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Composting organic waste

The processing of organic waste material from communities through different composting methods and utilisation of the compost in landscape care

The separated collection of organic waste and green cuttings is based on the TA Community Waste (1993) and the Circulation Economy and Waste Statute (1995). Composting meets the target of achieving sanitation and homogenisation of the material, thus giving a marketable organic dung and soil conditioner. Alongside the separate collection systems for organic waste, a technical standard for composting facilities has been developed. Composts produced in these are subject to strict monitoring for a certificate of quality (RAL GZ 251). Marketing takes place according to the waste materials regulation (Bio-waste Order) and also according to the fertiliser regulations.

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Keywords

Composting, compost application, row spreader

The fundamentals of planning a biological treatment facility are firstly the availability of usable organic wastes and the composition of these wastes. In combination with the local distribution of sites within the planning area, the following parameters must be considered for location and processing decisions:

- collection points and transport distances (waste logistics)
- process technology
- marketing and quality requirements of the product
- flexibility and availability of the plant
- investment and running costs
- space requirement and location conditions
- legal requirements and planning and building permission procedures.

Evaluation of these parameters helps determination of whether plant concept should be central or decentral. As a rule, central plants with a throughput capacity between 40,000 and 87,500 t/a are in the majority because the running costs of decentralised, smaller plants rise over-proportionately to the transport inputs. Decentral plants with a throughput of around 10,000 t/a are usually in rural, sparsely populated areas. As calculation factor, a collection amount of from 80 to 100 kg organic waste per inhabitant and year can be assumed.

Plants with a throughput to 6,500 t/a are normally liable to building regulations. For plants with a throughput of up to 87,000 t/a a planning permission process according to the federal emission laws must be carried out. In both systems, regulations have to be met concerning building technique, odour emission, wastewater production, noise emission and staff protection.

Composting procedures

The production of compost takes place in several procedural steps (*fig. 1*).

Basic procedural steps involve the preparation of the initial material, the actual composting or rotting process and finally the preparation of the compost to give a finished product suitable for marketing and use.

The aim of the different preparation procedures is the creation of optimum conditions for the microorganisms involved in the subsequent composting process. This involves:

- chopping of larger material (cuttings, unchopped vegetable material) to increase surface areas occupiable by, and thus available to, the microorganisms.
- mixing of components to create optimum nutritional, moisture and structural conditions for decomposition
- moisture reduction of high-moisture materials where these, as individual components, are too wet

Also part of preparation is removal of foreign material (glass, stones, plastic, metal), to improving compost quality.

In compost plants with a preparation technology involving sieve, metal separator and cyclone separator, bio-waste with a foreign object content of up to 5% (weight) can still be processed. The aim is to reduce the foreign object content of the compost according to the regulation values of the Federal Material Association RAL GZ 251 to under 0.5% (weight).

In the actual composting, material to be rotted is aerated and exhaust gases taken off with the aim of introducing enough oxygen

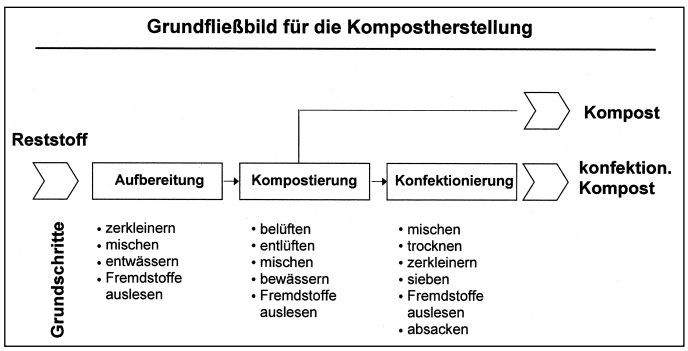

Fig. 1: Processes of compost production

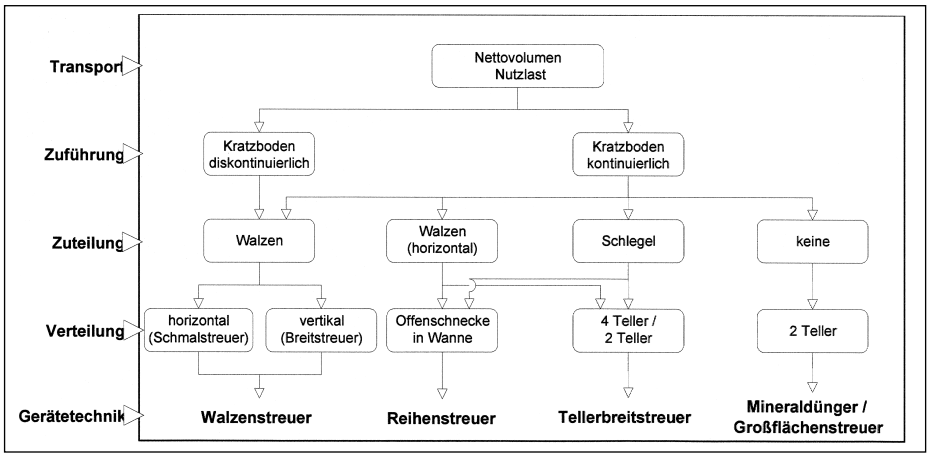

Fig. 2: Process of reactor composting

into the compost piles and to allow the escape of carbon dioxide and water vapour. The material is then mixed to balance unequal relationships in the piles (dry border zones, moist base areas, cool border zones, warm core zones); then moistened to relieve shortage of water so that no stabilisation occurs due to dryness.

The requirements for planning and building permission stipulate that the bio-waste be composted within an enclosed system or reactor. On the basis of the Federal Emission Protection Law as well as the TA Community Waste, the initial rotting phase has to be carried out in an enclosed plant with controlled collection and processing of seepage water as well as an exhaust air odour reduction system such as a bio-filter. In principle, the actual composting processes differ between static and dynamic systems. In the former no mixing occurs during rotting with gas exchange through system-specific aeration or exhaust systems.

The Brikollare System represents a special static process whereby the total waste is formed in small units and so piled that in all areas of each pile an unobstructed air exchange is possible.

With static processes there is a high plant availability in that no mechanisation which has to be serviced or can break down is involved within the reactor system. The dynamic reactor composting process features a continuous or intermittent movement of the rotting material during initial rotting. This system gives very high compost homogeneity.

From the biological aspect, completion of composting gives a usable material. This can be a product with hardly any sign of biological activity, or a fresh compost, also completely sanitised, but which can heat up to 40 to 50 °C through continued biological activity.

Refining compost

For the transport, storage, sale and application it is in many aspects very important to refine the compost and this can involve the following:

- sieving to separate undecomposed material and foreign objects, or to establish special particle sizes for specific applications
- supplementing the compost to achieve certain nutrient status or to give a required structure (e.g. by adding Perlite)
- Bagging so that different customers can be offered special batches.

The compost is marketed in the horticultural, landscaping or agricultural sectors.

Agricultural utilisation

In farming, the compost is used as organic manure, for improving soil structure and also as erosion protection.

Waste handling laws (Bio-waste Order) and fertiliser regulations determine the maximum application amount, whereby the most important limit to the amount applied is not the pollution potential but the amount of available plant nutrients.

The requirements for the application process are:

- application of up to 30 t DM/ha (Bio-waste Order)
- abiding by the predetermined application amount
- precise placement
- limited reduction of mixing
- symmetric application pattern
- low-loss and reduced-emission distribution
- application at beginning of vegetation period
- high area performance
- limited costs.

These requirements are usually met by disc broadcasters (Universal spreaders) with which compost can usually be spread in contractor, inter-farm, operations. These implements are also suitable for applying further forms of secondary raw material fertilisers. Application of over 100 t/ha can be achieved by two spreaders working a two-phase operation with a loading system of appropriate capacity [1].

As shown in *figure 2*, further systems can be applied for applying compost. Broadcasting the material is achievable with disc spreaders, roller broadcasters and large-area spreaders. For applying compost as erosion protection in rowcrops a special system has been developed for row applications at the Institute for Agricultural Engineering in Bonn. Here, the standard disc spinners on a disc spreader have been replaced by open augers running in a hopper. This system can also be used for depositing compost between crop rows after sowing or planting. Satisfactory application precision was achieved in first trials (according to [2]) (*fig. 3*).

Literature

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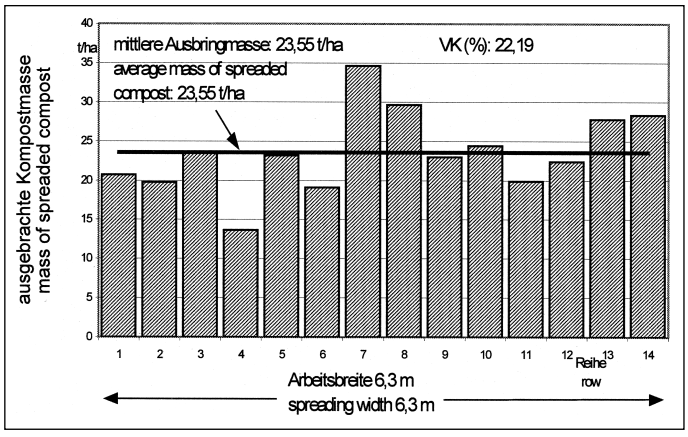

Fig. 3: Implements for area and for row compost application