SOURCE SEPARATION, COMPOSTING A WIN FOR GREENHOUSE GAS REDUCTION (THE NETHERLANDS)

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Dutch waste experts use a life cycle analysis - Eco-Indicator 99 - showing gains for the environment when source separating and composting kitchen and garden waste versus incineration.

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IN 1994, separate collection of organic kitchen and garden waste (KGW) became mandatory in The Netherlands and a new activity evolved for composting companies. At that time, it was apparent for everyone involved why separating KGW at the source was essential: it would immediately result in a reduction in the amount of waste to be landfilled. Indeed, a large reduction was achieved but more than a decade later, various developments have repositioned the composting sector at center stage. The severe restrictions concerning landfilling waste in Germany have led to changes in the Dutch waste market. At the same time, the Dutch government gives more freedom to municipalities to design their own policy concerning KGW collection. Finally, the environmental advantages offered by composting are in the picture again because of the focus on climate change.

This article reports the relevant developments in the waste market and outlines the environmental advantages. We also argue that separating KGW at the source and composting is an essential element of sustainable waste management. In view of the developments, an extra push is required to promote source separation of organic kitchen and garden waste in order to produce clean compost.

ENVIRONMENTAL ANALYSIS

Life cycle analysis (LCA) is a method used to gain insight into all the impacts on the environment of a product or a service. In the European Union, “life cycle thinking” occupies a central role in development of environmental policy. On a national level, the Environmental Impact Assessment of the Dutch National Waste Management Plan (EIA-NWMP) also uses the LCA as an instrument to support decision-making. The method adhered to by EIA-NWMP has been established by the Centre of Environmental Science in Leiden (CML) and is considered to be one of the best accepted methods.

The LCA for KGW is aimed at various processing techniques (composting, anaerobic digestion, incineration, gasification) carried out with sorted or unsorted waste streams. From the analysis, the EIA-NWMP concludes that integral incineration of KGW in a Waste Incineration Installation (WII) produces the greatest burden on the environment, but that the difference with separate collection and composting is not significant. This last statement is caused by the fact that there were a number of important uncertainties in data and basic assumptions. Points of attention included the effect of KGW compost on soil

when used in the agricultural sector and the contribution of KGW to the energy production of the WII.

After publication of the EIA-NWMP, improved insights and data were obtained. To detail the impact of these improved data, the LCA was recalculated by a research agency (IVAM) affiliated with the University of Amsterdam. The results of this recalculation led to a better environmental profile of composting KGW compared to the EIA-NWMP, whereby the differences at two of the seven weighted methods were considered to be significant. One of the constraints in both LCA studies was the lack of clarity in outcomes and conclusions for stakeholders who are not familiar with the LCA tool. To simplify interpretation of the effects shown by the CML method, weighted effect scores have been formulated in the framework of the EIA-NWMP. This increases the degree of interpretability of the results. However, no consensus was reached about a certain weighing method.

For this article, we calculated the LCA using identical data as the study conducted by IVAM/Grontmij but using a different LCA method: the Eco-Indicator 99. This method leads to a comparable analysis but with the advantage that interpreting the results, and consequently dissemination of results, is easier. The method was developed by PRé Consultants in collaboration with the Dutch Institute for Environmental Studies RIVM and is a widely accepted method. The advantage of the Eco-Indicator is that just three effect categories are presented: damage to the environment, (health) damage to humans and depletion of raw material resources. Figure 1 shows the environmental profile according to the Eco-Indicator 99.

A high score in Figure 1 means a greater burden on the environment. If KGW is incinerated together with combustible waste, the depletion of raw materials is greater as more fossil fuels are required. Incineration also causes greater damage to humans, as CO2 emissions are higher. The damage to ecosystems is comparable as both chains release approximately identical emissions of hazardous substances.

The Eco-Indicator 99 visualizes where the gains for the environment can be made when composting KGW: in the use of kitchen and garden waste compost. The gains are made on two fronts in particular:

1) Using compost leads to less use of artificial fertilizer and thereby saves on energy consumption. Savings in energy consumption are translated into a better score regarding the category “depletion raw material resources;”

2) Use of compost leads to binding of CO2 in agricultural soil. Plus the already mentioned reduction in the use of artificial fertilizer also lowers CO2 emissions. In the Eco-Indicator 99, CO2 emission leads to climatic changes and subsequently damage within the “human health” category. Reducing CO2 emissions leads to an improved score in the “human health” category.

The production of stable and clean compost from separately collected KGW has a big influence on the environmental profile of composting as a processing option. This profile becomes clearer if we make a comparison with landfilling biodegradable waste. This treatment option has not been included in the EIA-NWMP, as there is a ban on dumping this type of waste, but various European studies do give an indication. **Whereas composting leads to a net saving of around 42 kg CO2-equivalents per ton KGW-waste, landfilling this waste results in an emission of around 1,080 kg CO2-equivalents. These figures take the following factors into account: transport to the waste disposal site; methane emission at the waste disposal site; utilization of waste dump gas (in the Netherlands ± 20 percent including flare off); and binding CO2 in the waste disposal site.**

The comparison with landfilling is not as far fetched as it seems. The volume of combustible waste landfilled in The Netherlands has risen dramatically in recent months. This means that integrated collected KGW can also partly end up on the waste disposal site. This development is outlined below and sheds new light on the importance of separating kitchen and garden waste at the source.

DEVELOPMENTS IN THE WASTE MARKET

As already known, the enforcement of “the German ban on landfilling” has created enormous pressure on the present Waste Incineration Installations (WII) capacity in both Germany and the Netherlands. Developments in Germany are crucial for the Dutch waste market. The question is how this situation will develop in the coming years, considering that as from January 1, 2007, the waste borders will be opened even further. In Germany, there are currently many bottlenecks regarding the processing of industrial waste and household waste. The flow of waste is greater than the disposal capacity. In Germany, this has resulted in the following measures being introduced to temporarily increase the disposal capacity: Untreated waste is baled and stored at the waste disposal site to wait for processing at a later date; and The German federal states have allowed separation installations for household waste to run at a higher capacity and have permitted a more liberal landfilling policy for the organic fraction of the waste.

Untreated waste is stored simply because there is no other alternative due to the shortfall in disposal capacity caused by a surplus of millions of tons of combustible waste. We have the impression that these measures are being implemented on a large scale in Germany at the moment.

This means that - when the processing capacity is finally sufficient - the stockpiled waste will have to be dealt with first, which means the limited disposal capacity in the Dutch-German region may still last for a long period. Market research agency Prognos expects these “depositories” for waste flows will remain a necessity until at least 2013. The figures concerned are many tens of millions of tons.

The limited capacity on the German waste market means the German authorities have been compelled to relax the tight constraints of the recently introduced ban on landfilling. According to the German Regulation on Environmentally Compatible Storage of Waste

from Human Settlements (AbfAblV), the soiled organic fraction from residual waste may be landfilled if it complies with certain quality criteria, including stability, as established in the AbfAblV. The stability demands have been formulated to enable environmentally responsible landfilling (restricting methane emissions). Due to the fact that the Mechanical Biological Treatment (MBT) installations will be allowed to run at higher capacity, compliance with the stability norms demanded by the AbfAblV are at stake.

In general, the developments in Germany have resulted in rising pressure on incineration rates for the Dutch WIIs. Furthermore, a shortfall in the processing capacity for combustible waste has been created. In the second half of 2005, more than 600,000 tons of combustible waste have been landfilled. If the current pace continues, this could amount to ± 1.7 Mton in 2006. At the moment, it is unclear if the Bssa (Decree regulating waste to landfill) will be modified in 2006 and if so, what this will signify for the current dispensation possibilities regarding the ban on landfilling untreated waste. If the opportunity for dispensation disappears, only pretreated waste can be landfilled. In the Netherlands, there is already insufficient capacity.

The conclusion is clear: the incineration capacity is too small to cope with all the flows of combustible waste. Like in 1994, separated collection of KGW will therefore lead to less dumping, with an environmental gain of 1.122 kg CO2-eq per ton separated and composted KGW. The environmental gains made in practice are therefore actually greater than indicated by the LCA comparison carried out between composting and incineration. Naturally, the LCA method wasn't intended to be used to follow market developments. When calculating the actual environmental impact of the policy, dynamic market processes, as outlined, should also be taken into account.

The Netherlands has an advanced and well-developed KGW composting sector that is definitely able to cope with a larger supply of kitchen and garden waste. The processes are optimized and the trend in operational costs is still decreasing. This results in a big cost advantage for source separated KGW compared to gate fees for incineration of sometime more than €45/ton. The KGW policy therefore deserves a new national impulse whereby the positive attitude of 1994 cannot be missed. The composting sector should safeguard the further marketing of compost as well as possible in order to maximize all the (environmental) advantages.

WHAT THE FUTURE HOLDS

We have illustrated that composting separated flows of KGW offers cost-related and environmental advantages compared to incineration or dumping waste. Maintaining or increasing the percentage of separated KGW will lead to less pressure on the already strained waste market for WIIs. Plus, separate collection and composting are often cheaper.

The comparison with landfilling is once again a relevant topic. The amount of dumped combustible waste has risen immensely in recent months due to the German landfill ban. There is nothing to indicate this situation is likely to change in the short term.

Composting KGW is far better for the environment than landfilling and contributes positively to the climate policy. The Dutch NWMP is also a good example of using a life cycle approach in decision making as advocated by the EC. In addition, increased efforts to promote the separate collection of kitchen and garden waste have a positive effect on the willingness of the general public to collect and separate other types of waste. Separation at the source is once again a hot issue.

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