ECN Country Report *2023*

Germany

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1 Introduction on bio-waste management in Germany

In Germany the separate collection of biowaste from households and greenwaste from gardens and parks has a long tradition and is one of the main measures in waste management. The separate collection of biowaste is also a basic requirement for the production of high-quality compost or digestate in order to recycle nutrients and organic matter. Biowaste is treated in composting or biogas plants for sanitation and maturation. At the end of the treatment process compost or digestate is produced. Compost or digestate from organic waste is used as organic fertiliser for agriculture or as soil improver. Furthermore compost can be used as a substitute for peat in horticulture or potting soils. However, the treated biowaste must meet the defined quality requirements and the treatment process must be environmentally safe as possible.
Since the beginning of the separate collection of biowaste from households in the year 1985 the amount of recycled biowaste has steadily increased. According to the latest national statistics by DESTATIS from 2020[1] about 15.37 million tons of biowaste were treated in biological treatment plants. About 10.12 million tons of organic municipal waste were determined; aproximately 4.91 million tons of biowaste from households, 4.55 million tons of greenwaste from garden and parks and 0.65 million tons commercial foodwaste. (s. figure 2)

2 National concept/strategy on bio-waste management

2.1 Legal framework

Circular Economy Act (Kreislaufwirtschaftsgesetz - KrWG 2012)[2]
The requirements and the processes of modern waste management are defined in the Circular Economy Act (KrWG). It covers the prevention, preparing for re-use, recycling, other (energy) recovery and disposal of waste. KrWG is implemented via ordinances for different waste material groups, e. g. for biowaste or sewage sludge. Furthermore the revised KrWG (§ 11 paragraph 1) obligates all waste producers and mandated waste management authorities to collect biowaste separately from the 1th of January 2015.

Biowaste Ordinance (Bioabfallverordnung - BioAbfV 1998)[3]
The revised Biowaste Ordinance (BioAbfV) of 2022 covers the application of treated and untreated biowaste and mixtures in and on soil. It also covers suitable raw materials, quality and hygiene requirements, and treatment and investigations of such biowastes and mixtures. BioAbfV regulates – from a precautionary perspective – the waste side (e. g. heavy metals) of the application, whereas the fertiliser law regulates the nutrient part. With the amendment from 2022, rejection values for impurities contents (> 3 % fresh matter) and controll values for plastic impurities in the collected biowaste will get in force on the 1st of May 2025. Additionally new requirements for the use of biological degradable collection bags for biowaste were set: Full disintegration within six weeks of composting and a new design of the bag including an imprint on the bag about the permissibility of the use of these bags in the respective municipality. No other packaging materials is allowed as input material in the composting and anaerobic digestion processes, packaged food products must be unpackaged for the biological treatment.

Fertiliser Application Ordinance (Düngeverordnung - DüV 2017)[4]
The revised Fertiliser Application Ordinance (DüV) gives the frame for the good practice of fertilising and shows special requirements for organic fertilisers. It includes the limit of 170 kg N/ha as restriction for the application of organic fertilisers; for compost an application about 510 kg N/ha of total nitrogen within 3 year is allowed based on the average of arable land of the farm. Additionally an off-time for application of compost or digestate which relevant nutrient contents in the winter period are set (1th of Dezember – 15th January). For an better

sufficient use of nitrogen, the ordinance set minimum values for nitrogen mineralisation from organic or organic-mineral fertilisers in the year of spreading: compost fom green waste 3 % and other compost 5% and a factor for nitrogen mineralisation of about 10 % for compost within three years after application. Further and specific measures in designated nitrat polluted areas has to be considered in the fertilisation managament of the farm.

Fertiliser Ordinance (Düngemittelverordnung - DüMV 2012)[5]
The Fertiliser Regulation (DüMV) regulates the trade of fertiliser. Compost or digestate is subject of DüMV as organic fertiliser or as soil improver. A declaration of the fertiliser type, raw material, nutrients and other product properties is obligatory. Also treshold values for impurities or contaminants are defined in DüMV. The requirements of the BioAbfV also apply.

Federal Soil Protection Act (Bundes-Bodenschutzgesetz - BBodSchG 1998)[6]
The Federal Soil Protection Act (BBodSchG) ensures the soil function and gives among others precautionary requirements for the contamination of soils. BBodSchG is relevant for the application of compost for landscaping and recultivation. BBodSchG is implemented via the Soil Protection Ordinance (BBodSchV). With the revision of BioAbfV in 2022, specifications for the application of compost and digestates in and on soils were regulated.

Animal by-products Regulation (EC) No 1069/2009 (ABPR)[7]**; German Animal by-products-disposal Ordinance (Tierische Nebenprodukte-Beseitigungsverordnung - TierNebV 2006**)[8]
In Germany the European Animal by-products Regulation is implemented by a national ordinance on the disposal of animal by-products (TierNebV). For kitchen and catering waste (biowaste from households = biobin material, commercial kitchen and catering waste) the treatment according to Biowaste Ordinance (BioAbfV) has to be fulfilled. The materials have to be collected and stored separately.

Renewable Energy Act (EEG 2023)[9]
The German Renewable Energy Act (EEG) promote the technology and the production of renewable energy (e. g. biogas production) which support the development of anaerobic digestion of organic waste.

2.2 Waste management programs and strategies

The Act for Circular Economy (KrWG, § 11 paragraph 1)[2] obligates all waste producers and mandated waste management authorities to collect biowaste separately from 1th of January 2015. Actually the participation in separate collection of biowaste is not 100 % implemented because not all German municipalities has yet established the separate collection and do not offer all citizen in all areas a biowaste bin. A major reason for low connection rate of biobins in some cities and areas is based in the voluntary use of the biobin for citizen

2.3 National standards and technical guidelines (collection, treatment and use)

A technical guideline for composting or digestion is given by the VDI Guideline No 3475[10]. The scope of this guideline is the emission control for biological waste treatment facilities. Also the revision of the technical guideline for prevention of air pollution (Technische Anleitung zur Reinhaltung der Luft - TA Luft 2021)[11] includes the requirements of the best available techniques reference documents on national level. Specification for composting and anaerobic digestion plants operation are also contained in the permit of the plants in accordance to the German Immission Control Legislation (BimSchG and BimSchV) depending on plant input capacity.

2.4 Quality Assurance Scheme (QAS) and National Quality Assurance Organisation (NQAO)

In the eighties of the last century the German recycling industry started a quality initiative in composting which led to the foundation of the German Compost Quality Assurance Organisation (BGK - Bundesgütegemeinschaft Kompost[12]) in 1989. BGK is the carrier of the RAL quality labels for compost, digestate and fertiliser/fertiliser source material. It is recognised by RAL, the German Institute for Quality Assurance and Certification[13], as being the organisation to handle monitoring and controlling of the quality of compost, digestate and fertiliser in Germany.
In 1992 a quality standard, quality label and the RAL quality monitoring system for compost was established (RAL GZ 251). In the year 2000 an additional quality scheme for digestate was started. With a revision in 2007,

digestate products were divided into two different product groups according to their input materials. RAL GZ 245 "Gärprodukt" secures the quality for digestate produces from waste and RAL GZ 246 "NawaRo-Gärprodukt" for digestate produced from renewable energy crops and manure. RAL GZ 252 for fertiliser (wood ashes) was introduced in 2012 and in 2019 a quality scheme for fertiliser source material was added, mainly for depackaged food waste (Lebensmittelrecycling) within RAL GZ 252.
BGK was founded to monitor the quality of compost produced from biowaste. Through consistent quality control and support of the compost producers in the marketing and application, the organisation aims to promote composting as a key element of modern recycling management. BGK works through regional compost quality assurance organisations. These regional organisations are made up of ordinary members - the compost producers - and extraordinary members or promoters, amongst whom are those interested in composting, for example representatives from analytical laboratories, authorities, industry, science, and local authorities. In total, there are more 750 members who take part in the different quality assurance schemes by BGK.
In February 2023, 595 compost plants, 187 digestion plants, 18 incineration plants producing ashes from wood and 9 plants depacking food waste for the use in digestion plants take part in the quality assurance system and have applied for a RAL quality label (s. figure 1).

Figure 1: Product groups, number of participants, product name and quality labels of the German Quality Assurance Organisation (BGK)[14]

Gütesicherung	Anlagen	Produkte/Leistungen	Gütezeichen
Kompost RAL-GZ 251	595	Fertigkompost Frischkompost Substratkompost	
Gärprodukte RAL-GZ 245	145	Gärprodukt fest Gärprodukt flüssig	
NawaRo-Gärprodukt RAL-GZ 246	42	NawaRo-Gärprodukt fest NawaRo-Gärprodukt flüssig	
Holzaschen RAL-GZ 252/1	18	Holzaschen	
Lebensmittelrecycling RAL-GZ 252/1	9	Substrat aus der Aufbereitung	

Stand Februar 2023

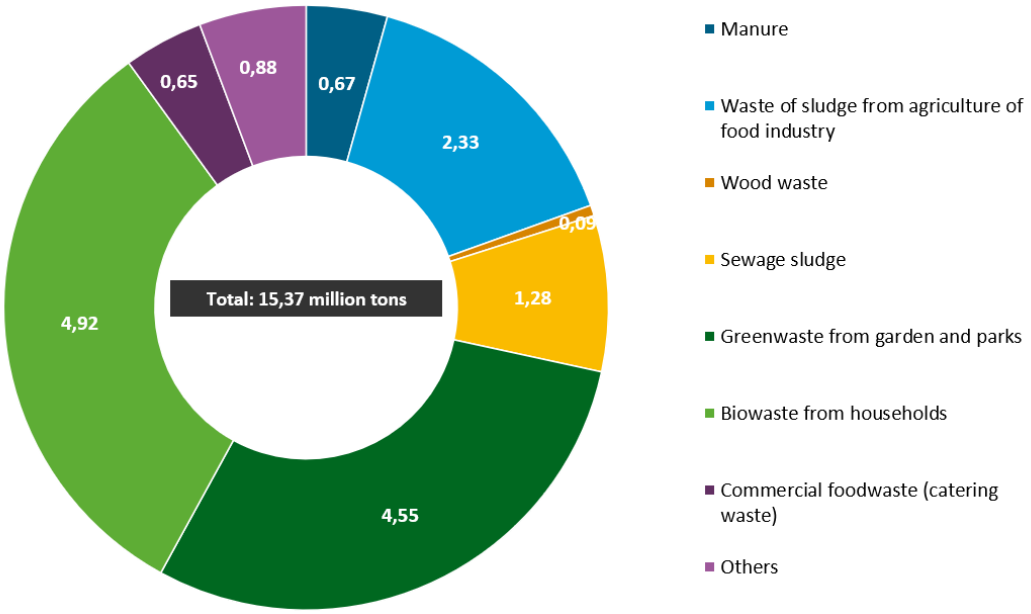
Besides the central office which oversees activities, a quality committee works as the main supervision and expert body in the quality assurance system. It controls the results of analysis and decides upon necessary measures. It is composed of representatives from research, laboratories, producers, compost users and authorities.
General quality standards were defined for compost, digestate, wood ashes and depackaged food waste. This includes the establishment of a national system for external monitoring of the products and production plants. The frequency of the investigations during the recognition procedure and the subsequent ongoing monitoring procedure depends on the plant input capacity. At least four inspections should be carried out during the first year of operation – one for every season – to assess the essential quality characteristics over the course of the

year. At least one sample should be taken every three months. In the following years, when the plant is working normally, it is possible to reduce the frequency and scale of inspection.[12]
Sampling and investigations must be done by an approved external sample taker and approved laboratory which does the analyses – in line with the procedures laid down by the Quality Committee of the BGK. The Quality Committee of the BGK has issued specifications for high-quality compost, digestate and ashes. The quality labels represent these specifications. This allows a standardisation of quality and enhances the product's sales image. The labels awarded by the BGK also mean that there are regular checks by independent bodies to ensure that product quality is maintained after the label has been awarded. The up-to-date quality criteria and directives of the BGK are the basis for the awarding of the RAL quality labels to treatment plants. The RAL quality criteria are valid for the different product types.[12]
The long-standing activities of the BGK for the standardisation, monitoring and declaration of high-quality products lead to an acknowledgement of these measurements by the law maker as "self-obligation of the industry". In addition the law making body implicates that the biowaste which is under continuous monitoring by and independent organisation is not a product but "likely a product". So members of the Quality Assurance Organisation which render themselves subject to a voluntary quality monitoring are widely exempted from an official control and from proof obligation by regional authorities based on the legal exemption set out in BioAbfV.

3 Source separated collection of bio-waste

The separate collection of biowaste is a precondition for the recycling of organic substances and nutrients. Only from separately collected biowaste a high-quality compost or digestate can be produced which is suitable for agricultural or horticultural use.
Biowaste includes biowaste from households (biobins) and trade, garden- and park-waste, catering and food waste, waste from food processing and agricultural waste. It should be noted that a large proportion of agricultural residues, such as manure, are not part of this, as they are not disposed of as waste. The next figure shows the composition of biowaste supplied to biowaste treatment plants in the year 2020.

Figure 2: Composition of organic waste supplied to treatment plants (published by UBA[15],data DESTATIS[1])



As output of the biological treatment of this biowaste

- 1.5 million tonnes of biowaste compost,
- 2.2 million tonnes of green-waste compost,
- 3.7 million tonnes digestate and composted digestate as well as
- 0.3 million tonnes of sewage sludge compost

were produced in the year 2020.[15]

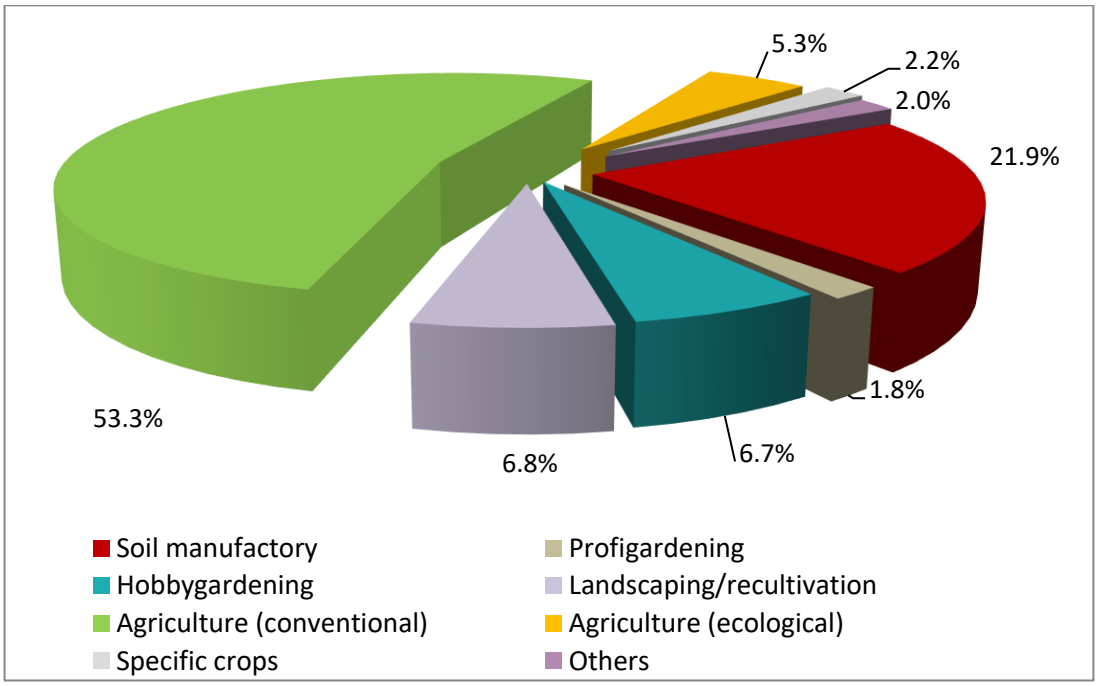
4 Bio-waste treatment

According to the national statistics by DESTATIS from 2020[1] 1.192 biological treatment plant exits in Germany. There are 218 biowaste composting plants with an input of 3.4 million tons, 599 green-waste composting plant with an input of 4.0 million tons, 58 combined digestion and composting plants with an input of 2.1 million tons, 227 digestion plants with an input of 4.1 million tons, 69 sewage sludge composting plants with an input of 0.6 million tons and 21 other biological treatment plants with an input of 1.2 million tons.

5 Application and market

Agriculture is the beneficiary of the recycling of biowaste. That was calculated by the annual statistics of the German Quality assurance organisation for compost (BGK)[15]. Almost all digestates and nearly 60 % of all composts are provided to agriculture. They are used as organic fertilisers on farming land.
The advantage is the substitution of mineral fertilisers as well as the soil improvement. Not only the nutrient content but also the organic matter of compost and considerable contents of liming materials argue for compost or digestate use in agriculture. To improve soil properties by using the stable organic matter of high-quality composts is seen as an appropriate solution for soil degradation. Especially the demand for compost by organic farming is increasing. A lot of compost is also applied in horticulture and in private gardens. Especially the demand for compost as substitute for peat may increase in the next years.

Figure 2: Market distribution of compost with quality label in 2016 (BGK, 2020)[16]



6 Expected trends and developments

The main item for the separate collection of biowaste in Germany is to optimise the quantity and quality of biowaste. According to the legal situation the separate collection of biowaste is expected to increase in Germany in the next years. Especially the recycling of kitchen waste is of note. Approximately one third of the mixed waste still consists of organic waste; a hugh potential that has so far remained untapped.
Another important issue for the separate collection is the sorting accuracy for biowaste. A wrong filling of biobins cause problems for the treatment and guaranteeing high compost quality. Especially impurities like plastics or glass must be sorted out during the treatment and recycling of biowaste in composting or digestion plants. Therefore, separate collection must be accompanied by active public relations and guidance by municipalities. The sorting accuracy must be guaranteed and to be controlled. "Clean" biowaste (without impurities) is the basic to produce a high-quality compost. The amended biowaste ordinance (BioAbfV) is a strong driver to this development.
Because of the revised Fertiliser Regulation with new restrictions for the application of organic fertilisers on farming land the marketing conditions for compost or digestate are expected to become more difficult especially in regions with high animal density. Ecological farming or substitution of peat in the soil manufactory is a growing market for compost use. Also, the quality demand by hobby-gardening or horticulture users will increase. For all markets, compost producer must fulfil high quality demand for his compost.

7 Contacts and sources of information

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BGK is the German quality assurance organisation for compost, digestate, wood and depacking food waste.

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8 Annexes

[1] **DESTATIS: Statistisches Bundesamt, Abfallbilanz 2020**
https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Umwelt/Abfallwirtschaft/Publikationen/Downloads-Abfallwirtschaft/abfallbilanz-pdf-5321001.html
[2] **Act for Circular Economy (Kreislaufwirtschaftsgesetz - KrWG 2012, latest amendment 27.07.2021)**
http://www.gesetze-im-internet.de/krwg/index.html
[3] **Biowaste Ordinance (BioAbfV 1998, latest amendment 28.04.2022)**
http://www.gesetze-im-internet.de/bioabfv/index.html
[4] **Fertilising Ordinance (DüV 2017, latest amendment 12.4.2017, latest amendment 10.08.2021)**
http://www.gesetze-im-internet.de/d_v_2017/
[5] **Fertiliser Ordinance (Düngemittelverordnung DüMV 2012, latest amendment 02.10.2019)**
http://www.gesetze-im-internet.de/d_mv_2012/index.html
[6] **Federal Soil Protection Law (BBodSchG 1998, latest amendment 25.02.2021**)
http://www.gesetze-im-internet.de/bbodschg/
[7] **Animal by-products Regulation (EC) No 1069/2009, latest amendment 14.12.2019**
https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=CELEX%3A32009R1069&qid=1677679627972
[8] **Animal by-products-Disposal Ordinance (TierNebV 2006, latest amendment from 04.12.2018)**
http://www.gesetze-im-internet.de/tiernebv/index.html
[9] **Renewable Energy Law (EEG 2023, latest amendment from 20.07.2022)**
http://www.gesetze-im-internet.de/eeg_2014/
[10] **VDI Guideline No 3475**
http://www.beuth.de/de/technische-regel/vdi-3475-blatt-1/59262060

[11] **Technical guideline for prevention of air pollution (TA Luft 2021)**
https://www.verwaltungsvorschriften-im-internet.de/bsvwvbund_18082021_IGI25025005.htm
[12]**BGK, Bundesgütegemeinschaft Kompost e.V.**
https://www.kompost.de/
[13] **German Institute for Quality Assurance and Certification (RAL)**
https://www.ral.de/
[14]**BGK: Zahlen und Fakten**
https://www.kompost.de/ueber-uns/zahlen-und-fakten/
[15] **Umweltbundesamt (UBA), 2022**
https://www.umweltbundesamt.de/daten/ressourcen-abfall/verwertung-entsorgung-ausgewaehlter-abfallarten/bioabfaelle#bioabfalle-gute-qualitat-ist-voraussetzung-fur-eine-hochwertige-verwertung
[16] **BGK, 2021: Absatzwege gütegesicherter Komposte 2016**
https://www.kompost.de/fileadmin/user_upload/Dateien/Zahlen/Markt_Info_2021.pdf