Quality assurance and certification
- Prevention
Recycling biowaste – circular economy
Post-treatment digestate ↔ legislation

• Raw digestate: a high ratio of nutrients
• Flanders is relatively small, densely built & populated + a lot of cattle ➔ animal manure (nutrient surplus)
• Decree on soil remediation & soil protection + European Nitrate directive: use ALL of the manure and digestate as fertiliser ↔ too much nitrates and phosphates in the soil and ground water
• European Nitrate directive has been implemented in Flanders into a ‘Manure-decree’: limited application of nitrogen and phosphorus.

➔ fierce competition
  manure ↔ raw digestate (and compost)

➔ obligation for the post-treatment of manure and digestate
  => appearance of new digestate products
Products of (wet) anaerobic digestion

Biological treatment of biowaste

- Mechanical separation
- Biological treatment
- Filtration
- Concentrate
- Waste water

- Sludge
- Effluent
- Thermal drying
- Biothermal drying

- Liquid fraction
- Solid fraction
- Manure
- Energy crops
- Biowaste
- Raw digestate
- Anaerobic digestion

- Fertiliser
- Dried digestate
- Ammonium sulphate
- (Bio)thermal (manure) treatment and/or filtration
- (Bio)thermal (manure) treatment > fertilisers

- As input for biological treatment
More than 2 million T/y since 2010

Separate collection and treatment 2016

- VFG
- industrial organic waste
- green waste
- secondary materials
- energy crops
- manure
Composting
Green composting
Biowaste composting
Anaerobic digestion (wet)
Quality Assurance: the Vlaco QAS

- Legal obligation
- Compost and digestate products
- Clear end-of-waste criteria included
- Input / process / output / reasoned use
- Sampling and analysis under recognition
- Benchmarked with ECN-QAS
- Extra quality: label
## Certification in 2016

<table>
<thead>
<tr>
<th>Method</th>
<th># plants</th>
<th># audits</th>
<th># samplings</th>
<th># certificates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composting green waste</td>
<td>37</td>
<td>35</td>
<td>106</td>
<td>45</td>
</tr>
<tr>
<td>Composting vfg-waste</td>
<td>8</td>
<td>8</td>
<td>42</td>
<td>9</td>
</tr>
<tr>
<td>Anaerobic digestion</td>
<td>39</td>
<td>36</td>
<td>295</td>
<td>140</td>
</tr>
<tr>
<td>Other treatment of biowaste</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>5</td>
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<tr>
<td>Others</td>
<td>21</td>
<td>20</td>
<td>53</td>
<td>32</td>
</tr>
</tbody>
</table>
Professional treatment: Quality Assurance

✓ ‘Good practice’
✓ Based on self control
  by treatment plant
    • Internal quality system
    • Protocol of acceptance for input
    • Process control
    • Quality control of the end-products
    • Reasoned use of the end-products
✓ Independant control
  by VLACO npo on the self control of the company
    • Sample taking
    • Analysis
    • Audits + admin. controls

 VLACO-certificate

• Agricultural value
• Input requirements (standard)
• No dilution
• Registration and traceability
• Risk Assessment through sampling + analysis protocol (recognised labs)
• Screening of suppliers of biowaste
• Optimising of the process
• Minimal process time, tracing
• Critical process factors
• Monitoring and steering
• Recognised labs (external control)
• Product information document
• Composition + application
Compost market 2016

Bulks and bags: 425,000 tonnes

- Landscaping (public and private): 46%
- Growing media and organic fertilisers: 21%
- Export: 20%
- Agriculture and horticulture: 13%
- 2% is used in organic farming
Digestate market:
1.3000.000 tonnes
>99,99% in agriculture

Opportunities for dried digestate as or in commercial organic fertilisers
One size fits all?
Product differentiation - compost

Development of sustainable potting soil based on green compost and other organic recycled materials

- Need for better valorisation of green compost
- Ecological constraints about use of peat
- Increasing consumer awareness for sustainable garden products

→ Challenge is to pursue the quality and specifications of traditional potting soil
Product tailoring – digestate: DIMA-project

• IWT-VIS project 140995 (‘15-’17)
• Development of specific digestate (-based) end products by customer specifications and matchmaking
• Thereby stimulating revenues from AD-plants
Compost in organic farming

Greencompost is allowed in organic farming ➢ indicated on the quality certificate
## Quality criteria greencompost

<table>
<thead>
<tr>
<th>Parameter</th>
<th>QO</th>
<th>Percentile</th>
<th>Standard</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GENERAL PARAMETERS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entrance through a 40 mm sieve</td>
<td></td>
<td></td>
<td>&gt;99</td>
<td>%</td>
</tr>
<tr>
<td>Dry matter</td>
<td>&gt;50</td>
<td>20</td>
<td>&gt;45</td>
<td>weight %</td>
</tr>
<tr>
<td>Organic matter</td>
<td>&gt;16</td>
<td>20</td>
<td>&gt;14</td>
<td>weight %</td>
</tr>
<tr>
<td>pH (water)</td>
<td></td>
<td></td>
<td>6,5 - 9,5</td>
<td>-</td>
</tr>
<tr>
<td><strong>HEAVY METAL CONCENTRATION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arsenic</td>
<td>&lt;15</td>
<td>75</td>
<td>&lt;20</td>
<td>mg/kg DM</td>
</tr>
<tr>
<td>Cadmium</td>
<td>&lt;1,5</td>
<td>75</td>
<td>&lt;2</td>
<td>mg/kg DM</td>
</tr>
<tr>
<td>Chromium</td>
<td>&lt;70</td>
<td>75</td>
<td>&lt;70</td>
<td>mg/kg DM</td>
</tr>
<tr>
<td>Copper</td>
<td>&lt;90</td>
<td>75</td>
<td>&lt;150</td>
<td>mg/kg DM</td>
</tr>
<tr>
<td>Mercury</td>
<td>&lt;1</td>
<td>75</td>
<td>&lt;1</td>
<td>mg/kg DM</td>
</tr>
<tr>
<td>Lead</td>
<td>&lt;120</td>
<td>75</td>
<td>&lt;150</td>
<td>mg/kg DM</td>
</tr>
<tr>
<td>Nickel</td>
<td>&lt;20</td>
<td>75</td>
<td>&lt;30</td>
<td>mg/kg DM</td>
</tr>
<tr>
<td>Zinc</td>
<td>&lt;300</td>
<td>75</td>
<td>&lt;400</td>
<td>mg/kg DM</td>
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<tr>
<td><strong>IMPURITIES, STONES AND VIABLE SEEDS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impurities &gt; 2 mm</td>
<td>&lt;0,5</td>
<td>75</td>
<td>&lt;0,8</td>
<td>weight %</td>
</tr>
<tr>
<td>Stones &gt;5 mm</td>
<td>&lt;2,0</td>
<td>75</td>
<td>&lt;4</td>
<td>weight %</td>
</tr>
<tr>
<td>Viable seeds</td>
<td>&lt;1</td>
<td>90</td>
<td>Max. 1</td>
<td>#/l</td>
</tr>
<tr>
<td><strong>STABILITY/MATURITY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decomposition degree (temperature)</td>
<td>&lt;30</td>
<td>90</td>
<td>&lt;40</td>
<td>°C</td>
</tr>
</tbody>
</table>
Compost in organic farming: field trial

- Long term field trial at an agricultural research center (Inagro) 2003 – 2017
- 6 fertiliser strategies are tested (incl. object 5 with green compost)
- Traditional organic crop rotation: summerwheat with clover, cauliflower or broccoli, potatoes followed by grass-clover, leek, carrot
Compost in organic farming: field trial

- f.e.: broccoli (2012)
- Greencompost (20 tonnes/ha.y): the soil has a significant higher organic carbon content

<table>
<thead>
<tr>
<th>Measurement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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</thead>
<tbody>
<tr>
<td>C in % (lab Inagro)</td>
<td>1,08  c</td>
<td>1,24  bc</td>
<td>1,17  bc</td>
<td>1,29  bc</td>
<td>1,7  a</td>
<td>1,38  b</td>
</tr>
<tr>
<td>( P (Fth &gt; F) : 0,006 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( VC : 5,53 % )</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Yield of broccoli in 2012

Results from object with green compost
Compost in organic farming: field trial

![Graph showing compost application results](image-url)
Compost in organic farming: field trial

1. RDM + VRM
2. RDM + VRM + GC
3. RDM + HM
4. CMC + HM
5. GC + HM
6. VRM
Digestate in organic farming

- Organic farmers have interest in organic fertilisers such as digestate.


  - Composted or fermented mixture of vegetable matter:
    - Product obtained from mixtures of vegetable matter, which have been submitted to composting or to anaerobic fermentation for biogas production.

  - Biogas digestate containing animal by-products co-digested with material of plant or animal origin as listed in this Annex.
Digestate in organic farming

• Availibity of digestate from vegetable input only
• Quality of those products is certified
• AD plants are willing to limit inputs in return for the option to sell to organic farming

BUT still not allowed by competent authorities
Digestate in organic farming: field trial

- **PCFruit** (agricultural research center for fruitcrops) tested digestate used by pears from 2014 – 2017
- Comparison with manure and bloodmeal
- Digestate gives same quality of pears as manure and blood meal
- Blood meal additional to digestate gives no added value
- Fertilising with only blood meal: negative effects on soil on long term (less organic carbon in soil)
Digestate in organic farming: field trial

- No negative effect on soil biology
- Also other field trial show no negative effect of digestate on soil biodiversity

This graph indicates that there are no significant differences between digestate and other fertilising strategies.
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