

The annual data evaluation was done by BGK in February 2018 for the recent year 2017. The results are published as activity report 2018 by BGK.

The following figure shows the development of the total throughput of composting and digestion plants with quality assurance since 2000. In the last year the total amount of input materials for composting was 7 million tons, means an average throughput per plant of 13.280 tons per year and plant. Furthermore 4,734 million tons were digested, means an average throughput per biogasplant of 27.846 tons per year.

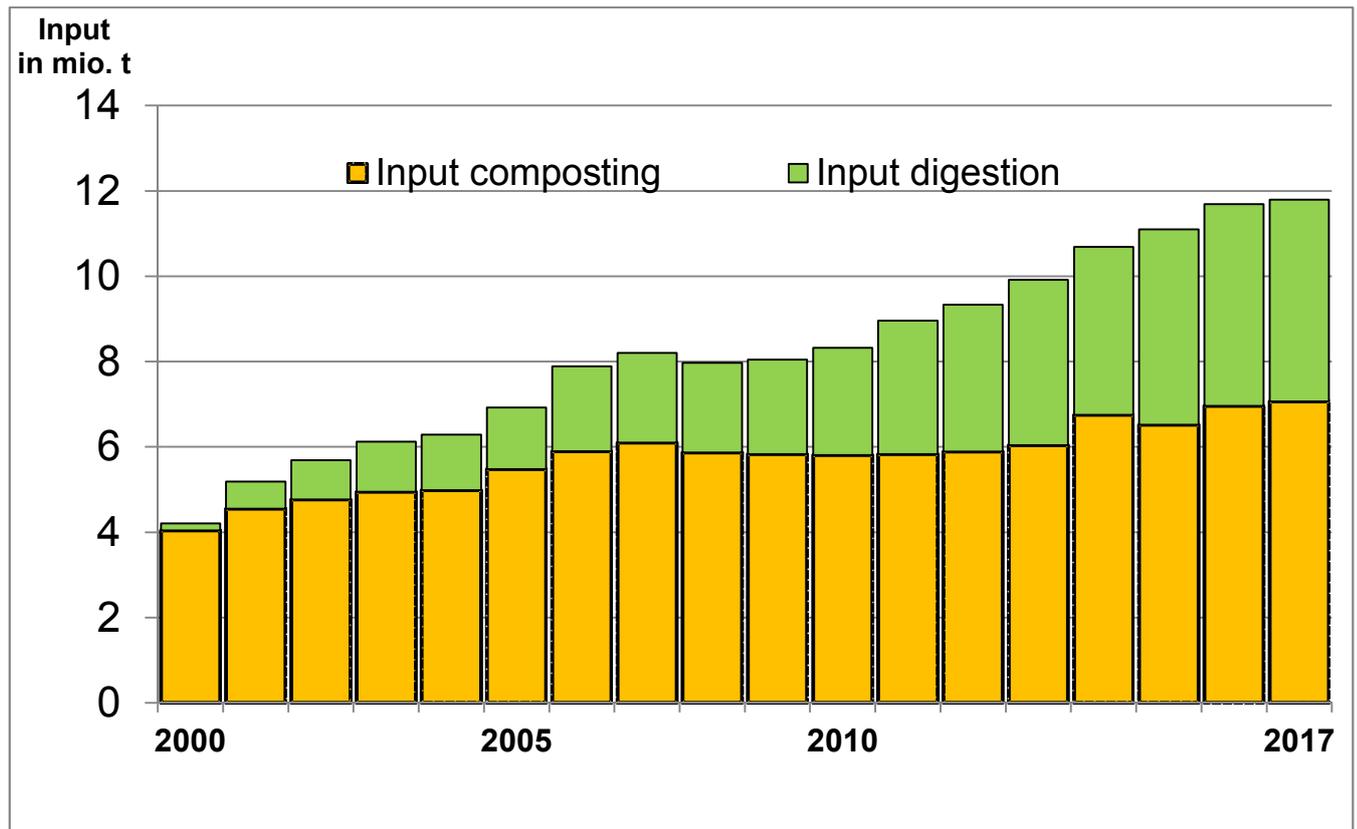


Figure 1: Development of input of compost and digestion plants with quality assurance from 2000 until 2017

Corresponding to the different input materials nearly 50 % of the composting plants treat only green waste. The other 50% of plants treat a mix of separately collected biowaste (usually content of biobins) and greenwaste for composting.

Usually the greenwaste composting plants are rather small ones and the composting is usually done in open windrow composting systems. Separate collected biowaste in mixture with greenwaste is usually treated and composted in enclosed and larger composting plants.

Beyond that differentiation between open and enclosed systems a wide range of different composting systems can be found in practice. For the quality assurance of BGK the different systems were described in the Hygiene Test System (HBPS) by BGK. Here we find composting systems divided in different categories called "Baumuster". Category 6 for example describes the different open windrow systems.

Table 1: Overview composting systems

1	2	3	4	5	6		7
Boxes/ Container	Briquets	Tunnel/ Line	Trommel	Windrows	Open Windrows		Windrow enclosed (Membrane-Cover)
				enclosed	open	Roofed over	
1.1 Herhof Boxen	2.1 Brikollare (42 days)	3.1 Gicom-Tunnel	4.1 Envital	5.1 Horstmann/Kompo Plus/Sutco Kompoflex (7 weeks)	6.1 Dreiecksmiete, belüftet	6.7 Tafelmiete, belüftet	7.1 GORE™ Cover (6 Weeks)
	2.1 A Brikollare (21 days)			5.1 a Horstmann/ Kompo Plus/Sutco Kompoflex (10 days)			
1.2 Biodegma		3.2 Bioferm-Tunnel		5.2 Bühler Wendelin	6.2 Dreiecksmiete, unbelüftet	6.8 Dreiecksmi ete unbelüftet	7.2 GORE™ Cover (14 days)
1.3 ML- Container		3.3 Geotec-Tunnel (14 days)		5.3 AE und Koch	6.3 Tafelmiete (I), unbelüftet		7.3 Humivit/Plus
1.4 BRV-Boxen		3.3 A Geotec-Tunnel (7 Tage)		5.4 Thyssen-Dynacomp	6.5 Tafelmiete, belüftet		
		3.4 Linde KCATunnel		5.5 Stratmann	6.6 Tafelmiete (II), unbelüftet		
		3.5 Sutco-Biofix Zelle		5.6 KNO Bremen	6.9 WURM Komp- Aktiv		
		3.6 Horstmann WTT-Tunnel					

Plant inspection:

Each regional quality assurance organisation assigns a quality manager for visiting their members and for the inspection of the compost plants. The quality manager reports the result of his audit to the BGK office. For surveillance procedure the plant inspection has to be done every two years, for the recognition procedure every year if necessary. The work of the quality manager is based on a special contract.

List of approved labs

The actual list of the 73 approved labs is published on the website of BGK under the heading: *Laboratories*.

The laboratories have to be acknowledged for the quality assurance systems by BGK. For that they are obliged to take part successful in a ring test for biowaste every 2 years. With the certificate of the ring test they can be acknowledged for the quality assurance. Additionally they have to fill in a form to declare that they work according the guidelines of BGK (Acknowledged sample taking, analyses according to the method book, report of results 20 work days after sample taking, reporting with special software to BGK (ZASLab) without preliminary information to the compost plant, independence from compost producer).

The last national ring test for all laboratories took place in 2017 in co-operation with BGK.

Compost quality:

An overview about product quality in the year 2017 is given in the following table 2 with the average and range of values for compost and in table 3 with average and range of values for digestate.

Table 2: Product quality of compost in the QAS in 2017 (n=3362 samples)

Criteria	Compost 2017	Mean	Median			
		25% quantile	50% quantile	75% quantile	95% quantile	
Nutrients:						
Nitrogen, total (N) [% DM]		1,42	1,10	1,40	1,70	2,10
Phosphate, total (P ₂ O ₅) [% DM]		0,68	0,49	0,65	0,83	1,12
Potassium, total (K ₂ O) [% DM]		1,23	0,91	1,20	1,51	1,95
Magnesium, total (MgO) [% DM]		0,80	0,48	0,71	0,98	1,61
Nutrients soluble:						
Nitrogen, CaCl ₂ -soluble (N) [mg/l FM]		286	89	220	414	794
Ammonium soluble (NH ₄ -N) [mg/l FM]		225	23	134	340	750
Nitrate soluble (NO ₃ -N) [mg/l FM]		61	3	10	63	304
Phosphat, CAL-soluble (P ₂ O ₅) [mg/l FM]		1121	790	1100	1441	1900
Potassium, CAL-soluble (K ₂ O) [mg/l FM]		3748	2540	3600	4790	6600
Physical criteria						
Bulk density [g/l FM]		641	560	640	720	859
Dry matter [%]		62,3	55,7	62,0	68,8	78,7
Impurities > 2 mm [% DM]		0,09	0,01	0,04	0,12	0,32
Plastic foils as impurities > 2 mm [% DM]		0,009	0,000	0,001	0,010	0,040
Surface area of all impurities cm ² /litre FM		4,7	1,0	3,0	6,1	16,0
Biological criteria						
Plant response (25 % rel.) [%]		110	103	109	116	132
Plant response (50 % rel.) [%]		102	92	102	111	127
Chemical criteria						
Salt content [g/l FM]		4,4	2,3	3,8	5,9	9,5
pH		8,25	7,9	8,4	8,8	9,1
C/N ratio		16,9	13,2	15,6	18,8	27,8
Hygiene:						
Seeds [per litre]		0,03	0	0	0	0
Loss of ignition [%]		38,8	31,8	38,1	45,0	55,8
Basic substances (CaO) [% DM]		5,0	3,0	4,4	6,2	10,6
Heavy metals:						
Lead Pb [mg/kg DM]		30,4	21,0	27,0	36,0	57,0
Cadmium Cd [mg/kg DM]		0,41	0,30	0,37	0,48	0,79
Chromium Cr [mg/kg DM]		21,97	15,40	20,00	26,30	39,00
Copper Cu [mg/kg DM]		39,11	29,00	36,90	47,00	63,00
Nickel Ni [mg/kg DM]		13,62	8,60	12,20	17,00	26,00
Zinc Zn [mg/kg DM]		160,9	130,0	155,0	184,0	243,0
Mercury Hg [mg/kg DM]		0,10	0,06	0,09	0,12	0,22

Table 3: Product quality of liquid digestate in the QAS in 2017 (n=1104 samples)

Criteria	Liquid digestate 2017	Mean	25% quantile	Median	75% quantile	95% quantile
Nutrients:						
Nitrogen, total (N) [% DM]		11,9	5,3	11,2	16,5	24,9
Phosphate, total (P ₂ O ₅) [% DM]		3,7	1,7	3,6	4,8	8,7
Potassium, total (K ₂ O) [% DM]		5,4	3,1	4,7	6,4	12,1
Magnesium, total (MgO) [% DM]		0,8	0,4	0,7	1,0	1,8
Nutrients soluble:						
Nitrogen, CaCl ₂ -soluble (N) [mg/l FM]		3263	2192	3141	4264	5921
Ammonium soluble (NH ₄ -N) [mg/l FM]		3256	2185	3120	4263	5917
Nitrate soluble (NO ₃ -N) [mg/l FM]		7	1	2	4	11
Phosphat, CAL-soluble (P ₂ O ₅) [mg/l FM]						
Potassium, CAL-soluble (K ₂ O) [mg/l FM]						
Physical criteria						
Bulk density [g/l FM]		1013	1000	1000	1022	1100
Dry matter [%]		6,8	3,6	5,0	7,8	17,4
Impurities > 2 mm [% DM]		0,02	0,00	0,00	0,00	0,07
Plastic foils as impurities > 2 mm [% DM]		0,01	0,00	0,00	0,00	0,03
Surface area of all impurities cm ² /litre FM		1,5	0,0	0,0	0,0	7,0
Biological criteria						
Stability (organic acids) mg/litre		816	260	486	900	2513
Chemical criteria						
Salt content [g/l FM]		17,5	12,4	16,8	20,9	29,1
pH		8,4	8,2	8,4	8,5	8,8
C/N ratio		4,2	2,1	3,0	6,1	9,6
Hygiene:						
Seeds [per litre]		0,0	0,0	0,0	0,0	0,0
Loss of ignition [%]		56,8	50,0	56,4	64,0	76,2
Basic substances (CaO) [% DM]		5,5	3,7	5,2	7,2	10,5
Heavy metals:						
Lead Pb [mg/kg DM]		12,4	3,0	4,9	15,9	44,0
Cadmium Cd [mg/kg DM]		0,39	0,23	0,35	0,50	0,76
Chromium Cr [mg/kg DM]		18,1	10,0	15,1	24,1	38,9
Copper Cu [mg/kg DM]		61,5	36,9	54,0	75,0	120,0
Nickel Ni [mg/kg DM]		14,6	9,6	12,2	17,0	27,0
Zinc Zn [mg/kg DM]		284,6	190,0	243,0	335,0	586,9
Mercury Hg [mg/kg DM]		0,08	0,03	0,05	0,10	0,24

Market report:

Biodegradable waste products are used in quite different fields on account of their manifold characteristics. Statistical numbers of 2017 are shown in the following figure for RAL quality assured compost products (figure 2):

Most of the compost products (57%) are used as organic fertilisers and soil improvers for agriculture. Not only the nutrient content but also the organic matter of compost and considerable contents of alkaline material (lime) argue for compost use in agriculture. Especially the demand for compost for organic farming is increasing. The decline of organic matter in European soils as well as the soil degradation by erosion become more and more important. To improve soil properties by using the stable organic matter of high quality composts is seen as an appropriate solution for these problems.

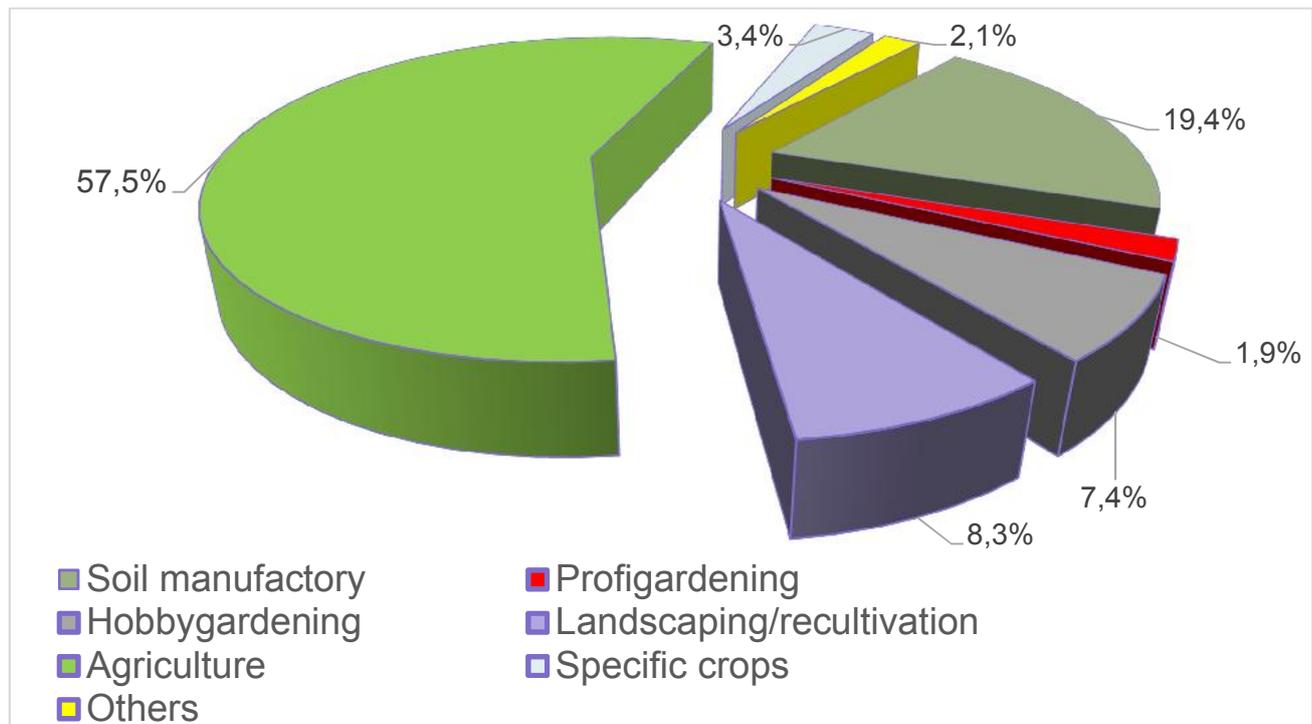


Figure 2: Market distribution of compost in 2017

Other areas of application like gardening or soil manufactory show a more favourable market situation because higher proceeds can be generated. But those fields compared with agriculture have distinctly smaller areas. But they are provided with a real demand in the sense of a free economy, based on the necessary use of humus which has to be bought as an additional means of soil improving. Especially the branch of horticulture and landscaping should be mentioned here. Also the use of compost as replacement for peat e.g. in potting soils is an interesting market in future.

Quality Assurance as a marketing tool

The consumer demand for quality assured products has increased considerably. This is reflected in the high amount of product quality labels of the food processing industry. According to this development the demands on the input materials of the foodstuff industry or of agricultural systems growth up, too. The experience has shown that without a well-established and acknowledged quality assurance system for compost products the market for waste-derived products is turning down. Today in several cropping systems only quality assured compost products are allowed. Furthermore in environmental risk areas (like water protection areas) the demand on controlled and certificated fertilisers and soil improvers plays an important role. Quality assured compost products which fulfil the requirements of the EU regulation on organic farming (EU Regulation NO. 834/2007) are listed in the official organic input material list of the research institute for organic farming (FiBL) and other organisations for organic farming like BIOLAND or NATURLAND opened their guidelines for certified compost regarding additional requirements.

Additionally to the certification of the compost products the BGK has also published different guidelines for good practice

1. for the application and use of compost in agriculture
2. or for the application and use of compost in water protection areas
3. for the good practice of composting in order to avoid emissions