Long-term Perspectives for Separate Collection and Recycling of Biowastes

Slide 2

Considering the composition of the German household-wastes / the biodegradable biowaste shows a portion of 30%. Before this background / the recovery obligation of the “German Closed Loop and Waste Management Act” can only be fulfilled / if biowastes and the other quantitative important recyclables from household-waste / can be reused.

Slide 3

The increase in quantities between 1990 and 2004 / concerning all fractions (packages, glass, paper, biowaste) / is obvious. The highest increase is documented for biowastes. Here / the quantities increased from 2 million t in 1990 to around 8 million t in 2004. Assessments of the BGK (which is the German Federal Compost Quality Assurance Organisation) assume / that the actual amount in 2007 will rise to 9-10 million tons. In 2007 / alone 6 million t of biowastes were delivered to those composting plants / which connected to the BGK.

Despite of a broad development of the recycling of biowastes in Germany, / compared with other European countries, / separate collection is not yet introduced nationwide.

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As can be seen in the graph / not all of the regions / respectively municipalities / offer their citizens a possibility / for separate collection of biowastes. Adding the regions / which did not yet introduce the biobin, / one comes to a percentage of 18% of Germany’s inhabitants. These inhabitants have to dispose their biowastes / (if not self-composting) / together with the residual waste bin.

Until now, / approximately 80 % of the regions introduced the biowaste collection. This is / without doubt / a high rate. In this areas, / a medium quota of about 60 % of the households / are connected to the biowaste collection.
On account of the assumption / that biowastes are partly self-composted in the gardens / and not each area can be connected to separate collection, / the not used potential of biowastes in Germany is estimated on 2 - 4 million t/a.

**Slide 5**

Basically / three disposal ways can be differentiated / when it comes to biowastes:

- **(First)** The recovery of treated biowastes (that’s the green area in the figures) Above all, composting and digestion is indicated here. Approximately 60-70% of the biowastes are collected separately / and recycled by this way in Germany. Wooden garden and park wastes / are recovered also energetically (up to approx. 25 % of the garden and park wastes).

- **(Second way)** is the incineration of not treated biowastes (see the red area). This are all biowastes / which are collected together with the residual waste bin / and supplied to incineration. The target of incineration / is here a pre-treatment / prior to landfilling. MBT (Mechanical-Biological-Treatment) / must also be allocated here, fulfilling the same purpose.

- **(The third disposal way)** is Landfilling of untreated biowastes (grey area) Since June 2004, / this option is no longer allowed in Germany / on account of the Technical Data Sheet for Urban Wastes (called TASI).

If one compares the situation in Germany / with the situation in Europe, / one discovers / that the importance of several disposal options / is very different. Corresponding figures can take from a discussion paper of the Commission / dated on December 2003.

Following from this / biowaste is recovered in the EU-15 countries or disposed of / over the following ways on average:

- **Via composting** / only 6 % of the biowastes are recycled.

- **About 22 %** are incinerated.

- **72 %** of the biowastes are landfilled with the effect / that huge amounts GH-gases are emitted.

In fact / the European Union has determined a reduction of the portions of organic matter in landfills / in their Landfill Ordinance.
Slide 6

Figure 6 illustrates by how many tons CO₂-equivalents the emissions from landfills will decrease, if the targets of the EU Landfill Ordinance are kept.

Compared with the year 1995 (100 %) the emissions from GH-gases should have been reduced by 25 % until 2006. Until 2009 the biowaste amounts shall be kept away from the landfill and until 2016 even 65 % should no longer be landfilled.

These targets can only be achieved if either incineration of wastes to be landfilled is developed or separate collection and the utilisation of biowastes. The target of a lowering of the CO₂-reduction can be achieved with both ways. But: An additional material recovery can be realised only if biowastes are in fact collected separately.

Slide 7

Environmental targets are not only directed on the protection of climate but also on the protection of resources and thus on the valuables contained in biowastes:

These are

- contents of organic matter for humus application on soils,
- contents of plant nutrients for fertilization and
- possible substitution for peat as component of growing media.

Incineration disturbs widely the material-recycling-potential from biowastes. A management of biowastes regarding the utilisation of plant nutrients, humus fertiliser and peat substitutes is only possible if biowastes are not incinerated.

Slide 9

Both composting as well as digestion belong to material recovery. During digestion biowaste is used energetically. The recyclables to be utilised remain at a high rate in the digestion-residues. This potential to be utilised is only lost if the digestion residues are (for example) dried and incinerated. In this case it would no longer be an energetic-material utilisation but an energetic-thermal utilisation, which can be totally assigned to only energetic-recovery.
This survey shows once more / that a pure energetic-recovery of biowastes excludes biowastes from material recycling. Contrary to that, / digestion has the advantage / that both / the energetic potential and the material potential / can be utilised. This makes sense / if the respective biowastes are especially suitable for anaerobic treatment, e.g. (for example) / if showing a relatively high gas-potential.

A special report of the “German Expert’s Council for Environmental” (SRU) in July 2007 with the topic „climate protection through biomass“/ points out / that / in the long run / material recycling of wastes must be preferred / compared to energetic-thermal recovery, / because biogenic-raw-materials are the only substitute for fossil-raw-materials.

Contrary to that / energy from fossil sources can be replaced with other renewable energies like the sun, wind, or water. Before this background / the “Waste Framework Directive” of the EU prefers the material recycling of wastes rather than energy recovery.

Besides the legal frame conditions / and the environmental targets / costs of the recycling and the disposal are important.

**Slide 10**

The figure shows the comparison of costs / for a scenario without separate collection / (shown by the left bars of the figure) / and on the other hand a scenario, / where separate collection is established (see the right bars of the figure).

Considered are the costs of the collection (in the left third of the figure) / and the costs of the treatment (which is composting and/or incineration, in the middle third of the figure).

The results of the INFA-Institute Münster, which carried out this survey, are the following:

- (First) The costs for the separate collection of biowastes show / that these are more expensive / than the costs of the combined collection of biowastes together with residual waste. The additional costs are mainly caused by additional containers. The here shown example of a rural disposal area / results additional costs of approx. 12 %.

- (Second) Contrary to the collection costs / the costs for treatment are lower. Treatment-costs of approx. 60 €/t are assumed for composting, / and for the incineration including landfilling of the ashes / approx. 145 €/t. The price-advantage of composting leads to the fact / that costs of the total treatment (which is composting of the biowaste and incineration of the residual waste) / are by 22 % more favourable than the costs / arising at incineration of the total mixed household waste.

- (Third) If one summarizes / the additional costs of separate collection and the cost-savings through treatment, one can see, that in total / separate collection and composting of biowastes in a rural disposal area is about 14 % more favourable / than the combined mixed disposal via the residual waste.

Of course depend the individual costs / on the individual requirements and frame conditions. This example shall only prove / that - contrary to the popular opinion - / separate
collection and composting must not be more expensive than disposal. This assessment is important in so far as the costs for disposal often are the most important criteria when decisions have to be made.

But not only the costs give Separate Collection a Long-Time-Perspective. Separate Collection is also a cheap way, to develop a source of humus-fertilizers.

Organic matter contained in compost or in solid digestates is very stable. Compost contains high portions of so-called “humus-C”. That is the portion of carbon that contributes to humus reproduction.

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This „humus-C“ fraction in compost accounts for 51 % of the total organic carbon and is therewith higher than in any other humus fertiliser. Compared with compost, straw and liquid manure are containing 21 % carbon resistant to degradation, and green-fertilisers just 14 %. The good reputation of compost as an effective humus fertiliser and as the “the gardener’s gold” is based on this context.

Slide 12

Considering the amounts of Humus-C, which are applied with compost according to good expert practice of fertilizing, the differences are becoming more evident:

- With liquid manure (from pigs) only 100 kg humus-C/ha are applied.
- Green-fertilising brings a lot of organic matter into the soil. This, however, is relatively quickly decomposed. As so called “nutrient-humus” this is good for micro-organisms. The humus-reproduction-effects with approx. 500 kg humus-C/ha are relatively modest.
- Straw with 600 kg lies distinctly higher. But: Straw contributes to humus reproduction only if it stays on the area and is not removed for other purposes.

With compost and its high contents of organic matter resistant to degradation more than 2,500 kg Humus-C/ha are applied. The effectiveness on the humus-reproduction is by factor 4 higher than with straw and by factor 20 higher than with liquid manure.

This fact is not without relevance if one knows that the agricultural cultivation is often connected with considerable losses of humus-C in the soils.
Those cultures / which are cultivated for the production of biomass to be energetically util-
ised / show deficiencies in the humus balance of -400 to -800 kg humus-C/ha and more.

If these losses are not balanced with the cultivation of humus-building cultures in crop ro-
tation / or through straw-fertilizing / or through organic fertilisers like digestion residuals
or compost, / the content of organic matter in the soil will gradually decrease / accompa-
nied with a following loss of soil fertility.

Before this background / it is important to recognise the importance of biomass for the soil
in the long run / and the importance of a balanced humus content / during biomass pro-
duction.

While it is obvious / that the demand of biomass is necessary for human nutrition or for
animal feeding stuff / and everybody is talking about the utilisation of biomass for energy
production, the fundamental demand of soils for biomass / should not be ignored in the
present biomass euphoria.

It's taken for self evident, / that energetic utilisation of biomass is CO2-neutral. But this is
only the case / if humus losses / arising at the cultivation of biomass / can be
compensated. With a negative humus balance / a “net-CO2-emission” arises from the soil / to
the amount of the balance-deficit. If the balance-deficit is compensated with compost / the
avoided emissions can be credited to the compost / as CO2-bonus.

An other sink-function can be realised / where the humus content of the soil lies distinctly
below the contents typical for the location. These cases occur in landscaping more often.
If compost is utilised in landscaping with the target / to produce a humus-content typical
for the location, / a CO2-sink can be assumed / and the compost can be credited accord-
ingly as CO2-bonus.

So, / after it was shown / that the use of biomass for energy recovery / is in partial-competition to humus reproduction of the soil, / the question arises / which type of biomass is best suitable for which sort of utilisation.
Composted biowastes and solid digestates, with their high contents of humus-C, are especially suitable for humus reproduction. But the predominant part of humus reproduction in agriculture is presently realised with residues from livestock and with straw, (that is) with material possessing a distinctly lower effectiveness at humus reproduction.

Particularly straw is a material that is better suitable for energy recovery when it comes to efficiency criteria. With a calorific value of 14 MJ/kg, a water content of 13 %, and an ash content of 15 %, these facts are obvious.

Biowastes with a calorific value of 4 MJ/kg only are not suitable for energetic recovery but is well suited for material-recycling.

In short: compost is the better humus fertiliser, straw the better energy carrier.

Around 21 % of the 2.17 million tons humus-C, contained in crop straw remaining on German arable land for humus reproduction, can be substituted by compost and solid digestates.

The amount of energy contained in this straw is with 82 PJ nearly twice as high as the amount in the original substrates of the utilised biowastes and digestates. It’s obvious even before this background that biowastes must be used for humus reproduction of the soils - i.e. (that is) for material recycling.

Besides the humus reproduction potential further arguments on behalf of a material recycling of biowastes must be claimed.
Plant nutrients / contained in biowastes / can be used only via the way of material-recycling. A discussion about the fertilising value of composts and digestates / would go too far at this moment. Therefore, just two aspects should be pointed out:

- (First) Plant nutrients / contained in biowastes / can substitute to some extent mineral fertilisers. The substitution-potential for phosphate / is 28.000 t / respectively 10 % of the phosphate of the mineral fertilisers / applied in Germany. With potassium / 9 % (43.000 t) / and with lime fertilisers 8 % (175.000 t) / can be substituted.

- (2. aspect) In solid organic fertilizers, the predominant part of nitrogen is bound in the organic matter. However, it can be assumed / that for plant nutrition / up to 30 % of the total amount of a mineral-fertiliser-equivalent / can be credited. The production of nitrogen as a fertiliser / is very energy-consuming. The production of 1 kg nitrogen / corresponds to a calorific value of 1 kg oil. If 30 % of the nitrogen / contained in compost / can be used / approx. 13.500 t nitrogen (with an energy-potential of 540 TJ) / can be saved as mineral fertiliser.

High concern must be given to phosphate. The world-wide resources are available for approx. 90 years only. This is of elementary importance / concerning recycling / and thus / the protection of the available resources. Contrary to the “alternative-energies” / plant nutrients have no “alternative nutrients”. Nutrients cannot be replaced. In the long run their “closed loop management” is absolutely essential.

This actual situation becomes clear / if one knows / that the production of biomass / depends directly on the availability of water and plant nutrients. In the long run / phosphate will be / (besides water) / the limiting factor / for the total biomass production / inclusive nutrient and feeding stuff production.

Composts and solid digestates / are also able to substitute the portion of peat in growing media / up to 20 to 30 %. For this purpose / structure-containing composts from garden and park wastes are suitable. The utilisation of green wastes / with a large wooden portion / as peat-substitute / is standing in direct competition with energetic-utilisation of these materials, which are in Germany state-aided by the Renewable Energy Law (EEG).

Information on the importance of peat substitution / were given before / by the presentation of Konrad Schleiß. Considering time, it’s not necessary, to deepen it here.
Last not least / some perspectives on the market for fertilizers from biowaste.

**Slide 22**

The market sectors of compost in Germany are shown in the diagram. Besides agriculture with 45 %, landscaping with 19 %, horticulture and hobby gardening with 10 % respectively 12 % / and the soil manufacturing industry / with 14 % / are important.

While the quantities of composts offered on the market / remain static in between / the **demand** for compost increases steadily.

In all the sales-segments are composts sold with profit. Revenues outside agriculture / with approx. 6 to 10 €/t and even more / are higher than in agriculture (0.5 to 2€/t).

The lower prices in agriculture / depend on higher costs for transports and spreading / compared with mineral fertilising. If these costs are considered in the calculation / the price is comparable with the value of the plant nutrients / contained in compost.

**Slide 23**

The figure shows the development of the value of plant nutrients / contained in compost and digestates / such as nitrogen, phosphate, potassium and lime. Considering nitrogen / just the soluble portion and 5 % of the organic bound portion is calculated, that’s around 10 % of the total content.

From 2005 to 2007 / the **monetary** value of nutrients contained in composts and digestion products / has increased by approximately 50 %.

The value for compost increased from 5.30 € to 8.10 € per t FM. The value for the farmer per ha / increased from 212 € on 320 €/ha. The development of values / for digestion products / is similar.

The value of the micro-nutrients / also contained in the fertilisers / and the organic matter / is not considered hereby. The value for organic matter is assumed to rise distinctly in future / accompanied by the increasing cultivation of energy crops and thus / the demand on humus reproduction of the soil.
Let me come to the end. The afore-mentioned aspects can be summarised as follows:

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• the landfilling of untreated biowastes / must be prevented / on climate-protection-reasons. Regarding the protection of resources / biowastes must not only be kept away from the landfill / but have to be supplied to material recycling as far as possible. This requires separate collection / for the sake of product quality and acceptance on the market.

• In order to support the targets of the EU Landfill Directive / and the announced targets for climate and resource protection / European Guidance is necessary. Best suitable here / is a Biowaste Ordinance / with concrete targets for separate collection and a combined energetic-material utilisation of biowastes. A single product-standard-definition for compost / in the Waste Frame Regulation / is definitely not effective enough.

• The costs of separate collection (with alternating biweekly collection), are usually not higher / than costs for a common disposal of biowastes / together with residual wastes.

• Climate- and resource-protection belong together. For reasons of a sustainable management of the resources / material recycling of biowastes has priority / compared to energy recovery.

• The importance of material recycling of biowastes will increase during the long-term perspectives regarding the following reasons:

  - (First) On account of the increase of the biomass for energy production / the demand for organic fertilisers for humus reproduction rises. Composts are especially suitable for this application purpose.

  - (Second) The closed-loop-management of phosphate / will become a central target of a sustainable resource policy. Biowastes / with a substitution-potential of 10 % / can contribute here distinctly.

  - (Third) Prices for fertilisers will rise / like the ones for energy / on account of increasing shortcomings of resources. The development has already started / and will accelerate in future. The nutrients contained in composts and digestates / will become more and more valuable.
• Notwithstanding the aforementioned arguments / for a sustainable resource-management of biowastes / in the present assessments / the contribution and benefits of material-recycling for climate protection / remains by far unconsidered /.

- (For example) The contribution of composts and digestates / in order to substitute humus losses in the soil / and thus / to reduce CO₂ emissions / is not considered.

- (And) the same can be said / for the contribution of material utilisation of biowastes / to substitute mineral fertilisers and peat / in regard to a CO₂-reduction.

• (Last point) Sale problems with compost are belonging to the past. The demand in the market is increasing / and will gain relevance / on account of the aforementioned correlations. As the recoverable potential of biowastes is limited / the increasing demand / will be reflected in increasing revenues.

Ladies and Gentlemen,

Policy promotion-measures are presently focussed on renewable energies. This is important and right. But: One must keep in mind / that the frame conditions of the material recycling of biowastes / and their specific benefit / will not be forgotten / and misleading-guidance of the material stream / will be avoided.

Thank you for attention.