I. Presentation of the Bundesgütegemeinschaft Kompost e.V. (BGK)

1.Quality Assurance Organisation

On account of the very bad mixed waste compost image in the late eighties the German recycling industry started a quality initiative in composting which led to the foundation of the German **Compost Quality Assurance Organisation (Bundesgütegemeinschaft Kompost BGK)** in 1989. This BGK organisation is the carrier of the RAL quality labels for compost, digestate, sewage sludge and sewage sludge compost. It is recognised by the RAL, the German Institute for Quality Assurance and Certification, as being the organisation to handle monitoring and controlling of the quality of compost, digestate, sewage sludge and humus products of sewage sludge in Germany.

In 1991 a quality standard, a quality label and the RAL quality monitoring system for the composting of source separated organic residues from households and gardens was established (RAL GZ 251). In 2000 an additional quality assurance system for digestion residuals (RAL GZ 256) was introduced. With the revision in 2007 the digestate products are divided into two product groups for digestion residuals according to the input materials: the RAL GZ 245 for digestion products and the RAL GZ 246 for digestion products produced from renewable energy materials. The RAL GZ 258 for AS Humus (sewage sludge compost) was introduced in 2003. In 2009 the BGK has introduced a quality assurance scheme for recycling of sewage sludge in respect to fertilisation purposes with the RAL GZ 247 for AS Düngung (sewage sludge for fertilisation). In 2011 a further label for fertilisers was established. The new label RAL-Dünger (RAL-GZ 252) was designed for other recycled organic fertilisers and input material for organic fertilisers like ashes as residues from biomass incineration.

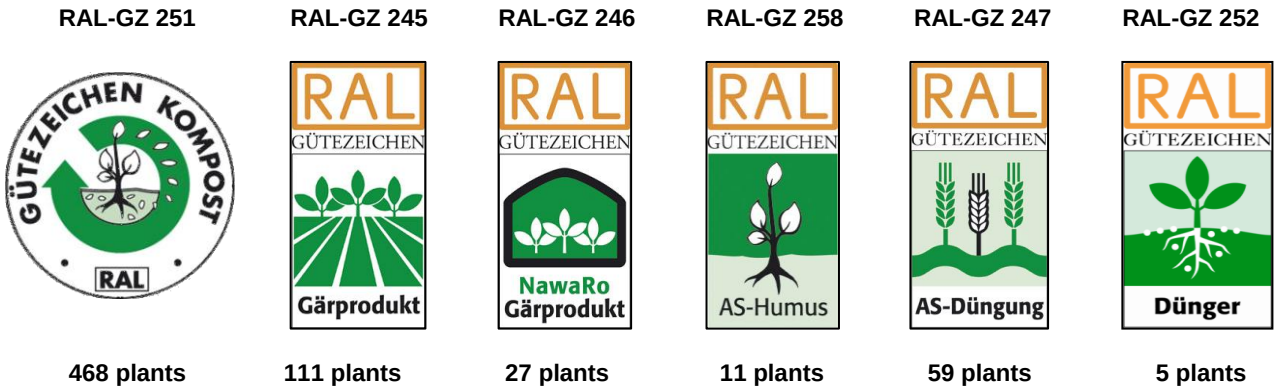

Figure 1: Quality labels and number of plants in the German Quality Assurance Organisation BGK

The Compost Quality Assurance Organisation was founded in order to monitor the quality of secondary raw materials from biodegradable waste. Through consistent quality control and support of the compost producers in the marketing and application sectors, the organisation aims to promote composting as a key element of modern recycling management.

The BGK works through a central office in Cologne and regional compost quality assurance organisations. The quality assurance organisations are made up of ordinary members – the producers – and extraordinary members or promoters, amongst whom are those interested in composting or digesting, for example representatives from analytical laboratories, authorities, industry, science and local authorities. Today there are more than 600 members in the BGK organisation. Actually 468 composting plants, 111 digestion plants, 27 biogas plants for renewable energy crops and manure, 11 composting plants for sewage sludge compost and 59 sewage sludge treatment plants take part in the quality assurance system and have applied for the different RAL quality labels.

Each regional quality organisation determine a quality manager for the plant inspections and visits. An overview about the different regional organisations and quality managers with contact addresses is given in figure 2 on the following side.

The central office in Cologne oversees all activities according to the quality assurance and runs a database with all indicators of the composting plants and analyses results of the products. The database (ZAS.net) includes more than 60.000 data. Also all documents of quality assurance are created out of these database.

An overview about the responsible persons in the central office is given in the organigram in figure 3 on side 5. Other responsible bodies in the organisation are the Annual Meeting of the Members, the Management Board (3-4 meetings per year) and the Quality Committee (2 meetings per year). Detailled information about the composition of the Management Board and the Quality Committee is given in table 1 and 2.

Regional Quality Assurance Organisations and Quality Manager

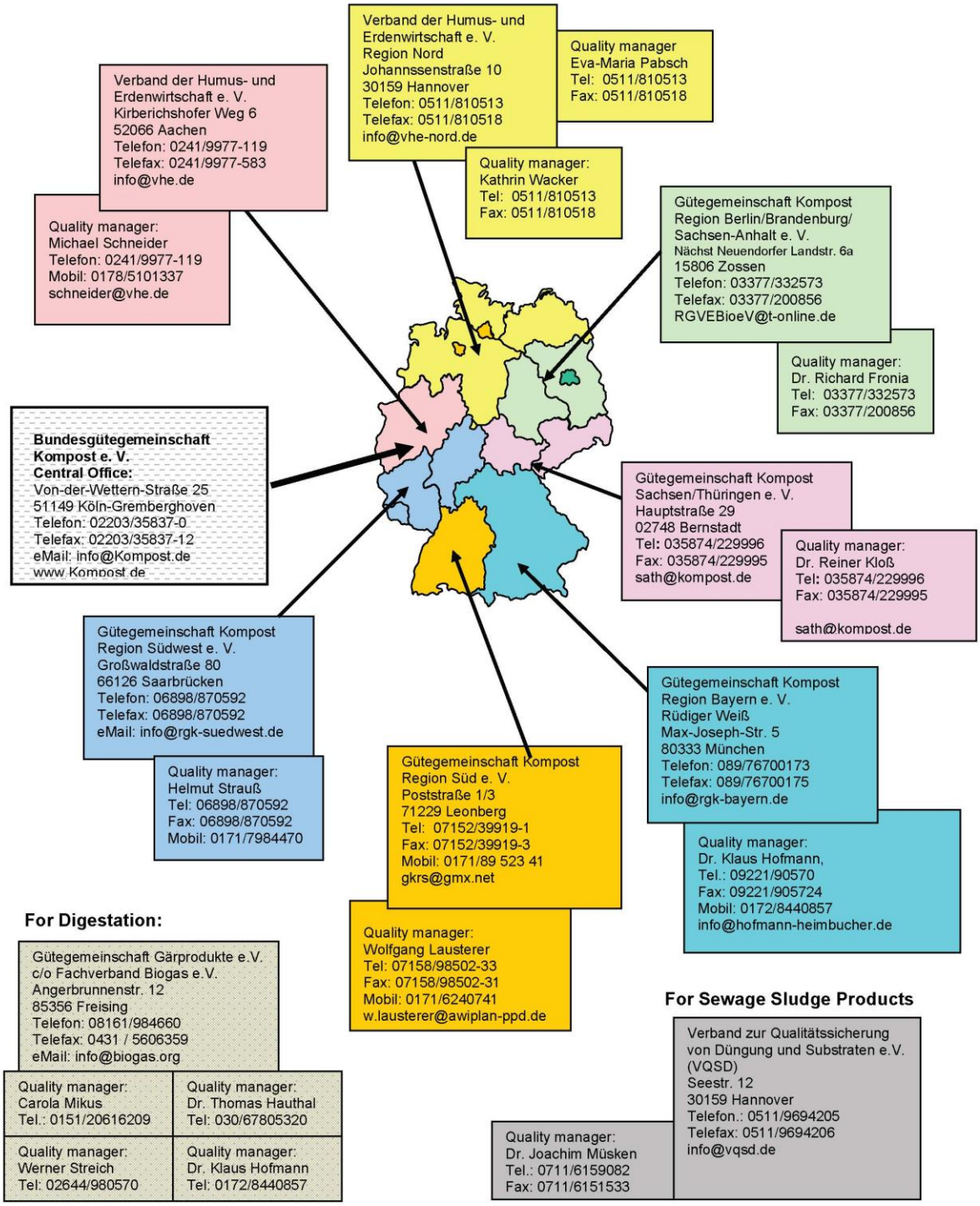

Figure 2: Regional quality assurance organisations and quality managers

Table 1: Members of the Board of BGK

CHAIRMAN:

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Herr Michael Buchheit
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94034 Passau
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CHAIRMAN OF THE QUALITY COMMITTEE

Herr Prof. Dr. Ing. Martin Kranert
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Herr Volker Höhne
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Table 2: Quality committee of BGK

CHAIRMAN:	
Prof. Dr.-Ing. Martin Kranert Institut f. Siedlungswasserbau,Wassergüte- und Abfallwirtschaft Bandtäle 1 70569 Stuttgart	
MEMBERS:	
Manuela Beyer EWE Biogas GmbH & Co. KG Ismus 45 a 26409 Wittmund	**Ralf Gottschall** Humus & Erden Kontor Karsbrunnenstr. 11 37249 Neu-Eichenberg
Dr. Patrick Lantzsch Ministerium für Ländliche Entwicklung, Umwelt und Verbraucherschutz Referat Umwelt- und Bodengeologie Heinrich-Mann-Allee 103/Haus 45 14473 Potsdam	**Jochen Lippross** Lobbe Entsorgung GmbH Hegestück 20 58640 Iserlohn
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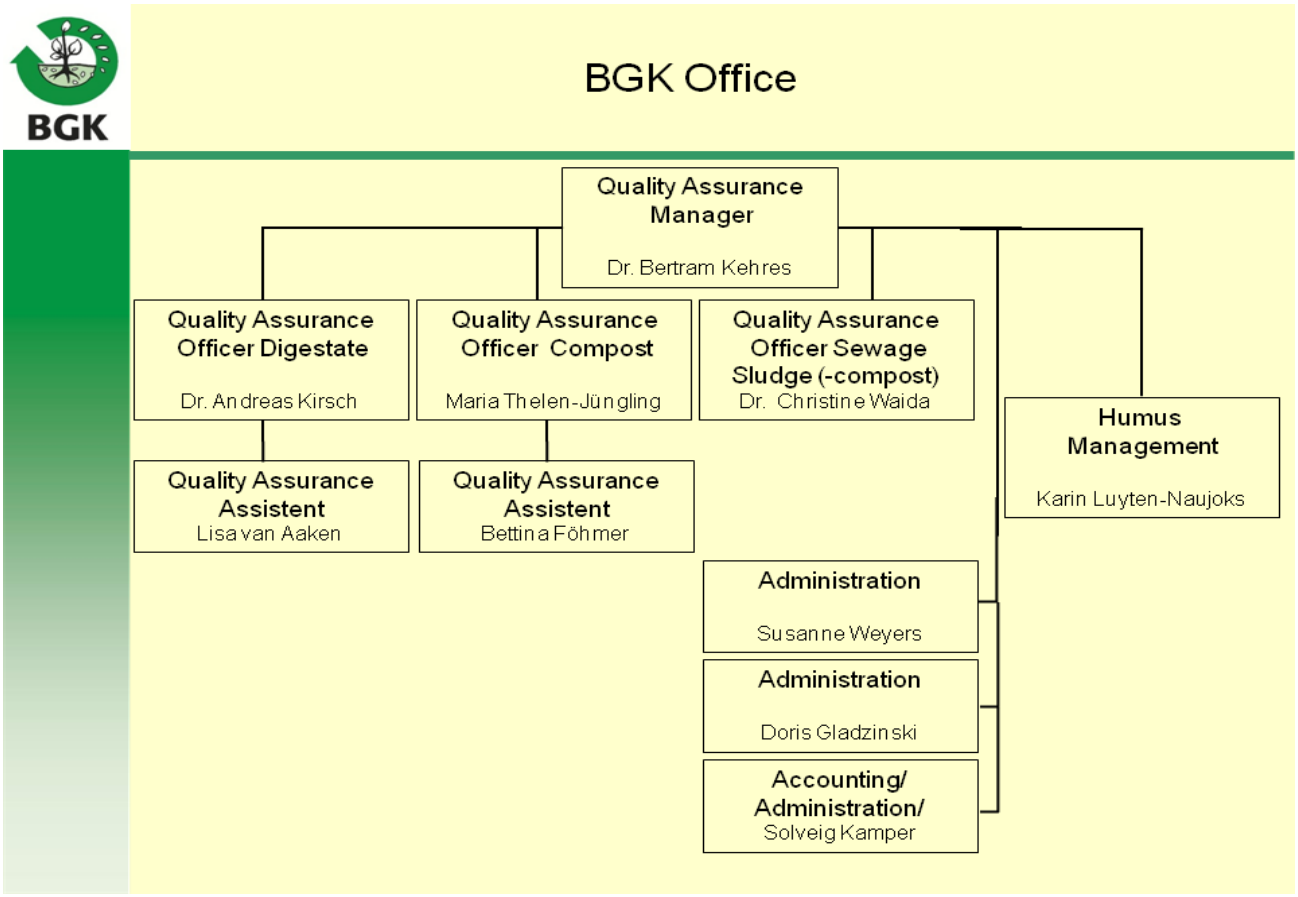

Figure 3: Structure of the central office BGK in Cologne

2.Course of the Quality Assurance System

The BGK has defined a general quality standard for each RAL quality label and established a nationwide system for external monitoring of composting and digestion plants and of compost and digestion products (Figure 4).

The quality assurance programme contains the definition of quality requirements, enables quality monitoring, and can enforce quality standards or discipline plants for failure to meet regulations and the labelling of the quality standard. The type, extent and frequency of evaluations depend on the capacity of the composting or digestion plant. In order to guarantee an identical standard for the monitoring all over Germany, BGK established a central office where all results originated from external monitoring are evaluated and controlled.

In order to obtain the quality label a plant has to start with a recognition procedure (usually 1 year) to show that they can fulfil the quality standard with their products. After this procedure the Quality Committee has to decide about awarding the quality label. Afterwards the plants take part in the continuous supervision procedure.

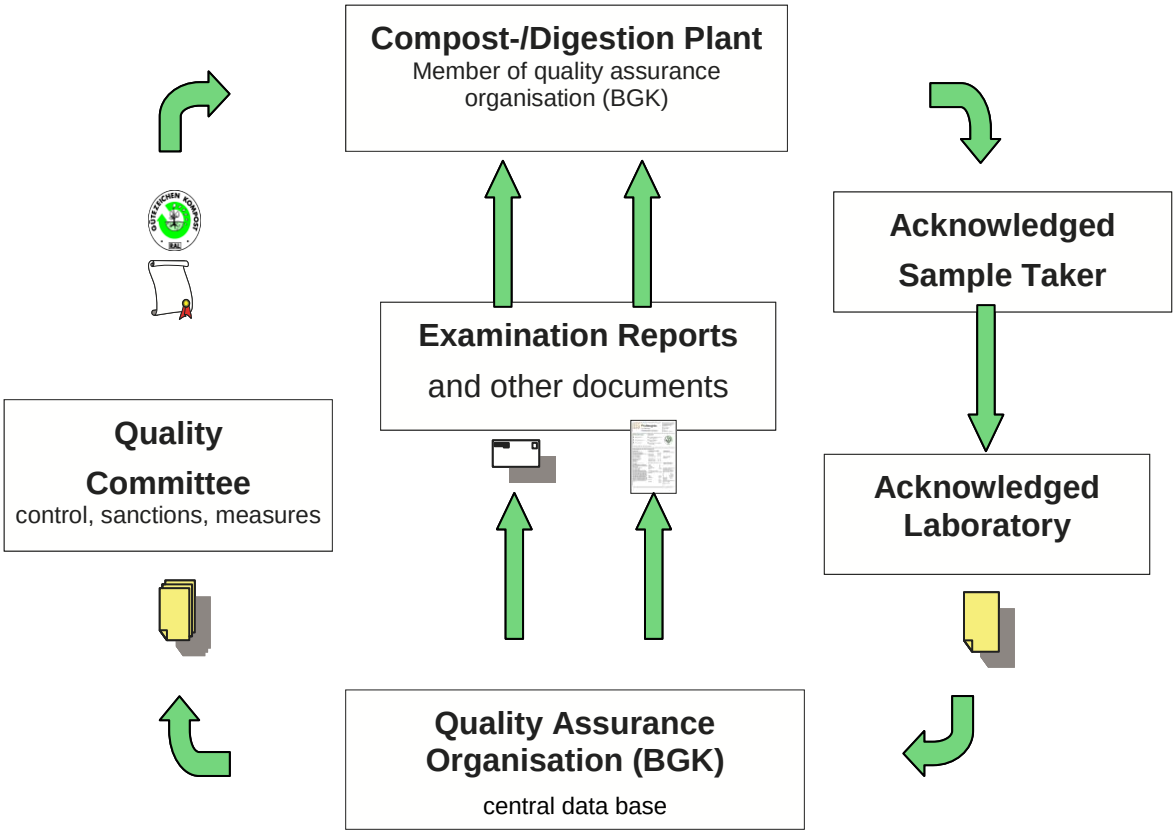

Figure 4: Course of Quality Assurance by BGK

The Quality Committee works as the main supervisior and expert body in the quality assurance system. It awards the quality label, controls the results of analysis and decides upon necessary measures. It is composed of representatives from authorities, research, laboratories, producers and compost users . (figure 5 and table 2).

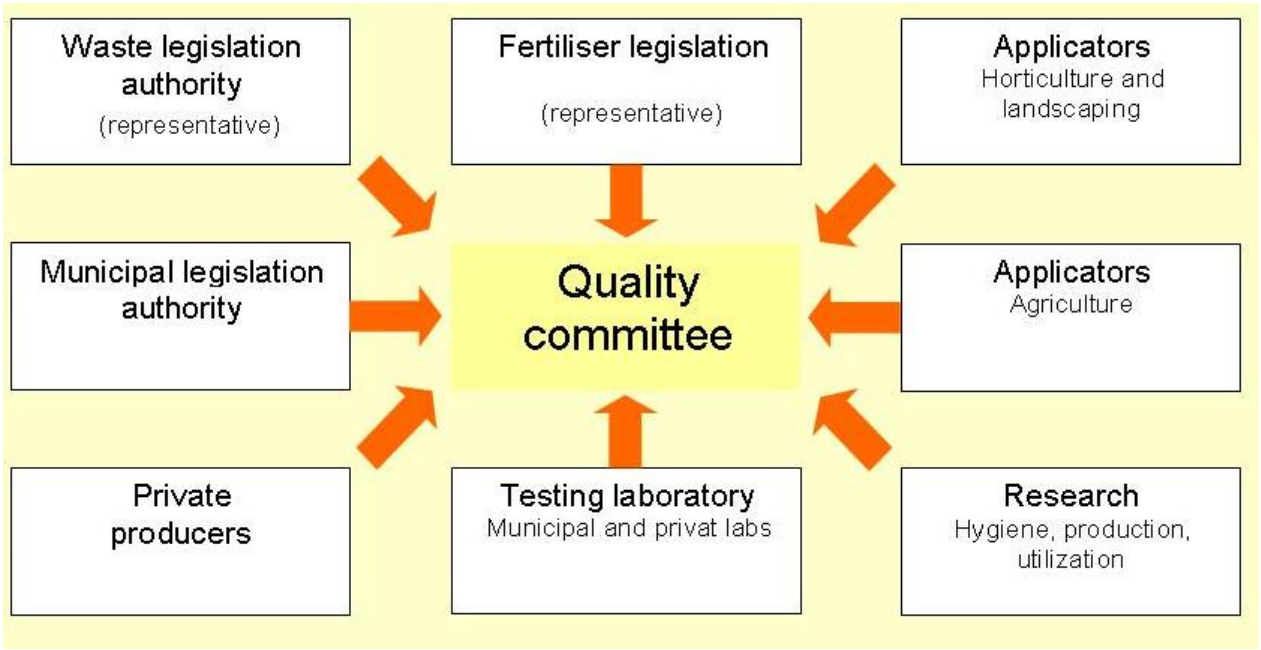

Figure 5: Composition of the Quality Committee

Quality requirements and monitoring system by BGK

The quality assurance system comprises the following elements:

- External monitoring: continuous and independent control of product quality;
- Documentation with a product certificate;
- Internal monitoring: control and documentation of the treatment process by the plants;
- On-site visit by the appointed quality manager;
- Quality criteria: standardisation of the product quality;
- Quality label: characterisation of the product quality;
- Compulsory declaration: description of the essential product characteristics and constituents;
- Application guidelines: information on correct application;
- Furnishing proof and the documents required by the plants to show treatment according to the Biowaste and Fertiliser Ordinance to the regional competent authorities.

Main elements of the BGK QAS are:

Suitable Input Materials

- in accordance with the biowaste ordinance and fertiliser regulation.
- operation control by plant visits of independent quality managers.
- control by independent sample takers and by declaration in analysis report.

Independent analysis and declaration of the product quality

- 4 - 12 times a year according to the quality guidelines, depends on the amount of input material.
- control and sanctions by an independent quality committee.
- certification with product declaration according to the fertiliser regulation

Application requirements

- Application requirements based on the biowaste ordinance and fertiliser regulation.
- Application requirements due to good practical use.

Hygiene requirements

In Germany considerable attention is directed towards the hygiene and sanitisation of compost. Harmful influences on human beings, animals and plants which may arise when compost is applied, should be eliminated during the biological treatment process. Three test methods are required by the Biowaste Ordinance for composting plants:

- The hygienic effectiveness of the individual composting procedure is determined by a process test. Indirect test criteria on hygiene effectiveness for a plant in practical operation is the daily measurement of the temperature during the hygienisation phase (>55 °C for more than 2 weeks, > 60°C for more than 6 days or >65°C for more than 3 days.
- The compost products are tested for absence of salmonellae and content of seeds.

Testing procedure for the RAL quality labels

Authorisation to use the RAL compost quality label is granted in accordance with the quality and testing regulations of the German Compost Quality Assurance Organisation, BGK. The compost producer shall demonstrate the quality of their products for every compost plant they have in operation, throughout the first year's recognition procedure and the following years' monitoring procedure.

Recognition and monitoring procedure

The frequency of the investigations during the one year 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. Sampling and investigations should be done by an approved outside monitoring – usually a laboratory which does the sample taking and the analyses – in line with the procedures laid down by the Quality Committee of the BGK, documented in the BGK Method book for analysing organic fertilisers, soil improvers and substrates (***http://www.kompost.de/index.php?id=219)*** . The Quality Committee of the BGK has issued specifications for high-quality composts and quality digestate. 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 regulations of BGK are the basis for awarding of the RAL quality labels to treatment plants. The RAL quality criteria are valid for different compost product types (fresh, mature and substrate compost).

3.Guidelines and by-laws of the quality assurance scheme

Together with the Biowaste Ordinance of October 1998 a multitude of obligations on a proof of investigation and validation has been introduced which are to be executed by the compost plants.

For composting the important laws are given with

Biowaste Ordinance (BioAbfV 1998, revised in 2012): The amended Biowaste Ordinance (BioAbfV) of 2012 covers the application of treated and untreated bio-wastes and mixtures on land which is used for agricultural, silvicultural and horticultural purposes. It also covers suitable raw materials, quality and hygiene requirements, and treatment and investigations of such bio-wastes and mixtures. The Biowaste Ordinance regulates – from a precautionary perspective – the waste side (e.g. heavy metals) of the application, whereas the fertiliser law regulates the nutrient part. (see: ***http://www.gesetze-im-internet.de/bundesrecht/bioabfv/gesamt.pdf***).

Fertiliser Law (DüV 2007): Gives the frame for the good code of practice of fertilising and shows special requirements for organic fertilisers. It includes the restrictions for the application of fertilisers with essential nitrogen contents in winter periods.
Fertiliser Ordinance (Düngemittelverordnung DüMV 2012): Compost from biodegradable waste is subject to the fertiliser ordinance as a secondary raw material fertiliser (or seldom as soil improving agent). A declaration of the fertiliser type, raw material, nutrients and other product properties is obligatory. Treshold values for contaminants like PFT, PCCD or dl-PCB, included in the Fertiliser Ordinance are obligatory for compost, too. (see: ***http://www.gesetze-im-internet.de/d_mv_2012/index.html***)

Federal Soil Protection Law (BBodSchG 1998/BBodSchV 1999): Ensures the soil function and gives among others precautionary requirements for the contamination of soils. The soil protection law is relevant for the application of compost for landscaping and recultivation (see: ***http://www.gesetze-im-internet.de/bbodschv/index.html***).

An overview about the precautionary thresholds of the biowaste ordinance and fertilizer Ordinance is given in the following table 3.

Table 3: Treshold values in the biowaste ordinance and in the fertiliser ordinance

	Biowaste ordinance	Fertiliser ordinance
Pb mg/kg DM	150	
Cd mg/kg DM	1,5	
Cr mg/kg DM	100	
Cu mg/kg DM	100	
Ni mg/kg DM	50	
Hg mg/kg DM	1	
Zn mg/kg DM	400	
As mg/kg DM		40
Tl mg/kg DM		1,0
PFT mg/kg DM		0,1
Sum of PCDD/PCDF and dl-PCB in **ng WHO-TEQ (2005)** /kg DM		30

The guidelines for the quality assurance systems are laid down in the "Güte- und Prüfbestimmungen" ***http://www.kompost.de/index.php?id=348&tx_commerce_pi1[catUid]=11&cHash=d1e36f490a*** . For compost products the guideline was revised in February 2007. This guideline refers to the special by-laws, that have to be fulfilled and to further applicable documents. These are

- the method book for analyses (***http://www.kompost.de/index.php?id=219***),
- HBPS (Hygiene Modular Test System) (***http://www.kompost.de/index.php?id=438***),
- a list of suitable input materials ***http://www.kompost.de/fileadmin/docs/Archiv/Guetesicherung/ListeZuAusgangsstoffeKo_GP.pdf***
- a list of acknowledged sample takers (***http://www.kompost.de/index.php?id=306***)
- and laboratories (***http://www.kompost.de/index.php?id=96***),
- requirements for operational process management (***http://www.kompost.de/fileadmin/images/guetesicherung/Anforderungen_Prozessqualitaet.pdf***),
- frequency of external compost analyses (***http://www.kompost.de/fileadmin/docs/Archiv/Guetesicherung/Untersuchungsumfang-neu_2012.pdf***)
- and requirements for declaration of products (***http://www.kompost.de/index.php?id=436***).

Furthermore the guideline determines in detail the system of quality assurance (recognition and continuous supervision procedure, specification of products (fresh compost, mature compost and substrate compost) and the different quality criteria and standards). Also the procedure of external and internal control is described.

The long-standing activities of the BGK for standardisation, monitoring and declaration of high quality humus 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 an independent organisation is not a product but "likely a product". Therefore members of the Quality Assurance Organisation which render themselves subject to a voluntary quality monitoring are exempted from additional analyses (max. 12 per year) and from some proof obligation by regional authorities as laid down by the Biowaste Ordinance.

II Activity report 2013

The last annual statistical examination real throughout was done by the Bundesgütegemeinschaft Kompost e.V. (BGK) in March 2014 **for the year 2013**. The following figure shows the results for the total throughout in 2013. For the 468 composting plants the total amount of input material was 6,044 million tons input and therefore the average throughout per plant nearly 12.940 tons per year.

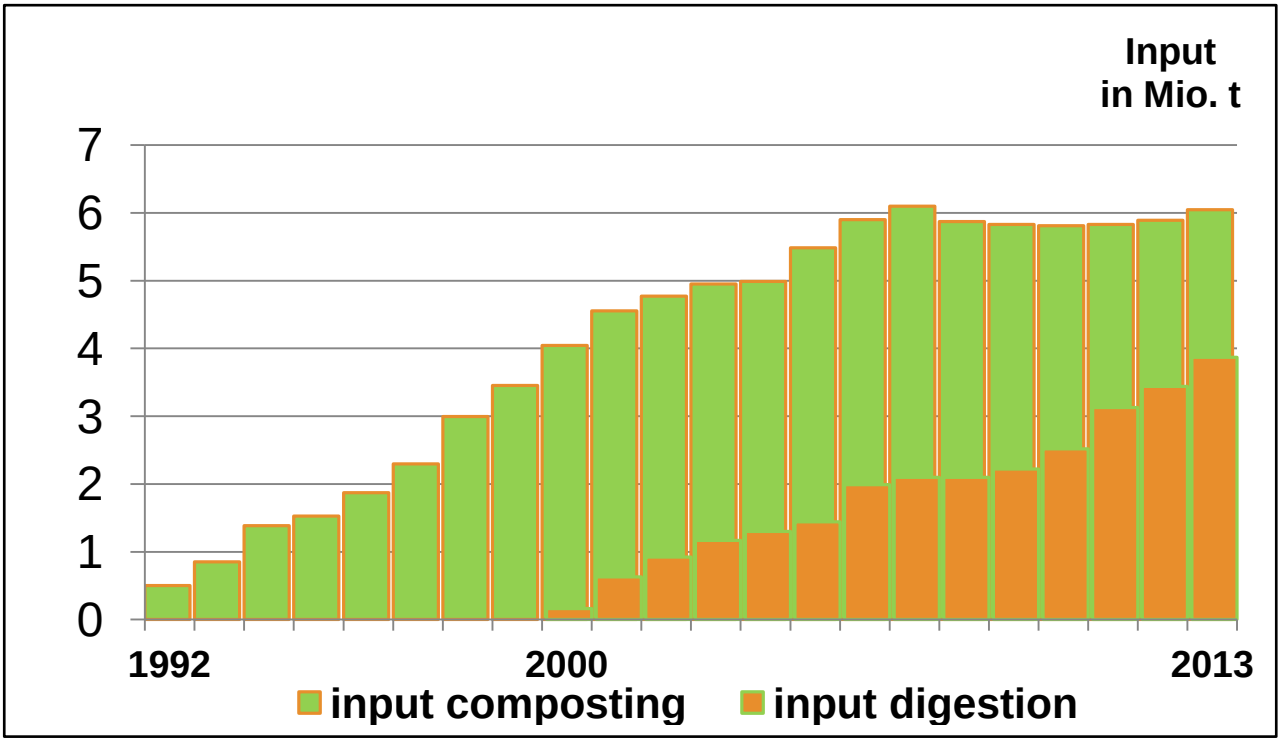

Figure 6: Input of compost and biogas plants with quality assurance from 1992 until 2013

Corresponding to the different input materials 47 % of the composting plants treat only green waste. The other 53% of plants treat a mix of separately collected biowaste (usually content of biobins) and greenwaste for composting. The different throughouts depending on size of plants is shown in the next figure.

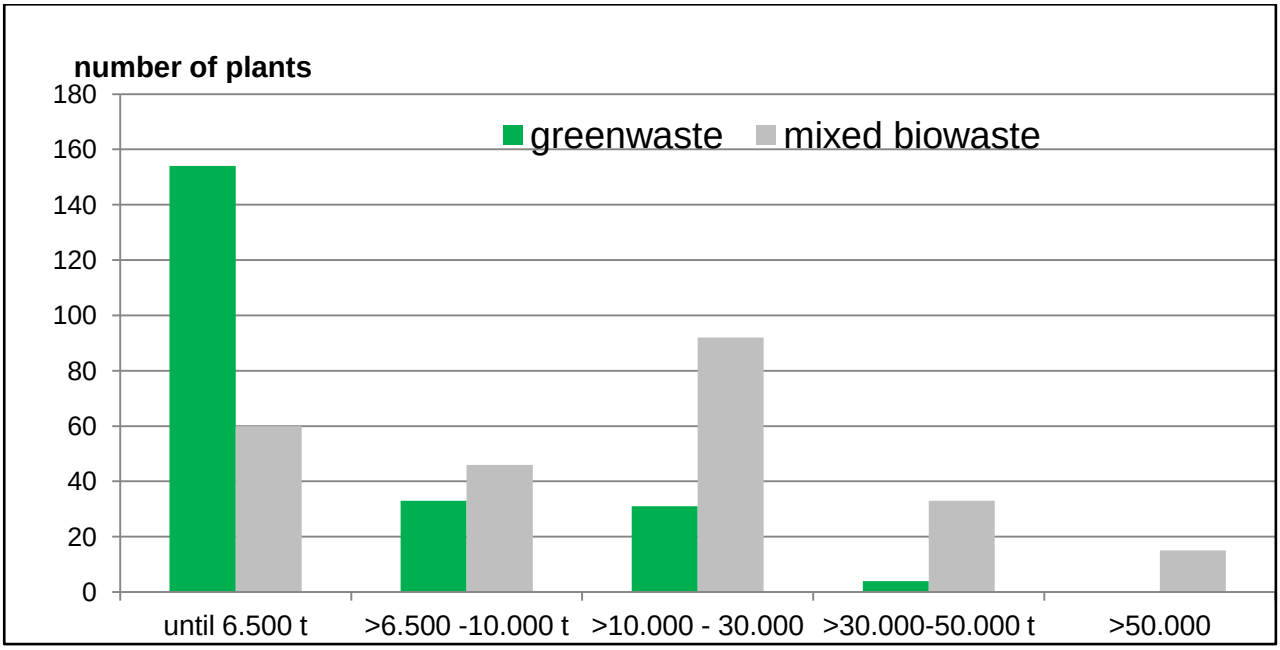

Figure 7: Throughout of compost plants according to input materials

Usually the greenwaste composting plants are rather small ones (69% of the greenwaste plants have less than 6.500 tons input/year) with open windrow composting systems. Separate collected biowaste in mixture with greenwaste is usually treated and composted in enclosed and larger composting plants (37% of these plants have a throughout between 10.000 and 30.000 tons/year).

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 4: Overview composting systems

1	2	3	4	5	6		7
Boxes/ Container	**Briquets**	**Tunnel/ Line**	**Tromm el**	**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** Tafelmiet e, 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** Dreiecks miete 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 Zeile		**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 the audit based on a check-list for composting plants to the BGK office. During the recognition procedure there is an annual inspection and visitation. Afterwards every two years the inspection has to be done. The work of the quality manager is based on a special contract.

List of approved labs

The actual list of the 93 approved labs and 245 approved sample takers are published on the website of BGK under the heading of

Laboratories (***http://www.kompost.de/index.php?id=96***) and

Sample takers (***http://www.kompost.de/index.php?id=453***).

Laboratory qualification system

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 this 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, independance from compost producer).

In May 2013 the last national ring test for all laboratories took take place in Germany in co-operation with BGK.

Compost quality:

An actual overview about product quality in the year 2013 is given in the following table 5 with the average and range of values.

Table 5: Product quality of compost in the QAS in 2013 (n=2834)

Criteria **Compost 2013**	**Mean**	25% quantile	**Median** 50% quantile	75% quantile	95% quantile
Nutrients:					
Nitrogen, total (N) [% DM]	1,37	1,08	1,35	1,63	2,05
Phosphate, total (P_2O_5) [% DM]	0,71	0,5	0,67	0,87	1,24
Potassium, total (K_2O) [% DM]	1,2	0,89	1,18	1,48	1,89
Magnesium, total (MgO) [% DM]	0,8	0,52	0,72	0,97	1,57
Nutrients soluble:					
Nitrogen, $CaCl_2$-soluble (N) [mg/l FM]	289	88,5	231	429	772
Ammonium soluble (NH_4-N) [mg/l FM]	224	15	139	357	734
Nitrate soluble (NO_3-N) [mg/l FM]	64,7	2,1	14	76	292
Phosphat, CAL-soluble (P_2O_5) [mg/l FM]	1149	776	1082	1450	2083
Potassium, CAL-soluble (K_2O) [mg/l FM]	3674	2555	3511	4597	6527
Physical criteria					
Bulk density [g/l FM]	670	580	670	752	900
Dry matter [%]	61	63,3	60,3	54,1	46
Impurities > 2 mm [% DM]	0,1	0,01	0,06	0,13	0,39

Criteria Compost 2013	Mean	25% quantile	Median 50% quantile	75% quantile	95% quantile
Biological criteria					
Plant response (25 % rel.) [%]	109,6	102	108	115,4	131
Plant response (50 % rel.) [%]	99,66	90	99	109	127
Chemical criteria					
Salt content [g/l FM]	4,66	2,58	4,15	6,3	9,41
pH	7,95	7,5	8	8,5	8,95
C/N ratio	17	14	16	19	26,5
Hygiene:					
Seeds [per litre]	0,11	0	0	0	0
Loss of ignition [%]	38,3	31,3	37,5	44	56,15
Basic substances (CaO) [% DM]	5,01	3,03	4,5	6,2	10,5
Heavy metals:					
Lead Pb [mg/kg DM]	33,97	23,5	31	40,2	63
Cadmium Cd [mg/kg DM]	0,42	0,3	0,38	0,5	0,79
Chromium Cr [mg/kg DM]	23,5	17	21,7	27,2	43
Copper Cu [mg/kg DM]	42,3	30,3	39	50,8	73,8
Nickel Ni [mg/kg DM]	14,7	9,5	13,3	18	28,9
Zinc Zn [mg/kg DM]	173	137	165	200	276
Mercury Hg [mg/kg DM]	0,11	0,07	0,09	0,12	0,22

Market report:

Biodegradable waste products are used in quite different fields on account of their manifold characteristics. Statistical numbers of the year 2013 show marketing outlets for RAL quality assured compost products (see figure 8):

Most of the compost products (61%) are used as organic fertilisers and soil improvers for agriculture. Not only the nutrients content but also the organic substances in compost and considerable contents of alkaline material (lime) make compost use in agriculture an increasingly popular and effective means of soil cultivation. As it is postulated in the EU Soil strategy 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.

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.

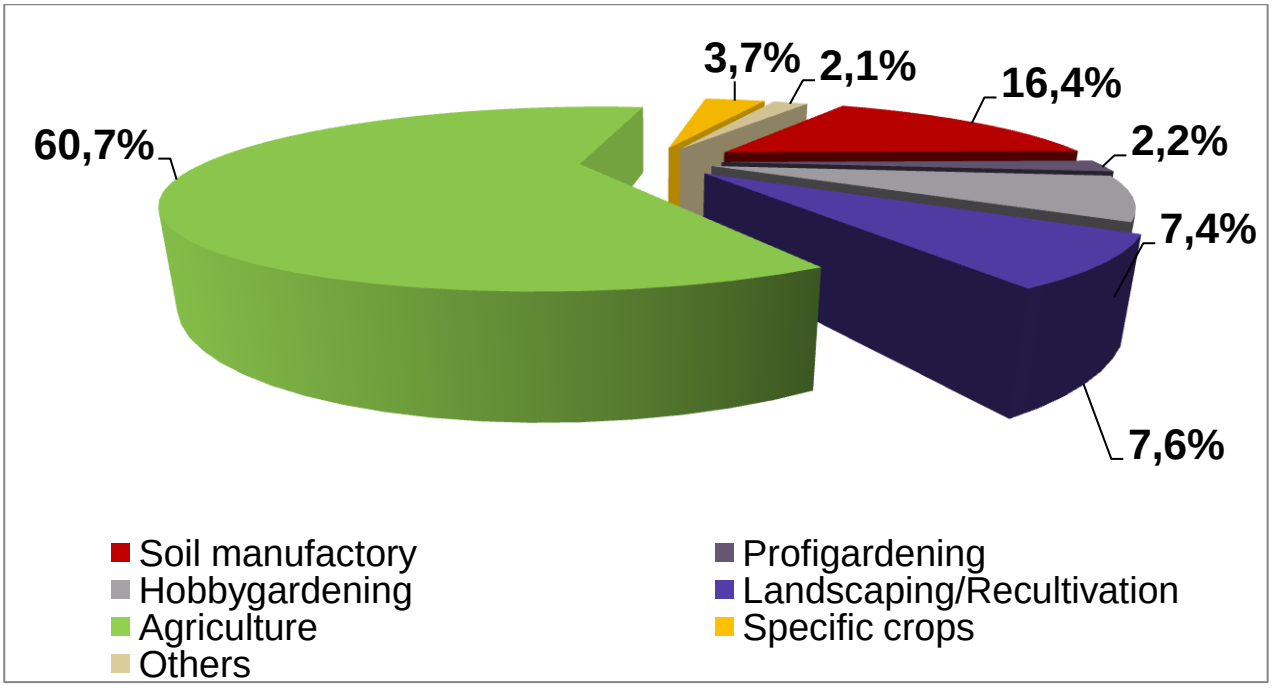

Figure 8: Market distribution of compost in Germany 2013

Quality Assurance as a marketing tool

The consumer demand for quality assured products has increased considerably in the last ten years. 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 N0. 834/2007) are listed in the official organic input material list of the research institute for organic farming (FiBL e.V. 2013).

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
   http://www.kompost.de/fileadmin/docs/shop/Anwendungsempfehlungen/Organische_Duengung_Auflage3.pdf

2. for the application and use of compost in landscaping and gardening)

   http://www.kompost.de/fileadmin/docs/shop/Anwendungsempfehlungen/6.5-Kompost_fuer_den_Garten-_und_Landschaftbau_final_V1_internet.pdf

3. or for the application and use of compost in water protection areas

   http://www.kompost.de/fileadmin/docs/shop/Anwendungsempfehlungen/druckfassung_07_11_5Auflage_Titel_internet.pdf

4. for the good practice of composting in order to avoid emissions

   http://www.kompost.de/fileadmin/docs/publikationen/6.4_1_Kompostierungsanlagen_geringe_Emission_internet.pdf

III Requirements for composting plants:

Operation quality:

In the quality assurance system the operation quality is described in a separate document called Requirements for process quality “Anforderungen an die Prozessqualität” as further applicable document of the quality guidelines (RAL GZ 251 Güte- und Prüfbestimmungen Kompost).

In this document the requirements for the internal quality management of the compost plant are described. The general aim is to avoid mistakes in the composting process or to prevent bad qualities of compost. For this the producer has to define critical points and to develop strategic measures. The compost plant has to develop a process model (flow chart) including the important checkpoints. The following components must be part of the flow chart: acceptance of input materials, storage, conditioning and processing of input material, sanitisation and maturation of compost products, measures to avoid emissions, conditioning of products (sieving e.g.) and storage and delivery and declaration of the products.

These documents and the operating quality is controlled during the visit of the quality manager and the result is reported to the BGK Office.

Additionally the BGK published a guideline for good practice of composting in order to avoid emissions (see: .
http://www.kompost.de/uploads/media/6.4_1_Kompostierungsanlagen_geringe_Emission_internet.pdf)

An example for a flow chart of a compost plant with open windrow composting for green waste is showed in the next figure 9.

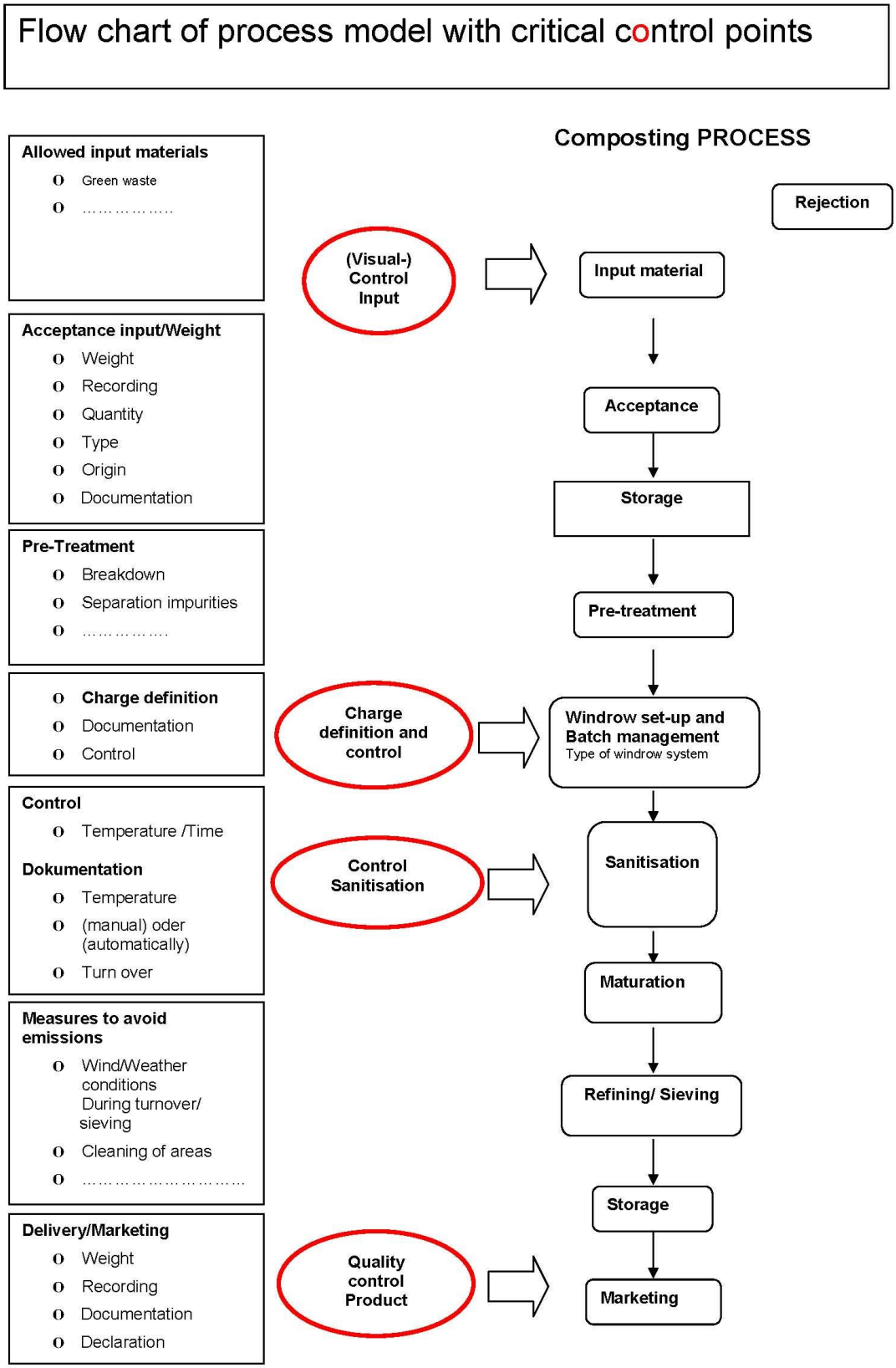

Figure 9: Example for a process model with critical control points for a greenwaste composting plant with open windrows

The actual audit report of the quality managers includes the following points to describe the operation quality according to the ECN-QAS check-list for operation quality (ECN-QAS Quality Manual Annex C5):

Actual Check-list (laid down in new contracts with quality mangers) for operation quality: marked with X		
General information about the plant	**Yes**	**Remark**
Is the plant properly enclosed?	**X**	
Has the entrance a sign where company name, hours or opening, telephone number etc. are mentioned?		
Is a recent operation plan of the plant present?	**x**	
Are the intake- and storage areas sufficient marked?	**x**	
Traffic and composting areas		
Are all traffic areas paved?	**X**	
Are all the composting areas sufficient paved with asphalt or concrete?	**X**	
Are the traffic- and composting areas sufficient for the permitted capacity?	**X**	
Is all leakage water from the composting-areas collected and sufficient dispatched or removed?	**X**	
Is all the run-off water from the traffic-areas collected and sufficient dispatched or removed?	**X**	
Equipment, facilities and staff		
Are the required machinery for the workload available?	**X**	
Are there safety devices (e.g. dust mask, air filter for wheel loader) present?	**(x)**	Generell check: Other certifications (e.g. Entsorgungsfachbetrieb) *Working safety is regulated by separate by-laws and is usually checked by other certification institutions.*
Is the plant regularly cleaned?	**X**	
Is an office for documentation and administration available?		
Is the staff adequately and regularly trained for specific tasks (e.g. composting skills, regulatory skills)?	**(x)**	Generell check: Other certifications (e.g. Entsorgungsfachbetrieb)
Are responsibilities (e.g. for quality control, hygiene) clearly assigned?	**(x)**	Generell check: Other certifications (e.g. Entsorgungsfachbetrieb)
Does the staff have regular medical checks?	**(x)**	Generell check: Other certifications (e.g. Entsorgungsfachbetrieb) *Working safety is regulated by separate by-laws and is usually checked by other certification institutions.*
Is the staff informed about occupational health and safety?	**(x)**	Generell check: Other certifications (e.g. Entsorgungsfachbetrieb)

		Working safety is regulated by separate by-laws and is usually checked by other certification institutions.
Quality assurance aspects		
Is there a quality control from an independent control-organisation?	**X**	
Is a flow diagram of the composting process available?	**X**	
Delivery and acceptance of input materials		
Is a controlled weighbridge present?	**X**	
Is a functional control of input-material given?	**X**	
Are acceptance criteria given?	**X**	
Are origin, type and quantity of the delivered materials daily documented?	**X**	
Storage and processing of input materials		
Is there a designated intake-area with sufficient flooring?	**X**	
Is input material that is unsuitable for storage (e.g. biowaste from bins) processed daily?	**X**	
Is input material that is suitable for storage (e.g. root wood) stored separately for mixing purposes?	**X**	
In case of a breakdown, is there sufficient storage-capacity and also back-up capacity (e.g. in other plants)?	**X**	
Conditioning of input material and build-up of the composting pile		
Are the different input materials mixed properly and is the processing function able and acceptable?	**X**	
Are there instructions for the composition of the material (e.g. material mix, moisture, structure-stability)?	**x**	
Monitoring and record keeping		
Is an operation log regularly maintained?	**X**	
Are the charges separate recognisable?	**X**	
Are the charges classified and documented (e.g. charge-designation, date)?	**X**	
Are the different streams traceable in the documentation?	**X**	
Are there instructions regarding the number of turns?	**X**	
Are calibrated thermometers present?	**X**	
Are the temperature-/time-protocols accessible and controllable filed?	**X**	
Are the temperature-/time-protocols conform with national/European regulations (like ABP)?	**X**	

Are the following aspects recorded in the operational diary - temperature during sanitisation - duration of sanitisation step - number of turns during sanitisation step	**X**	
Are there measurements taken to prevent odour?	**X**	
Are possible biofilter well-functioning?	**X**	
Are striking emissions recorded and described (e.g. dust, gaseous or liquid emissions)?	**X**	
Is cross-contamination of treated and untreated biowaste barred (no double use of wheel-loaders)?	**X**	
Storage of the products		
Has the selling product been sieved (particle size)?	**X**	
Is the contaminated screening overflow (> 5 % contamination) re-used as structural material or sluiced from the process?	**X**	
Are further measurements on the screening (e.g. finer screen) in case of contamination with impurities (> 0.2 % in finished compost)?	**X**	
Is the storage separated from input and processing material?	**X**	
Are designated areas for the various products present and are those products properly marked?	**X**	
What is the quantity and whereabouts of the interfering and residual materials?	**X**	In single cases proofed
Are the products protected from water (cover)?	**X**	
Are the products protected from seeds flying in?	**X**	
Sampling		
Are the samples taken by independent sample taker?	**X**	
Is the yearly demanded quantity of samples equally spread?	**X**	
Is the laboratory acknowledged by national quality assurance organisation (NQAO)?	**X**	
Are the recent certificates of essay available on the plant and do they meet the demand?	**X**	
Product declaration		
Is the declaration in line with national/ European regulations?	**X**	
Is the declaration in compliance with the test results?	**X**	
Are specific instructions for the use of the product taken in the declaration?	**X**	
Product delivery		
Are there complete recordings of the delivered products in a year?	**X**	
Are there instructions to prevent that unfit declared products is sold?	**X**	
Are there instructions how to handle unfit declared products?	**X**	

List of permitted input materials:

In the quality assurance system the actual list of permitted input materials is one of the further applicable documents of the quality guidelines (RAL GZ 251 Güte- und Prüfbestimmungen Kompost). The actual list combines the input materials for composting and digestion. The overview about the permitted input materials follows in the next table.

EWC code	Waste type	Specification of permitted materials	Remark
02	**WASTE FROM AGRICULTURE, HORTICULTURE, AQUACULTURE, FORESTRY, HUNTING AND FISHING, FOOD PREPARATION AND PROCESSING**		
02 01	***Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing***		
02 01 01	Sludges from washing and cleaning	e.g. Soil sludges from sugar beet, potato and other vegetable processing	Washing is done without using any synthetic agents and additives
02 01 02	Animal-tissue waste	Bristle and horn waste, wool, feathers, hair, horns, hoof cuts, raw milk, shell from shellfish, eggs, hatchery by-products, digestion tract content, blood	ABPR [1)] Blood: ABPR Cat. 3 material only; digestion [2)]
02 01 03	Plant-tissue waste	Algae; feed waste; crop waste; mowings; waste plant tissues form agriculture; vegetable components of driftings, plant tissue waste from biofilter materials, Straw, riverine vegetation and spent growing media based on plant tissues, such as compost derived from source-segrated biowaste, peat and bark. sea weed	
02 01 06	Animal faeces, urine and manure, effluent, collected separately and treated off-site	Solid and liquid manure including the following bedding materials: straw, sawdust, wood shavings, and chipped wood	ABPR [1)], Used animal bedding not allowed if it contains veneers, other coatings or preserving substances.
02 01 07	Wastes from forestry	Bark	Not allowed if contains veneers, other coatings or preserving substances.
02 01 99	Wastes not otherwise specified	Spent mushroom substrate	

EWC code	Waste type	Specification of permitted materials	Remark
02 02	**Waste from the preparation and processing of meat, fish and other foods of animal origin**		
02 02 01	Sludges from washing and cleaning	Sludge from milk processing	ABPR [1)] Digestion [2)] Washing is done without using any synthetic agents and additives
02 02 02	Animal-tissue waste	Bristle and horn waste, wool, feathers, hair, horns, hoof cuts, raw milk, shell from shellfish, eggs, hatchery by-products , digestion tract content, blood	ABPR [1)] Blood: ABPR Cat. 3 material only; digestion [2)]
02 02 03	Materials unsuitable for consumption or processing	Former foodstuff	ABPR [1)], products of animal origin, or foodstuffs containing products of animal origin, which are no longer intended for human consumption for commercial reasons or due to problems of manufacturing or packaging defects or other defects from which no risk to public or animal health arise;
02 02 04	Sludges from on-site effluent treatment	Content of fat separators and flotation agents (possible sources: slaughter-houses and meat/fish processing plants)	ABPR [1)], Digestion [2)] Washing is done without using any synthetic agents and additives
02 02 99	Waste not otherwise specified	Sludges from gelatine production, gelatine stampings, filtrations effluents from methionin production	ABPR [1)], Digestion [2)]
02 03 Wastes from the fruit, vegetables, cereals, edible oils, cocoa, coffee, tea and tobacco preparation and processing; conserve production; yeast and yeast extract production, molasses preparation and fermentation			
02 03 01	Sludges from washing, cleaning, peeling, centrifuging and separation		Washing is done without using any synthetic agents and additives

EWC code	Waste type	Specification of permitted materials	Remark
02 03 04	Materials unsuitable for consumption or processing	Expired flour; Bleach earth de-oiled; Fermentation residues from enzyme production; Crop waste; Yeast and yeast-like residues; Coco fibre; Molasses residues; Oilseed residues; Residues from the production of potatoes, rice, corn or starch; Residues from processing coffee, tea and cocoa; Residues from processing fruit, vegetable and corn; Residues from tinning processes; Seasonings residues; Husk, husk dust and cereal dust; Tobacco dust, veins and sludge Expired foodstuff; Spent filters and absorbing mass (diatomaceous earth) active earth, active carbon; Defective cigarette batches (without filter);	
02 03 05	Sludges from on-site effluent treatment		Digestion [2)] Washing is done without using any synthetic agents and additives
02 04 Wastes form sugar processing			
02 04 03	Sludges from on-site effluent treatment	Soil sludges from sugar beet cleaning and other processing steps	Washing is done without using any synthetic agents and additives
02 05 Wastes from the dairy products industry			
02 05 01	Materials unsuitable for consumption or processing	Former foodstuff Milk and milk processing products	ABPR [1)]
02 05 02	Sludges from on-site effluent treatment		Digestion [2)] Washing is done without using any synthetic agents and additives
02 06 Wastes from the production of baking and confectionary industry			
02 06 01	Materials unsuitable for consumption or processing	Expired bread, pastry, Expired foodstuff Waste dough	
02 06 03	Sludges from on-site effluent treatment		Washing is done without using any synthetic agents and additives

EWC code	Waste type	Specification of permitted materials	Remark
02 07 Wastes from the production of alcoholic and non-alcohol beverages (except coffee, tea and cocoa)			
02 07 01	Wastes from washing, cleaning, and mechanical reduction of raw materials		It has to be ensured that no synthetic detergents and additives are used during washing and cleaning.
02 07 02	Wastes form spirits distillation	e.g. Spent grains fruit, cereal and potato pulp	
02 07 04	Materials unsuitable for consumption or processing	e.g. Yeast and yeast-like residues spent hops malt husks, malt sprouts, malt dust, pomace expired beverages spent filters and absorbing mass (diatomaceous earth) active earth, active carbon	
02 07 05	Sludges from on-site effluent treatment		Digestion [2)] Washing is done without using any synthetic agents and additives
03 WASTES FROM WOOD PROCESSING AND THE PRODUCTION OF PANELS AND FURNITURE, PULP, PAPER AND CARDBOARD			
03 01 01	Waste bark and cork		Natural barks and unmixed products for further processing made from bark only. Not allowed if contains veneers, other coatings or preserving substances.
03 01 05	Sawdust, shavings, cuttings, wood, particle board and veneer		Only material from untreated wood from the wood processing industry Not allowed if contains veneers, other coatings or preserving substances
03 03 Wastes form pulp, papers and cardboard production and processing			
03 03 01	Waste bark and wood		Natural bark and wood. Not allowed if contains veneers, other coatings or preserving substances.
04 WASTES FORM THE LEATHER AND TEXTILE INDUSTRIES			
04 02 Waste from the textile industry			
04 02 21	Wastes from unprocessed textile fibres	Cellulose fibre wastes Plant fibre waste Wool waste	

EWC code	Waste type	Specification of permitted materials	Remark
19 WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREAMENT, PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION			
19 05 Waste from aerobic treatment of solid wastes			
19 05 03	Off-specification compost	Oversize fraction of screened compost Drainage and waste water from composting	Oversize fraction of screened compost of own plant that has been produced from input materials listed in this Annex; Drainage and waste water from composting of own plant of input materials listed in this Annex
19 06 05	Liquor from anaerobic treatment of animal and vegetable waste		Liquor from anaerobic digestion of input materials listed in this Annex
19 06 06	Digestate from anaerobic treatment of animal and vegetable waste		Digestate from anaerobic digestion of input materials listed in this Annex
19 09 Wastes from the preparation of water intended for human consumption or water for industrial use			
19 09 02	Sludges from water clarification		Digestion [2)]
19 09 03	Sludges from decarbonation		Digestion [2)]
20 MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS			
20 01 Separately collected fractions (except 15 01)			
20 01 08	Biodegradable kitchen and canteen waste	Catering waste [1)]	ABPR [1)] Individual national regulations with diverting treatment requirements for catering waste must be considered
20 01 25	Edible oil and fat		Digestion [2)] Only edible oil and fat of animal origin is covered by ABPR [1)] In this case it is included in the definition of *catering waste*
20 01 38	Wood other than mentioned in 20 01 37		Natural wood. Not allowed if contains veneers, other coatings or preserving substances.

EWC code	Waste type	Specification of permitted materials	Remark
20 01 99	Other fractions not otherwise specified	Separately collected biowaste from households and similar institutions	Bio-bin; brown-bin collection; If it contains catering/ kitchen waste: ABPR [1)] Individual national regulations with diverting treatment requirements for catering waste must be considered
20 02 Garden and park wastes (including cemetery waste)			
20 02 01	Biodegradable waste	Garden and park waste Algae, pond waste Landscape gardening waste	
20 03 Other municipal wastes			
20 03 02	Waste from markets	Separately collected vegetable and other biowaste	

ABPR[1)] Input materials underlying the ABP Regulation (EC) Nr. 1774/2002

Digestion[2)]) Those Input materials are recommended to use preferably in anaerobic digestion before being composted

List of possible additives

EWC code	Waste type	Specification of permitted materials	Remark
10 WASTES FROM THERMAL PROCESSES			
10 01 Wastes from power stations and other combustion plants			
10 01 01	Bottom ash, slag and boiler dust (excluding boiler dust mentioned in 10 01 04)	Ashes from the incineration of natural plant tissue Ashes from the incineration of faecal matter Ashes from the incineration of meat and bone meal	Only as additive: less than 2% (m/m) in initial mix for composting
19 WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREAMENT, PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION			
19 01 Waste from incineration or pyrolysis of waste			
19 01 12	Bottom ash and slag other than those mentioned in 19 01 11	Ashes from the incineration of natural plant tissue Ashes from the incineration of faecal matter Ashes from the incineration of meat and bone meal	

Quality criteria and declaration parameter for compost

For the different compost products special quality requirements are given:

Mature compost

Quality characteristics	Quality requirements
Hygiene	• proof that can be tested on epidemic-hygienic effectiveness of the decomposition process (process test or "Konformitätsprüfung") •Compliance with time-/temperature requirements (process control) • exclusion of germinable seeds and sprouting plant parts ('free' means < 2 plants/l compost) • exclusion of *Salmonellae*
Impurities Stones	• maximum 0.5 weight-% in dm selectable, species-inappropriate material >2 mm diameter •Total surface area of impurities < 25 cm^2/l fm (if more impurities than 0,1 weigth % dm were found) Stones >10mm: max. 5 weight %
Plant compatibility	Plant compatibility for the provided area of application
Decomposition degree	degree IV or V
Water content	• bulky material maximum 45% weight • higher contents of water are admissible for composts with more than 40% om according to annex 3 of the RAL Quality and Test Regulations
Organic matter	at least 15 weight-% in dm, measured as volatile solids
Content of heavy metals	Guide values (mg/kg dm) Lead 150 — cadmium 1.5 Chromium 100 — mercury 1.0 Nickel 50 zinc 400 copper 100
Parameter for declaration	• mature compost (grain size) • producer • bulk density (volume weight) • pH-value and salt content • plant nutrients total (N, P_2O_5, K_2O, MgO, CaO) • plant nutrient soluble (N, P_2O_5, K_2O) • organic matter • net weight or volume • information for a suitable application

Fresh compost

Quality characteristics	Quality requirements
Hygiene	• proof that can be tested on epidemic-hygienic effectiveness of the decomposition process (process test or "Konformitätsprüfung") •Compliance with time-/temperature requirements (process control) • exclusion of germinable seeds and sprouting plant parts ('free' means < 2 plants/l compost) • exclusion of *Salmonellae*
Impurities Stones	• maximum 0.5 weight-% in dm selectable, species-inappropriate material >2 mm diameter •Total surface area of impurities < 25 cm^2/l fm (if more impurities than 0,1 weigth % dm were found) Stones >10 mm: max. 5 weight %
Decomposition degree	degree II or III
Water content	• bulky material maximum 45% weight • higher contents of water are admissible for composts with more than 40% om accord. to annex 3 of the RAL Quality and Test Regulations
Organic matter	at least 30 weight-% in dm, measured as volatile solids
Content of heavy metals	Guide values (mg/kg dm) lead 150 — cadmium 1.5 chromium 100 — mercury 1.0 nickel 50 zinc 400 copper 100
Parameter for declaration	• fresh compost (grain size) • producer • bulk density (volume weight) • pH-value and salt content • plant nutrients total (N, P_2O_5, K_2O, MgO, CaO) • plant nutrient soluble (N) • organic matter • net weight or volume • information for a suitable application

Substrate compost

Quality characteristics	Quality requirements
Hygiene	• proof that can be tested on epidemic-hygienic effectiveness of the decomposition process (process test or "Konformitätsprüfung") •Compliance with time-/temperature requirements (process control) • exclusion of germinable seeds and sprouting plant parts ('free' means < 0.5 plants/l compost) • exclusion of *Plasmodiophora brassicae* (in vegetable growing) • exclusion of *Salmonellae*
Impurities	• maximum 0.5 weight-% in dm selectable, species-inappropriate material >2 mm diameter • free of impurities >5 mm ('free' means <0.1% in dm) •Total surface area of impurities < 10 cm^2/l fm (if more impurities than 0,1 weigth % dm were found)
Stones	maximum 5 weight-% in selectable stones of 2-10 mm free of stones >10 mm ('free' means <0.5 weight-% dm)
Plant compatibility	• plant compatibility in the provided area of application • free of phytotoxic materials (volatile phytotoxic materials specifically tested, cress test in a closed vessel) • not nitrogen immobilising
Decomposition degree	degree V
Water content	• bulky material maximum 45% weight, bagged material max.35% weight • higher contents of water are admissible for composts with more than 40% om accord. to annex 3 of the RAL Quality and Test Regulations • 'humid' corresponding to classification (~50–60% of the maximum water concentration)
Grain size	• in all grain sizes >50% vol. particle 0–5 mm • maximum grain size 0/25 mm
Organic matter	at least 15 weight-% in dm, measured as volatile solids
Content of heavy metals	Guide values (mg/kg dm) lead 150 — Cadmium 1.5 chromium 100 — Mercury 1.0 nickel 50 Zinc and copper guide values will be acquired
Plant nutrients and salt content	Type 1 / Type 2 • salt content: max. 2.5 g/l / max. 5 g/l • minimum nitrogen (sum NO_3/NH_4-N): <300 mg/l / <600 mg/l • soluble phosphate P_2O_5: <1.200 mg/l / <2.400 mg/l • soluble potassium K_2O: <2.000 mg/l / <4.000 mg/l • soluble chloride: <500 mg/l / <1.000 mg/l • soluble sodium: <250 mg/l / <500 mg/l
Carbonate ($CaCO_3$)	<10% in dm
Parameter for declaration	• substrate compost • producer • grain size and bulk density (volume weight) • pH-value, salt content, C/N ratio • plant nutrients total (N, P_2O_5, K_2O, MgO, CaO) • plant nutrient soluble (N, P_2O_5, K_2O) • organic matter • net weight or volume • information for a suitable application

Sampling and analyses

Depending on the amount of input in tons 4 to 12 external analyses per year had to be done for the quality assurance.

Input plant per year (tons)	Recognition Procedure Analyses per year	Continuous Supervision Analyses per year
≤ 2000	4	4
2001-4000	6	4
4001-6000	6	4
6001-8000	8	4
8001-10000	8	5
10001-12000	8	6
12001-14000	12	7
14001-16000	12	8
16001-18000	12	9
18001-20000	12	10
20001-22000	12	11
22001-24000	12	12
>24000	12	12

The analyses of a year should be representative for all compost products and produced grain sizes. For this the BGK create every year a special plan for sample taking. There the number of analyses per product and grain size is given. The analyses must be administer evenly across the year (each quarter). An example for the sample taking plan is showed in the next figure.

BGK

Plan for sample taking 2014

BGK.-Nr. 9999, Anlage xy

Verteilung der Analysen auf die RAL-Gütesicherungen

Die Anzahl der Analysen ergibt sich aus der zu Jahresbeginn gemeldeten voraussichtlichen Inputmenge der Anlage. Weitere Informationen hierzu finden Sie im Merkblatt zur Untersuchungshäufigkeit der jeweiligen Gütesicherung unter www.kompost.de.

	Voraussichtliche Inputmenge für 2014	Erforderliche Anzahl an Analysen für 2014
RAL-Gütesicherung Komposte	65.000 t FM	12

Zeitliche Verteilung der Analysen auf Produktionsmonate

Die für 2014 erforderlichen Analysen sind möglichst gleichmäßig auf die Quartale zu verteilen. Innerhalb eines Quartals kann der Zeitpunkt der Probenahme frei gewählt werden.

Gütesicherung	Jan	Feb	Mrz	Apr	Mai	Jun	Jul	Aug	Sep	Okt	Nov	Dez
Komposte	1	1	1	1	1	1	1	1	1	1	1	1

Aufteilung der Analysen auf die einzelnen Produkte

Die Aufteilung der Analysen auf die erzeugten Produkte erfolgt anhand der aktuell hinterlegten Produktions-verhältnisse. Änderungen im Jahresverlauf können im Mitgliederbereich unter www.kompost.de gemeldet werden.

Produkt	Produktanteil	Erforderliche Anzahl an Analysen für 2014
Frischkompost	33%	4
Fertigkompost	67%	8

Aufteilung der Analysen auf die verschiedenen Körnungsklasse

Die Aufteilung erfolgt anhand der gemeldeten Verteilung auf die Körnungsklassen. (Feinkörnig: Siebmaschenweite bis 12mm; mittelkörnig: Siebmaschenweite 13 bis 25mm; grobkörnig: Siebmaschenweite 26-40mm)

Produkt	Erforderliche Analysen gesamt	davon Analysen aus feinkörnig	davon Analysen aus mittelkörnig	davon Analysen aus grobkörnig
Frischkompost	4	4	-	-
Fertigkompost	8	8	-	-

Bundesgütegemeinschaft Kompost e.V. Köln, den 28.01.2014