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The value of composting in Germany – Economy, ecology, and legislation

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ABSTRACT

Based on a recent survey of German composting plants an evaluation of costs and benefits of composting was attempted. In this regard, several economical, ecological and legal aspects and some interrelations are discussed in this paper. A special emphasis is placed on the fees and compost prices of composting plants. It is also shown how the legal framework provides the economic basis for composting in Germany, how economical and ecological costs and benefits could be assessed, and why it is so difficult to determine the value of composting.

1. Reasons for assessing the value of composting

The treatment of biodegradable waste is possible with a variety of technologies, such as anaerobic digestion, combustion, or composting. In Germany, the use of source separated biodegradable waste for producing compost is well established. Around 950 composting plants with a combined capacity of approximately 10 Tg (10 million tonnes) exist throughout Germany (BGK, 2011). Against the background of a total 13 Tg biodegradable waste input for all types of treatment facilities (DESTATIS, 2010) – composting plants included – it can be said that composting plays a key role in the treatment and utilisation of biodegradable waste in Germany.

Despite that well-established position, there are concerns about a possible diversion of input material to combustion and anaerobic digestion plants, because of incentives for renewable energies. With this possible competition over biomass, the question of the optimal utilisation of biodegradable waste becomes an increasingly important issue. A sound evaluation of composting in relation to not so well established and still subsidized technologies is important. It is important for taking the necessary steps for directing every kind of biodegradable waste into its respectively best treatment facility, for avoiding bad investments and for allocating capital to the best available options.

2. The legal and economic framework for composting in Germany

Prior to the discussion about ways of assessing the value of composting, some basic information about economic and legal aspects, concerning composting in Germany, is given.

2.1. Legal aspects

The Waste Act of 1986 (AbfG) implemented the hierarchy of waste prevention, recycling, and disposal, which favours also composting of biodegradable wastes. With the Technical Guidelines for the Disposal of Municipal Solid Waste (TASi), which came into effect in 1993, Germany had to reduce the amount of biodegradable waste going to landfills. Since the EU Landfill Directive, 1999/31/EC came into force, reducing the landfilling of biodegradable waste has become an EU-wide goal, with the intended effect of reducing methane emissions from landfills as well. Although a thermal or mechanical–biological pre-treatment of mixed waste is an option to reach that goal, Germany established a legal framework, which gives preference to source-separated collection and treatment of biodegradable waste. The closing of material cycles, including nutrients, was one main intention and result of this approach.

The Renewable Energy Act (EEG), in act since 2000, is the basis of incentives for renewable energies, which include anaerobic digestion and biomass combustion. The incentives come mainly in form of guaranteed higher purchase prices for electricity provided by these technologies. Since they partly use the same input material, there is a possibility of diverting biomass away from composting plants.

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2.2. Economic aspects

The financial basis of German composting plants is the fee for taking in the biodegradable waste. Therefore, the price for compost is not a big concern for plant operators, as long as the compost is removed from the plant site. For that, the compost has to have a good quality, so that farmers and gardeners accept it. The Federal German Compost Quality Assurance Organisation (BGK), founded in 1989, takes over the responsibility for that. The fact, that no market saturation occurred, despite the strong increase in compost production during the last two decades, is a sign of the successful work of the BGK.

However, the low market price for compost affects also its appreciation. The question occurs, what is the value of compost? In economic terms, it seems to be very low. The survey revealed the price of compost to be at around 4 €/Mg_{FM} (4 EUR/tonne fresh matter). Assuming a degradation rate of 50%, this would relate to 2 €/Mg_{FM} input material. In comparison, the average input fee, according to the survey, is at around 39 €/Mg_{FM}.

3. Ways to assess the value of composting

The following discussion about possible ways how to calculate the costs and benefits of composting is by no means complete. It shall provide the basis to comprehend the difficulties associated with determining the value of composting in Germany.

3.1. Methodology and data availability

A sound material and energy balance is the foundation of every assessment, e.g. for a life cycle assessment (LCA), which focuses on ecological aspects, see EASEWASTE (DTU, 2012). The survey, on which the data, used in this paper, are based, included all composting plants that are subject to the BGK. From these 440 plants with a total capacity of 7.5 Tg, 59 plants with a total capacity of 1.2 Tg provided data. That correlates to a response rate of 16%, when calculated with total treatment capacity. Fig. 1 gives a detailed overview about the numbers of answered questionnaires in regard to the numbers of all existing plant types. Several plant types are defined by the BGK, but the most widespread ones, which also provided the most datasets, are No. 6.2 Open Triangular Windrows and No. 6.6 Open Trapezoid Windrows. The figure provides also the information that these two types are operated without forced aeration. Although there are several datasets from plants with forced aeration too, detailed data on energy consumption is scarce for both types. Therefore, it is just possible to analyse the overall energy use of several plants, without knowing there detailed weaknesses and strengths concerning energy and material efficiency. Then there are several plants named "combined", which operate with more than one composting type. For example, they first use an intensive rotting process with forced aeration and later let the compost mature in an open windrow without forced aeration. These plants are hardly to compare with single type plants or just with one another, since they comprise a high variety of type combinations.

Beside the detail level of the data, the outcome of any assessment relies heavily on the chosen system boundaries. For example, to consider just the composting plant with the plant gates as system boundaries would bring some comfort in collecting necessary data, but it blinds out important factors like the transport distances. A plant might look energy-efficient, i.e. a low energy consumption per treated amount of input material, but when very long transport distances are included, the efficiency of the whole treatment chain of this plant could drop drastically in comparison with other plants.

Another example is the usage of the produced output. The compost could be used e.g. as final coverage for landfills, or as substitute for peat in gardening, or as source for humus and nutrients in agriculture. The environmental impact would be different in every case, as recently shown again by Springer (2010). Therefore, it is hardly possible to evaluate the costs and benefits of composting based only on data from composting plants, a fact which is already considered in LCA approaches.

Apart from what should be included into an assessment, the question arises, what can be included? Not only is it difficult to collect detailed data of the plants itself, as already mentioned, it would also involve considerable effort to collect data regarding

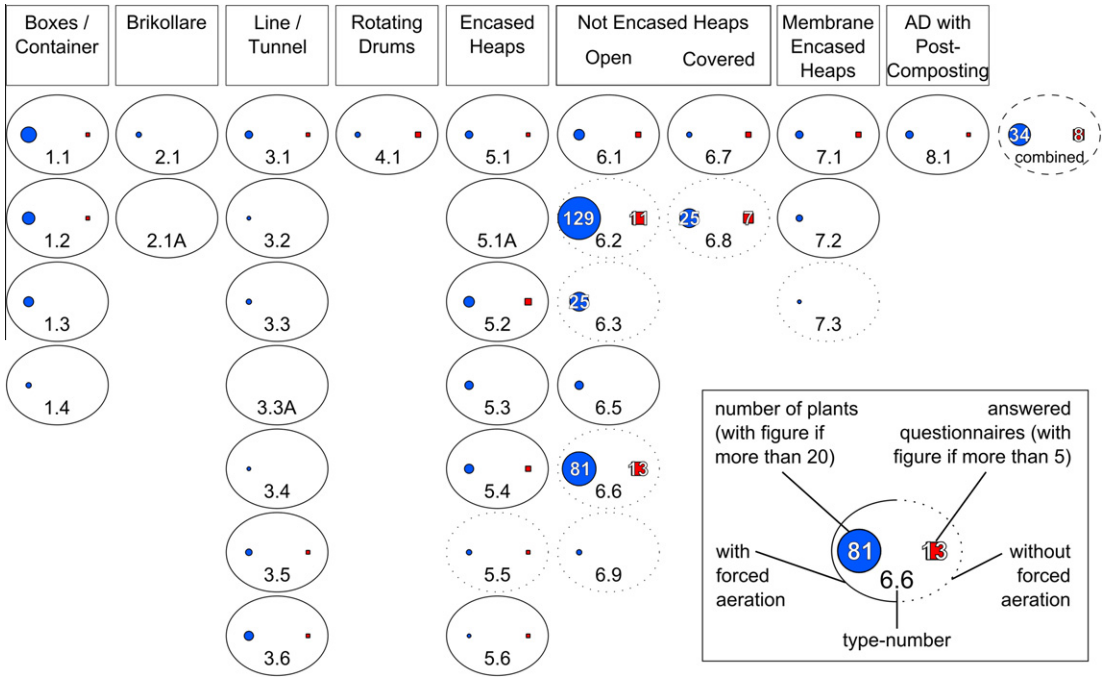

Fig. 1. Answered questionnaires in regard to existing plant types.