Can green cuttings be turned into biogas?

Grass, flowers and small bushes are constant features along roadsides; they are mowed at regular intervals, and either dumped, left where they are, or less frequently composted. Cuttings like these could contribute to solving the global energy problem and even generate money. However, communities that are aiming to turn green waste from roadsides, riversides or sports grounds into biogas, and hence a renewable source of energy, are confronted with practical problems that require precise planning and the assessment of potential gain. Dr. Chantal Ruppert-Winkel and her team from the Centre for Renewable Energy in Freiburg have carried out a survey in a Baden-Württemberg administrative district aimed at identifying the factors that communities need to take into account before setting up renewable energy systems, i.e. using previously neglected sources of biogas for generating energy and heat. What local conditions need to be taken into account? Can any profit be expected, and if so, when?

The Schwäbisch-Hall administrative district has an ambitious goal and as such, can be considered a model for a growing number of communities in Germany. In future, Schwäbisch-Hall has plans to cover its entire energy requirements with renewable energies. The first things that come to mind are wind turbines, sunlight collectors and maize plantations for biogas production; nobody really thinks of green cuttings. Grass clippings resulting from mowing the grass alongside pavements, riverbanks and on football fields, if properly treated in a fermentation plant, could become an excellent source of biogas. And furthermore, this green waste could be used to generate biogas that would not be in competition with areas used to cultivate vegetables and crops. So why would you mow the grass and
leave it where it is, or worse still, collect, transport and dispose of it at great expense? Why not come up with a concept that would kill several birds with one stone? "The problem we became aware of when we first started our investigations was that the prevailing conditions in cities and villages were rather different. And these differences made it quite difficult to assess the actual potential of using green waste as a biogas source," said Dr. Chantal Ruppert-Winkel from the Centre for Renewable Energy at the University of Freiburg.

No simple answers

In cooperation with partners from the Institute of Ecological Economy Research in Berlin and the Institute of Landscape and Plant Ecology at the University of Hohenheim, Ruppert-Winkel and her team undertook a project called “Decentralized micro-biogas generation (micro-biogas) – development of transferable concepts for the sustainable use of biogenic residues and waste for micro-biogas production in communities and administrative districts” funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. Between 2009 and 2011, the researchers investigated the potential of unused green areas for the production of biogas. They came up with a whole list of questions, rather than a simple answer. However, it is a list that could potentially help ambitious communities and administrative districts turn their green waste into profit – and not just in the economic sense of the word.

“When they look at the possibility of renewable sources of energy, many communities are seeking to develop holistic concepts that take into account financial and ecological issues as well as attempting to find a way to use resources sustainably,” said Ruppert-Winkel. Many factors – not just economic ones – need to be taken into account when it comes to using green waste for energy production. Ruppert-Winkel and her team therefore make a clear difference between the various cost- and profit dimensions.

How much green waste that can be turned into biogas accumulates in a particular community? Is the waste fertilized grass from sports grounds or parks that is frequently mowed, is it barely ligneous and therefore ideal for generating energy-rich biomass? Or is it greenery from riverbanks that is difficult to access, ligneous and therefore energy-poor, and is also used as a breeding ground for many bird and insect species? Is it material that grows alongside motorways and has accumulated harmful substances whose fermentation residues must not be circulated?

A question of legislation?

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“All these cost and benefit factors need to be weighed up against one another, and this is frequently a very long and difficult process,” said Ruppert-Winkel. In addition to such issues, there are also organizational problems such as planning the collection and transport of the green waste to a biogas plant or fermenters. This is why geographical conditions also need to be taken into account: are there already farmers in the vicinity who operate a biogas plant? How far is it to the biogas plant? Is there a local heat consumer in the vicinity or does the heat need to be transported through pipelines? Will untreated biogas be transported to a central combined heat and power plant via biogas lines? The evaluation and calculation of potential profit needs to take all these aspects into account.

Generally speaking, financial profitability depends mainly on the quantity of biomass accumulating in the form of green waste. If it is too low, the positive effects of short transport routes, optimal heat-power coupling and other parameters have little effect on the outcome. However, if ecological and societal benefits (e.g. the reduction of greenhouse gases) are also taken into account, then the use of green waste for the production of biogas is worth considering despite the fact that no financial profit can be made. The German Federal Ministry of the Environment, Nature Conservation and Nuclear Safety would be well advised to consider one particular issue. “Legislation has a big impact on the profitability of a green cuttings biogas concept,” said Ruppert-Winkel. For example, the German Renewable Energy Sources Act (EEG) determines what funds the German government sets aside for different concepts focusing on energy generation from renewable energy sources. During the course of the project, the general conditions (EEG, market incentive programmes – MAP, German: Marktanreizprogramme) have changed several times.

“The changes have had major consequences. We found that none of the concepts we investigated is profitable,” said Ruppert-Winkel. For example, since early 2011, no financial support has been given to biogas pipelines pursuant to the government’s market incentive programme. In addition, the EEG’s bonus system has also changed. The establishment of an energy supply concept takes a lot of time and costs a community a lot of money, and is a long-term investment commitment. If legislation changes from one year to the next, it is difficult to implement innovative concepts.

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