GOOD PRACTICE STYRIA:

BIOWASTE COLLECTION

SEPTEMBER 2014

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1. GENERAL INFORMATION ON THE GOOD PRACTICE (GP)

1.1 General information

Region	Styria
Country	Austria
Short name of the good practice	Separate Collection of Biowaste
Geographical level of implementation (country, region, municipality…)	Province of Styria
Target group	Private households
Date of implementation/duration	1990 – 1993
Waste stream (and subcategory)	Biowaste
Legal framework	Styrian Waste Management Act, LGBl. Nr. 68/1990 §3, Abs. (4)
Main local instruments involved	Separation at Source; door-to-door collection; composting plant for biodegradable waste
Scale (pilot/partially roll out /roll out)	Roll-out
Initiator/coordinator	Province of Styria
Demography	
Population	1,2 M
Number of households	512 000
Area (km²)	16.000
Population density (number of inhabitants/km²)	75
General waste data (Not necessarily related to the GP but to give some background information. Data about the GP should be included under 3.1)	
Year of the following waste data	2012
Sum of all waste streams excl. residual & bulky waste (kg/inhabitant/year) (Use indicator 1 or 2 from the R4R Online Tool)	269,3

Residual waste (including sorting residues) (kg/inhabitant/year) (Use indicator 8 or 9 from the R4R Online Tool)	128,9
Total waste (add up the previous two)	398,2
Sum of all waste streams excl. residual & bulky waste to DREC (kg/inhabitant/year) (Use indicator 3 of the R4R Online Tool)	269,3

1.2 Context

Due to limited capacities of landfill sites in the 1980ies new alternatives for certain waste streams had to be found. As biowaste made out more than 1/3 of the total waste landfilled, biowaste was one priority topic. Therefore the separate collection of biogenic wastes and their recovery were introduced as pilot projects in Styrian waste management from 1987 to 1989 and were defined as targets in the Styrian Waste Management Concept 1989. As first Austrian province, Styria legally implemented the separate collection of biogenic waste by integrating it into the Styrian Waste Management Act 1990 (StAWG). As early as in 1993, the set goal of separately collecting and composting biogenic waste was fully achieved at the provincial level. As an alternative, the home and community composting of biowaste were introduced.

1.3 Short description

Currently, around 51% of household biogenic waste is collected in organic waste containers, which are integrated in the separate collection system. The rest, mainly biogenic waste originating in gardens and green spaces, is collected via municipal structures or socio-economic organisations. In rural areas and households with gardens, biogenic waste is recovered by home or community composting, which has been encouraged by the Provincial Government of Styria according to the slogan "as centralised as required and as decentralised as possible". Department 14 published a brochure with guidelines for "*Dezentralisierte Kompostierung in der Steiermark - Decentralised composting in Styria*", which can be downloaded here (German version).

Figure 1 : Home composting plant in Styria

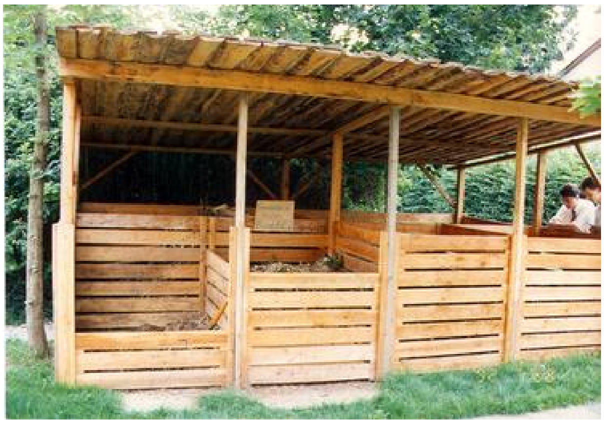

Figure 2 : community composting plant in Styria

1.4 Objective

The main objectives of the separate biowaste collection in Styria are

- to diveret organic waste from landfill sites for the following reasons
  - reduction of wastage of landfill capacities
  - reduction of landfill gas production
  - reduction of landfill seepage water
- collection of dry waste fractions in order to improve the recovery of recyclables
- reduction of the amount of non-reusable waste
- production of compost to be used in the agriculture (fertilizer, ameliorant)

1.5 Method used to identify the good practice

The method to identify this good practice is evolution. After the introduction of the separate biogenic waste collection in Styria, the landfill volume was reduced and the volume of the biogenic municipal waste collection increased considerably.

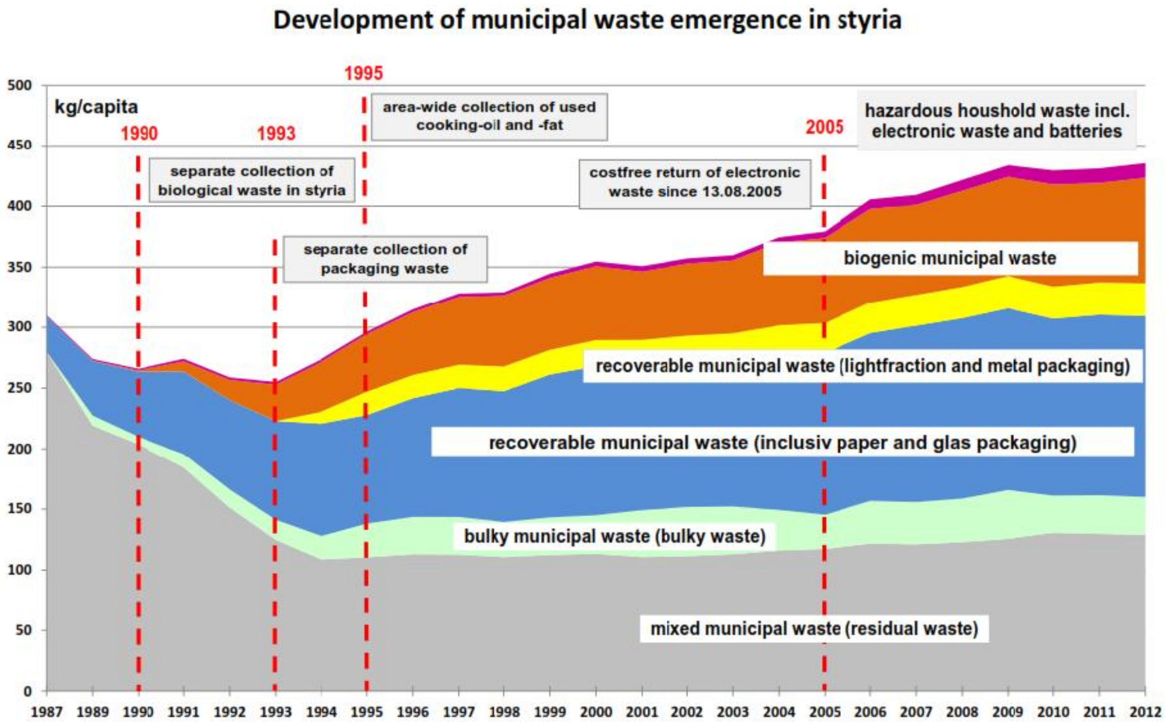

Figure 3: Development of municipal waste emergence in Styria 1987 – 2012

2. IMPLEMENTATION

2.1 Preparation phase

The separate collection of biogenic wastes and their recovery were introduced in the form of some pilot projects in Styrian waste management from 1987 to 1989. First composting trials have been implemented under scientific monitoring, e.g.

Project „Disinfection of biogenic waste during composting“

Project „Nitrogen in biowaste und green waste composting“

Project „Implementation of a community biogas plant in Feldbach“

Furthermore, the optimal ratio of biogenic waste and structure materials was investigated. An accompanying information campaign informed the public about the separate waste collection ("Müll getrennt – Happy End")

Figure 4: Information campaign „Müll getrennt - happy end"

2.2 Technical implementation

In Styria, biogenic waste is mainly collected in 120 l containers. In most municipalities collection intervals vary according to the seasons: organic waste containers are emptied every week in the summer months and every two weeks in winter.

Two treatment forms are possible for biogenic waste: aerobic treatment (composting) and anaerobic treatment (fermentation).

Composting

In Styria, the main form of biological treatment of biogenic municipal waste is composting, aiming to generate a product rich in humins (compost) from biogenic waste. If the requirements of the Compost Ordinance are met, the used wastes eventually lose the characteristic properties of waste: they run through specific processes before defined output qualities are determined and can then be considered a competitive product which is returned to the natural cycle.

Impurities in biogenic municipal waste ("misthrows", contaminated input) can significantly increase the pollutant content of biogenic waste, making it inadequate for composting. Since only high-quality biogenic waste is suitable for composting impurities must be separated, which necessitates technical efforts or increased personnel input. Modern systems automatically detect impurities in organic waste containers and allow reducing their number by informing the waste producer or by not emptying the containers in question. In the future, measures to reduce contamination should be taken in particular in areas where a lot of impurities are detected in organic waste containers.

24 communal or commercial composting facilities with a processing capacity of approx. 65,000 t/year are available in Styria. Moreover, 46 agricultural composting plants with a processing capacity of approx. 55,000 t/year hold approvals. Therefore, the total Styrian processing capacity amounts to 117,000 t/year.

Figure 5: In Styria, composting of separately collected biogenic waste is mainly performed in uncovered piles

Figure 6: modern composting plant in Liezen with composting tunnel

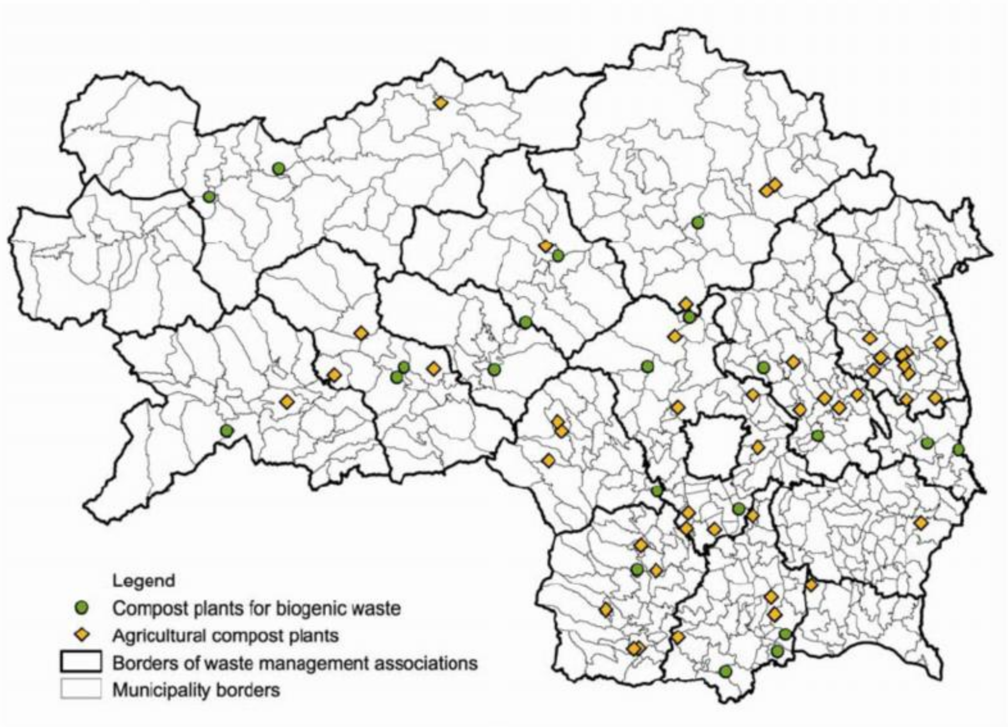

Figure 7:Sites of corporate and agricultural composting facilities in Styria (as at January 2010)

Material collected in organic waste containers and sewage sludge must be mixed with bulking materials such as tree and bush cuttings before composting. An in-depth examination of material flows during composting (Fehler! Verweisquelle konnte nicht gefunden werden.) shows that a mass fraction of approx. 55% of the total input is biodegraded ("rotting loss"). Approx. 0.7% of the total input must be considered as impurities (in particular plastic and metals). Then the composted materials are sieved. The screening overflow (approx. 10% of sieved materials) is reintegrated into the composting process. Approx. 90% of the sieved materials, i.e. approx. 40% of the original input material, leaves the facility as commercial compost. An annual quantity of approx. 46,000 t of commercial compost could be produced in Styria if all approved processing capacities of composting facilities were exploited. The amount of impurities largely depends on the quality of input materials, whereas the share of rotting losses depends on the type of input materials and processes. Therefore, the indicated data must be considered as average values.

Within the observation period from 2005 to 2008 40% of composts produced in Styria were suitable for classification as quality compost class A+, 53% as quality compost class A, and 7 as quality compost class B.

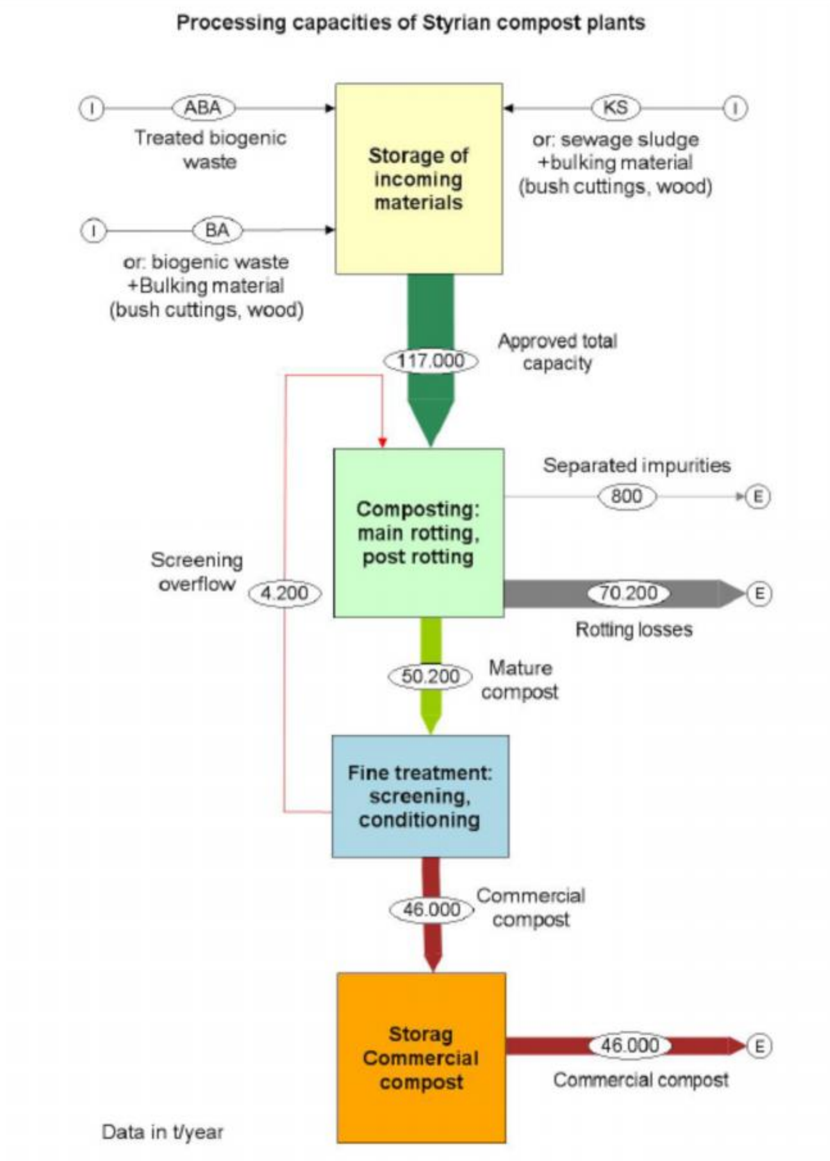

Figure 8:Capacities of Styrian composting facilities and illustration of material flows

During the composting process, the organic input substance is biologically degraded: for instance, organic carbon is converted into carbon dioxide (CO_2), hydrogen contained in the organic mass into water (H_2O). This mass reduction caused by biodegradation processes is referred to as "rotting loss" and on average amounts to approx 50%. Subsequently, approx. 50% of used organic carbon is released into the atmosphere as CO_2 without being any further exploited. Additionally, methane (CH_4) and nitrous oxide (N_2O) are produced in anaerobic compartments, which may be the result of insufficient ventilation of the rotting material. According to data of the *Klimaschutzbericht 2009* -

Climate Protection Report 2009[1] anaerobic waste treatment, and in particular composting, account for 5.0% of all GHG emissions produced by the waste management sector. Moreover, these GHG emissions have experienced a major augmentation by 214.2% since 1990, representing the highest increase within this sector.

Equally, the heat generated during composting is lost without being exploited. As advantage of composting some organic carbon of the used biomass is on the long term trapped in the humus as part of the terrestrial carbon sink. According to calculations of the Environmental Protection Encouragement Agency (EPEA) composting 1 t of biogenic waste allows for permanent trapping of approx. 35 kg carbon in 60 kg humus. The agency also underpins the positive effects of composting for soil fertility, biodiversity and soil structure.

Biogas plants

In biogas plants biogenic raw materials (waste and/or agricultural residues) and, to some extend, sewage sludge are biologically converted into biogas and a remaining fermentation residue. This process does not require oxygen (anaerobic treatment) and is done by microorganisms, producing combustible biogas from the carbon contained in the biogenic raw materials. Biogas is a mixture of 60% vol. CH_4 and 40% vol. CO_2 with a calorific value of approx.. 22 MJ/Nm3, depending on the CH_4 content. As at January 2010, 44 biogas plants with a total processing capacity summing up to approx.. 500.000 t/year were operated in Styria (Figure 10). In about half of all biogas plants energy crops (so-called renewable resources) and farm-produced fertiliser (in particular pig manure) are treated, whereas agricultural residues and other commercial biogenic waste (from food, beverage and feeds industries, gastronomy, etc.) are treated in the remaining plants. Currently, the treatement of biogenic municipal waste in biogas plants plays a minor role; the same is true for the joint treatment of biogenic waste and municipal sewage sludge in digestion towers of sewage treatment plants (so-called co-fermentation). In principle, kitchen waste and grass cuttings would be well suited for fermentation, whereas wooden parts (tree and bush cuttings) are not biodegradable during anaerobic processes.

[1] Anderl et. al, 2009.

Figure 9: Biogas plant/fermentation tank with foil gas storage

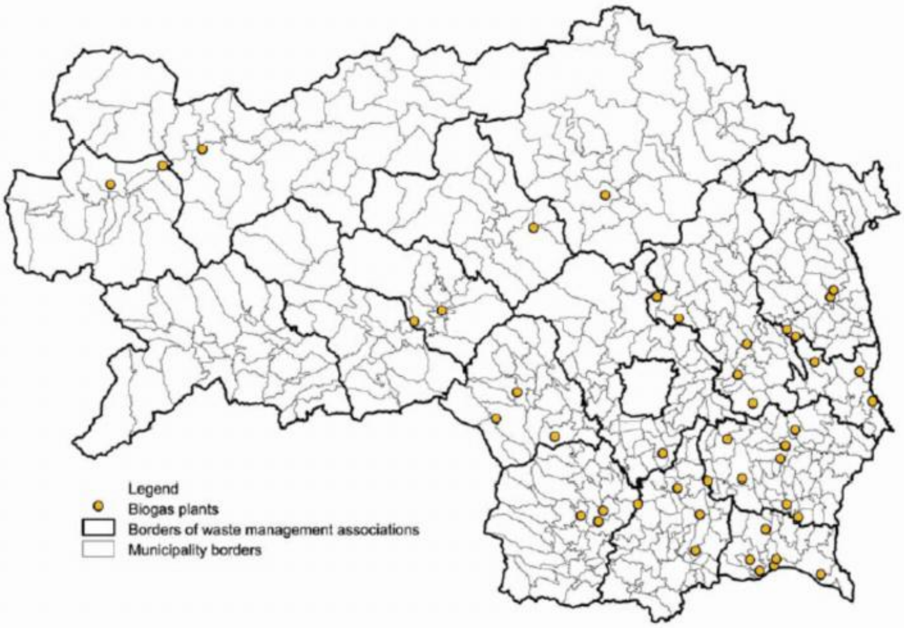

Figure 10: Sites of biogas plants in Styria (as at 1 January 2010). Input materials comprise approx. two thirds of energy crops and farm-produced fertilisers. To date, the use of separately collected biogenic waste and sewage sludge is limited.

Figure 11 illustrates the treatment principle of biogas plants. The material flows are based on available Styrian plant capacities. During treatment, impurities still contained in the waste are separated because they can have negative impacts on the substrate and process flow. The main impurities are floating matters such as wood, straw, plastic etc. as well as setting sediments such as metals, sand, stones, glass, etc.

To adjust the optimum dry matter content in the fermenter, already fermented material (recyclate) is partly re-introduced. Alternatively, water is introduced into the plant with the input materials.

The produced biogas can either be transformed into electric energy and heat in block heating stations or heat can be generated directly. Alternatively, correctly purified biogas can be introduced into the natural gas system or used to operate vehicles. To 75%, the fermentation residue (also referred to as biogas manure if only energy crops and farm-produced fertiliser were used) is directly applied to agricultural surfaces as fertiliser. Approx. 25% are pressed and composted, or thermally recovered. The waste water generated during the pressing process is either recovered agriculturally or introduced into water treatment plants.

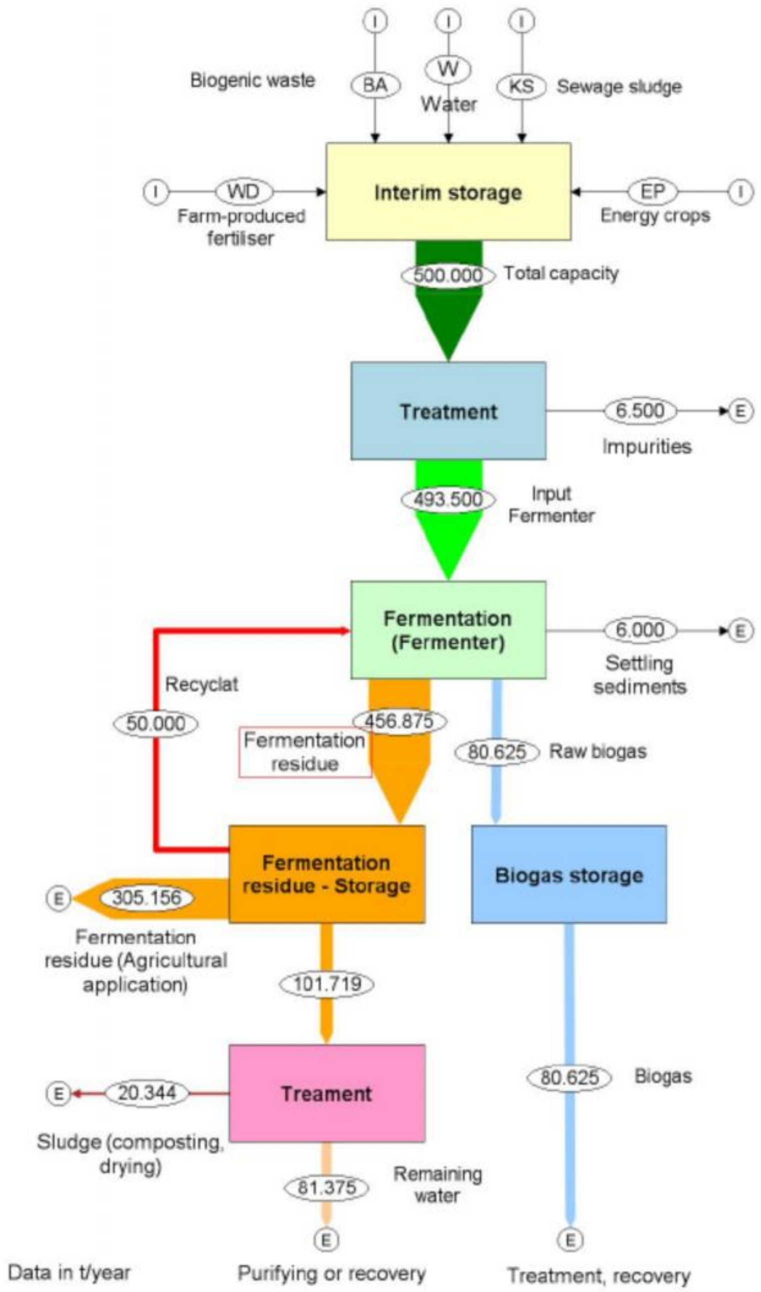

Figure 11: Capacities of Styrian biogas plants and illustration of material flows

Since fermentation is a biological process involving various plant designs, the material flows illustrated in Figure 11 represent only average values: in practice, differences in plant conception and process design may involve major deviations from the scheme shown.

In biogas plants, approx. 85% of the carbon input is transformed into useable biogas with „climate neutral" combustion due to its biogenic origin. Minor quantities of the greenhouse gas methane

(CH_4) are contained in the fermentation residue and may be emitted into the atmosphere if stored inadequately (e.g. in open storages) or during application to agricultural surfaces. Additionally, the fermentation residue also contains nitrogen, mainly in the form of ammonia nitrogen, whereof approx. 13% are lost as NH_3 during application. The greenhouse gas N_2O can form in the soil from the applied nitrogen.

A study performed by the University of Rostock on the ecological evaluation of fermentation of biogenic waste concludes that the positive greenhouse effects resulting from the different biological waste treatment processes are related to the "non-release" of nitrous oxide and methane emissions". With regard to climate protection and taking into account other ecological effects (such as the release of ammonia or fine particles) fermentation of organic waste container contents followed by composting of the fermentation residue (together with bush cuttings) would be the process of preference.

Therefore, a combination of biogas production and composting should be considered during the development of new plants, while considering the regional characteristics and economic possibilities. For existing plants measures to reduce emissions have to be taken for reasons of climate protection, including:

- Avoiding methane emissions by consequent application of anaerobic processes during composting
- Self-contained storage of fermentation residues until application
- Applying low emission methods for the application of fermentation residue
- If possible, optimising the combustion efficiency factors of biogas plants, e.g. utilisation of waste heat

2.3 Communicative implementation

Waste consultants inform the public via public events and organise action days and excursions to composting plants. What is more, informations via internet, leaflets and newspaper articles are provided. Department 14 also published a brochure with guidelines for "Dezentralisierte Kompostierung in der Steiermark - Decentralised composting in Styria" which can be downloaded here.

Further promotion material:

- Nationwide guideline for kitchen and catering waste (developed under the guidance of Department 14 of the Province of Styria)
- Information about decentralized small-size composting
- Informationsheets about composting
    - Biowaste – how to collect it right
    - Bio ton – tips for disinfection
    - Composting – tips for the container dress

- o [Composting - how to do it] – general information
- o [Composting – how to do it in the own garden]

2.4 Organisations

Municipalities provide biowaste collection bins to households. The collection of biowaste is carried out by municipal or private waste collectors. Waste management associations are responsible for the treatment of the biowaste, the treatment is practically carried out in municipal, agricultural and commercial composting plants. Dependend on the quality the compost is used either in agriculture or landscaping.

2.5 Key success factors

The introduction and implementation of the separate collection of biogenic waste came with the following advantages:

- saving of landfill spaces
- avoidance of greenhouse gases (landfill gas)
- economic targets were set: 80 farmers produce compost; new technical innovations for biowaste treatment did arise (worldwide leader KOMPTECH)

Figure 12: KOMPTECH plant

Figure 13: KOMPTECH plant

2.6 Resources

The biowaste collection is financed via the municipal waste fee (tariffs are determined in the municipal waste removal ordinances). In the initial phase the treatment of the biogenic waste was financially supported via fundings of the Province of Styria.

The separate collection of biogenic waste leads to cost savings. On the one hand profits can be generated through the sale of compost and on the other hand cost savings occur by different removal tariffs:

Biowaste	
Collection costs	64,1 – 155,5 € per ton
Treatment costs	47,4 – 84,9 € per ton
Total costs	114,0 – 359,1 € per ton

Residual waste	
Total costs	229,6 – 327,0 € per ton

3. RESULTS

3.1 Monitoring of the progress of the GP

In Austria an average quantity of 86 kg/inhab (714,900 t in absolute numbers) of biogenic municipal waste was collected in the year 2008.

In Styria, 95,136.2 t of biogenic waste was collected and recovered in 2008. This corresponds to 78 kg/inhab and is composed of 56 kg/inhab/year of kitchen and garden waste collected in organic waste containers, 20 kg/inhab/year of municipal garden and park waste and 2 kg/inhab/year of biogenic cemetery waste. Data on biogenic waste recovered in home or community composting are not collected comprehensively; they are estimated to amount to approx. 50,000 t/year.

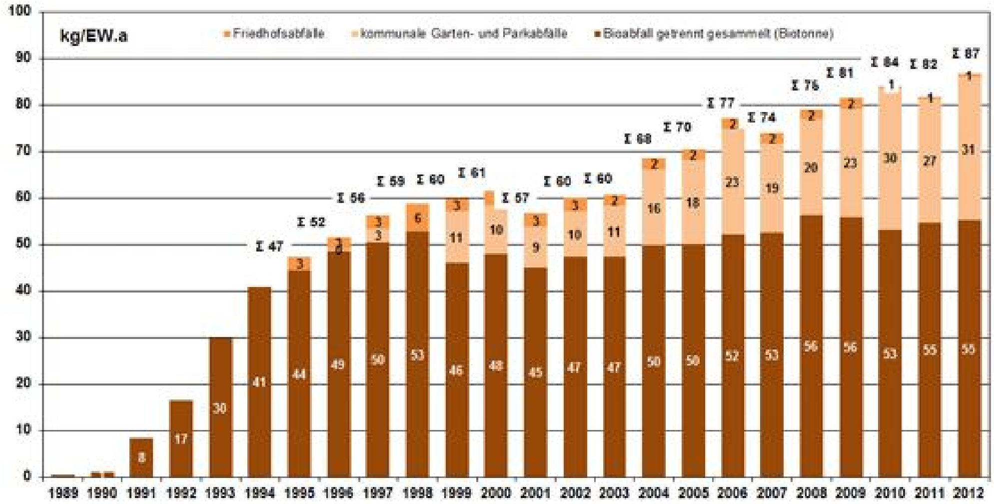

Figure 14 : increase of collected biowaste between the years 1989 – 2012

4. LESSONS LEARNED

4.1 Negative effects

Especially during the summer months odour nuisance is a problem. In order to overcome this problem, the collection intervals are shortened and the collection bins get washed regularly.

4.2 Challenges

A future topic will be the improvement of the quality of the collected biowaste, meaning the reduction of impurities like plastic bags. A possible solution is the provision of bio-degradable plastic bags to be provided for the biowaste collection (Verpackungszentrum Graz).

5. PICTURES AND OTHER DOCUMENTATION

Figure 15: Promotion Material "Müll getrennt – Happy End"

Figure 16: impressions of the Styrian biowaste collection

Figure 17: impressions of the Styrian biowaste collection

Other documents about biowaste collection (nationalwide):

- Federal Waste Management Plan (Part I , Part II)
- Compost Ordinance

6. FURTHER INFORMATION

Organisation	Office of the Federal State Government of Styria Department 14, Division Waste Management and Sustainability
Address	Bürgergasse 5a 8010 Graz
Contact person	Wilhelm Himmel
Phone	+43 316 877 4323
E-mail address	abfallwirtschaft@stmk.gv.at
Website	www.abfallwirtschaft.steiermark.at
Others	The Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management www.bmlfuw.gv.at/en.html

7. OTHER REGIONS WITH SIMILAR GOOD PRACTICES

The following partners of the R4R-project have a good practice similar to the good practice described in this factsheet:

Organisation	Municipality of Lisbon
Address	Rua da Boavista, nº 9, 1200-066 Lisbon PORTUGAL
Region	Lisbon
Country	Portugal
Contact person:	Inês Cristóvão
Phone	00351 213 253 599
E-mail address	ines.cristovao@cm-lisboa.pt
Website	http://www.cm-lisboa.pt/viver/higiene-urbana/recolha-de-residuos
Others	http://www.valorsul.pt/pt/o-sistema/valorizacao-organica.aspx
Short description of the main differences.	The biowaste that is selectively collected in Lisbon, in restaurants, canteens, hotels and others, is sent to an anaerobic digestion plant, managed by Valorsul. It treats only kitchen waste. There is no composting.

REGIONSFORRECYCLING