CORE Project - Review on good practices examples presented on kick-off meeting

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Index

Summary

This report collects the good practices examples presented during the kick-off meeting of the Interreg project "**Composting On Rural Environments (CORE)**" which took place in Ciudad Real (Spain) from 17 to 19 April 2023.

The examples were presented by the different project partners and reflect different approaches to bio-waste management in decentralised areas. From small-scale local composting (preferably household composting) to large-scale anaerobic digestion facilities for biogas production. But also technical training programmes focusing on the development of a network of local composting experts ("master composters") who can take care of the local treatment of food waste in management models without separate collection through community composting sites.

Diagnoses

The different examples presented have been reviewed according to the information and explanations provided during the presentations. The list of pros and cons of each case considers the extent to which they are close to or coincide with a model of bio-waste management based on a decentralised strategy of local treatment by composting (at household, community and small scale facilities).

The factors considered can be grouped in three categories: technical, social and economical.

- Technical: all the aspects related with the equipments, tools, technologies, infrastructures, staff and work protocols.
- Social: factors that directly affect to the citizenship at very different levels. From awareness campaigns, communication, environmental education,... to even political issues.
- Economical: considering the investment costs and treatment/operative costs.

As mentioned above, the information in the different examples is based on the information and data provided during the presentations. At some points it would be desirable to have more detailed data from the cases presented, in order to be able to qualify or develop in depth some of the issues raised in this report.

In the following table there are listed all the practical cases presented and it is indicated for the three groups of factors, how close they are to a decentralized local bio-waste management model trough community composting.

Cases	Technical	Social	Economical
Training in Master Composter - Red Estatal de Entidades Locales por el Compostaje Doméstico y Comunitario (Spain)	✓	✓	✓
Implementing a Home Composting scheme, with the help of Master Composters - Vlaco (Flanders, Belgium)	✓	✓	✓
Community Composting of Biowaste - RSUSA (Castilla La Mancha, Spain)	✓	✓	✓
Community Composting in Kóspallag: obstacles and solutions - CTRIA (Kóspallag, Hungary)	✗	✓	✓
Anaerobic Digestion & Composting - Bio-Energy Centre - Schwarze Elster (Denmark)	✗	✓	✗
Anaerobic Digestion in Rural Areas - Implementing professional predigestion and composting of biowaste (Flanders, Belgium)	✗	✓	✗
Soil improver (Poland)	✓	✓	✗
Biogas (Poland)	✗	✓	✗
From farm composting to robust composting plants in rural areas (Italy)	✓	✓	✓
Good practices on Anaerobic Digestion in Province of Bolzano (Italy)	✓	✓	✗
Food Waste Collection and Anaerobic Digestion System for Biogas and Biofertilizer (Sweden)	✓	✓	✗

Training in Master Composter - *Red Estatal de Entidades Locales por el Compostaje Doméstico y Comunitario* (Spain)

Presented by [redacted] from [redacted]

Objective: The creation of an official training program at national level in composting at local scale (household, community and small facilities) that could be recognized and validated by all the local administrations. During the past years there is a rising in the demand of experienced technicians ("master composters") to attend projects in local composting for towns and villages, and even some cities. But, as there is not such official title in the job market, there is a lack of personnel with that background.

Pros:

- High demand of technicians with that specific knowledge and experienced.
- They have a national network of practical cases and experts on local composting.

Cons:

- The first local administrations that were interested in local composting 12-15 years ago have already trained their own staff, or there are small companies and/or associations (focused in social inclusion) in those areas that give that service.
- At this moment in Spain there is an important offer in different training courses in local composting in different regions. Not all of them have the same level and there is an imbalance between theoretical and practical training. Very few courses offer an intense practical training in real conditions and this lack of practice limited the real capacity of the students during their first months of work.

- It is hard to adapt the curricular content of the course to all the realities that can be found in a waste management model that have to designed at a local level and adapted to the singular circumstances of each territory.

Implementing a Home Composting scheme, with the help of Master Composters - *Vlaco* (Flanders, Belgium)

Presented by [redacted], from the Flemish compost organisation (Vlaco).

Objective: In Flanders there is an active network of voluntary masters composters since 1995. These citizens that volunteer to take care of community composting sites and/or perform the follow-up of household composting programs are trained by Vlaco since 1998. This strategy allows to develop local composting projects with reduced operative costs, because the personnel in charge of the maintenance, monitoring and promotion of the composting projects are local citizens that have received a specific training.

Pros:

- The capacity of create a network of trained people that keep updating and promoting composting in their localities.
- Lower operative costs than models with professional "master composters"
- Higher capacity to communicate with the citizenship and rise environmental awareness and active participation in waste reduction and recycling. At the end, there are neighbors who are in charge of the food waste management and it and it helps to create confidence in the waste management model.
- Fast identification of the social problems and/or difficulties in the developing of the local composting program, as well as fast alert of any malfunction or process problems in the composting sites. It leads to recognize the good practices and reinforce them.

Cons:

- Attendance at the composting points should be guaranteed throughout the year. This implies that it is necessary to consider how this will be done when these volunteers go on holiday, have a health problem or any other commitment that does not allow them to maintain the care of food waste management in their area.

- Intense training and compromise are essential. In other countries, many experiences working with volunteers as master composters have always detected management problems at different levels: from the simple presence of flies to serious process control issues.

- The programme relies heavily on the increased availability of free time by the retired population. At the same time, the management of the composting sites (turnings, mixing, transfers....) implies a hard physical work that not all people is prepared to do in a regular basis. It is not uncommon for young technicians to have to take medical leave from time to time due to muscular injuries, tendinitis, back pains..., so that in an older population the limitations to perform the physical parts of the job properly are more compromised. At some point there will be a need for younger master composters to be able to attend to some of the fundamental tasks in the composting areas.

Community Composting of Biowaste - *RSUSA* (Castilla La Mancha, Spain)

Presented by [redacted], from the *Municipal Solid Waste of Castilla La Mancha LTD* (RSUSA).

Objective: Implementing on site composting for two specific single generators of food waste in a small rural municipality. These are educational centers with kitchens where it is intended to reduce the generation of waste and produce a fertilizer for local gardens and the greenhouses of those centers. At the same time, they want to learn about this scale of composting through these experiences, so they can be replicated in other areas.

Pros:

- Large/single generators of food waste, like educational centres, but also restaurants, hotels... are the best cases to initiate local composting models. They generate relatively important quantities of food waste in a single place and it is easy to get high quality on this material (according to a low presence of contaminants like plastics, metal...).
- Normally these kind of examples can be displayed to promote and show what is local composting at different types of target audiences: citizenship, civil associations, technicians from public administrations, politicians,...
- It can be used to evaluated the potential problems and barriers that can be found to promote this kind of model, at administrative level (local normative) to economical and logistic issues, like the source of bulking material.
- The use of the compost produced in the same centre (as a fertilizer or organic amendment for orchards and/or greenhouses) also demonstrates the fact of closing the cycle of organic matter and what circular economy really means.
- At the same time these can be training areas for future master composters, where they can complete practices of the management of community composting sites in real work conditions.

- The final product obtained, the compost, can be evaluated to find potential consumers in the region and promote it.

Cons:

- The type of composters used in this initiative are designed for composting green waste, when the biological process is not so intense, rather than food waste where the process conditions require a deeper control of certain factors such as avoiding insect access to fresh food waste (these composters have many slots through which flies can enter), protecting the material being composted from weather conditions (rain, heat,. ...), keeping the biologically generated heat (the plastic walls of these composters are relatively thin and do not insulate the material from the outside temperature) .....
- This kind of initiatives or pilot projects should have a temporal framework completely defined. In relative quantities they do not represent a significative reduction in the food waste that is recycled locally and, at the same time, all the resources placed to operate these areas normally exceed what it would be specifically needed. It means that they are more costly to manage than it really should be.

Community Composting in Kóspallag: obstacles and solutions - *CTRIA* (Kóspallag, Hungary)

Presented by [redacted], from the Central Transdanubian Regional Innovation Agency (KDRIÜ), Hungary.

Objective: The development of a local composting model for the management and treatment of green waste in a rural town (Kóspallag), with about 850 inhabitants, at the north of Hungary based on voluntary work.

Pros:

- The management of green waste is the first step to evaluate and design a local composting model as it is the main source of the bulking material needed for food waste composting.
- It is being promoted in the population and the participation is volunteer. In the first stage it helps to avoid rejection among citizenship.
- The management of green wastes through composting is simple and will make it easier to promote it's use among citizenship.
- The compost will have a moderate macro-nutrient (NPK) content and can be used as an organic amendment or substrate. This facilitates the promotion of its use among the population.

Cons:

- Green wastes are just a part of all organic wastes that are generated in urban nucleus. Focusing the separate management only on them and not in food waste does not represent a big change at long term in municipal waste reducing and recycling.
- The costs are high considering the necessary equipment (shredders, tools...), the public awareness and participation campaign, the necessary technical staff... for the management of green waste alone.

- People can get idea that food waste is not recyclable or it is hard/problematic to do it.
- Composters (according to the pictures) do not seem to be protected from the environment in an area where the weather conditions are specially humid. Episodes of rain and precipitation as well as hot weather will particularly affect the processing conditions in the composters. This could cause reduced composting efficiency such as odour episodes, leaching and/or attraction of insects. At the same time, locating composters away from people does not facilitate or promote their use. It would be advisable to review the design and location of composters to minimise these extra difficulties in project management.

Anaerobic Digestion & Composting - Bio-Energy Centre - *Schwarze Elster* (Germany)

Presented by [redacted] from the LfU State Office of Environment Brandenburg, Germany.

Objective: This bio-waste management model is based on the selective collection with high quality (low contaminants mixed with the organic material) of food waste and garden waste in the urban areas of the Counties *Elbe-Elster* and *Oberspreewald-Lausitz*, in the East of the country. It is corresponds with a rural area of 23,230 inhabitants with a population density of 67 inhabitants per km^2. The separate collection is based in a voluntary basis

The anaerobic digestion facility began to operate in 2022 with an installed capacity for 24,000 tons of biowaste (annually). It includes the post-treatment of the digestate through composting (28 days) with an estimate production of 9,000 tons per year.

Pros:

- The public image of the model is positive, as it centers in the green energy production through anaerobic digestion and the final use of the compost by the citizens.
- There is an increase in the collection of bio-waste (biotonne) in the counties that almost 1,000 % since 2019, when the selective collection model was introduced.
- It is being promoted in the population and the participation is volunteer. In the first stage it helps to avoid rejection among citizenship.

Cons:

- It is a centralized model designed for the collection and treatment of all the bio-waste generated in those counties. Being a rural area there should be some consideration for decentralized models that reduce the quantity of food waste and garden waste to be collected and transported.
- Being a model based on collection for energy production, the reduction and prevention measures could not be considered a top priority.
- The collection rate of bio-waste is low (around 100 g per person per day). It is a voluntary model, so more investment in awareness raising campaigns is needed to increase the number of participants in this model so that it can have a significant effect on the efficiency of municipal waste management in the area. Moreover, the efficiency of the facility has a high dependance of keep the lowest percentage of contaminants in the food waste.
- There are not real data of the efficiency of the facility (in the presentation provided), but according to the description the biogas production rate is around 170 - 200 Nm^3 of biogas per ton of organic matter. If that is confirmed, the generation of biogas is relatively low for this kind of organic material.

Anaerobic Digestion in Rural Areas - Implementing professional predigestion and composting of biowaste (Flanders, Belgium)

Presented by [redacted] from the Flemish compost organisation (Vlaco).

Objective: Include the treatment of the food waste (VFG model) selective collected (household composting is also promoted) through thermophilic anaerobic digestion (DRANCO technology) in centralized facilities for the final production of biogas and certified compost. The project involves 29 municipalities.

Pros:

- As the previous example, the public image of the model is positive, as it centers in the green energy production through anaerobic digestion and the final use of the compost by the citizens.
- The collection model is door-to-door, increasing the capture rate and the quality of the food waste. It allows to include a PAYT model, considering the size of the bin (40 or 120 L) and the quantity (mass) of bio-waste generated.

Size of waste bin	Payment by collection (€·emptying^{-1})	Payment by mass (€·kg^{-1})
40 L	0.15 €	0.1 - 0.15
120 L	1 €	

- It leads to a strong reduction in the generation of residual waste in the municipalities. Around of the 85 % of the previously mixed residual waste is now collected separately.
- There is the intention of produce different kind of final products: compost, wood chips, potting soil.

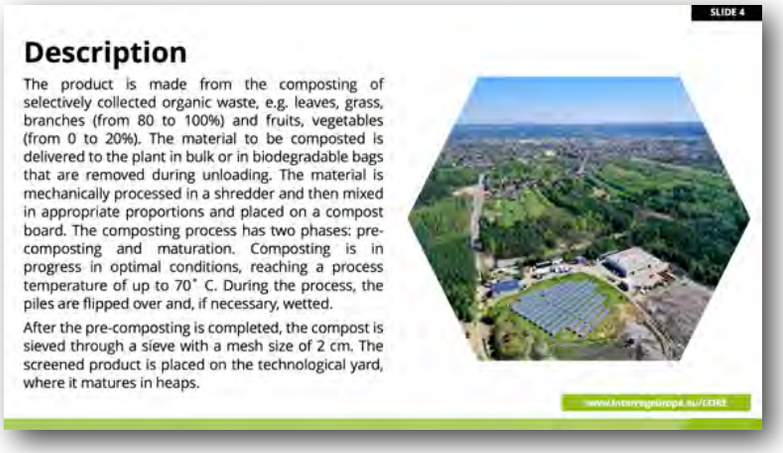
Cons:

- It is a centralized model for the collection and transportation of just one part of the food waste as it is a VFG model. The most productive part of the bio-waste (referred to the methane production) is not capture as a resource.
- The frequency of bio-waste collection is every two weeks. This is a long timeframe to replicate in other territories, especially those with warmer climates. In reality, with the climate change crisis and the onset of extreme weather conditions (heat waves, for example) it may be necessary to reduce this frequency.
- As in any anaerobic digestion facility, there is a strong dependence on the quality of the organic matter entering the process. The lowest levels of contaminants are required to maintain this treatment efficiency. Therefore, there is also a strong dependence on keeping public awareness high at all times.
- At the same time, investment costs are supposed to be really high for the quantity of bio-waste that is treated. At the end they are operating on a VFG model.

Soil improver (Poland)

Presented by [redacted] from the Marshal Office of *Świętokrzyskie Voivodeship*, Swietokrzyskie region, Poland .

Objective: The municipal organic waste (VFG - 80 % green waste and 20 % of fruit and vegetables) is selective collected from 6 municipalities in a rural area at the south of Poland to be composted. The waste is delivered to the treatment plant in bulk or in biodegradable (but not compostable) bags. It is mechanically processed in a shredder and placed into process, with two phases of pre-composting and maturation in turned windrows. The final compost is intended to be distributed among local farmers and their crop soils.



Pros:

- Composting of green waste (VFG) at an industrial level is quiet simple and allow to have a good quality product to be used as an organic amendment or growing media.
- Citizenship will have a positive view of the waste management model as it is based in green wastes and composting.
- The treatment of green waste at the facility can be the first step towards the production of bulking material that could be used to promote local (community and household) composting, as well as for distribution to other small composting plants (perhaps agricultural composting?) in the region.

Cons:

- According to the explanation provided during the presentation, there have been some odour issues in the composting facility. Being green waste the main organic material that goes into composting the plant design and work protocol should be reviewed.

- The use of biodegradable but not compostable bags can become a communication problem with the citizenship and, at the same time, a management problem at the facility.
- The final product can be considered as a growing media and/or an organic amendment, but not a fertilizer because of his low content in NPK (less than 0.5 %). It is not negative per se, but it will affect to the potential users/consumers if it is intended do be used in agriculture.
- In the end it is a traditional centralised model of green waste management (disguised in the VFG collection model) in a rural area. There is nothing new about it beyond the fact that there was no precedent for separate management of this organic fraction in the region.

Biogas (Poland)

Presented by [redacted], from the Marshal Office of *Świętokrzyskie Voivodeship*, Swietokrzyskie region, Poland .

Objective: Food waste selective collected from 18 municipalities is transported to a centralized AD facility for its treatment. The fermentation process is divided into three stages: biological waste pretreatment, dry fermentation, and mechanical dehydration of digestate. The staff that operates the facility is formed by 6 people in all shifts. The energy produced from the methane obtained is transformed into electric and thermal energy that, at this moment, it is used for self-consume. There is not information about the use or final destination of the digestate.

Pros:

- As in other examples above, the fact that anaerobic digestion is applied in the waste management strategy usually gives a positive vision to the public.
- Bio-waste is not separated into vegetable (VFG) and other materials, so the whole organic fraction is being treated.
- The use of the energy produced is local, even if for the time being it is only for self-consumption of the facility.
- There is the possibility of using the digestate for the production of a compost for its later use as fertilizer in the region.

Cons:

- It is a centralized bio-waste management model for 18 municipalities, not decentralized.
- The quality of the bio-waste, considering the contaminants content, is limited and it is affecting to the efficiency of the facility.
- There are high costs related to the construction and maintenance of the facility.
- So far there has been no information on the further use of the digestate and whether it will be composted or not. It is essential to already determine the return of organic waste as a product, so that people can see that the cycle is being closed.
- According to the energy balance provided in the presentation, the methane concentration in the biogas should be quite low, around 25%. If this is confirmed, the biological methanisation process would have some limitations.

From farm composting to robust composting plants in rural areas (Italy)

Presented by [redacted] from the Waste Management Office in Bolzano, Italy .

Objective: Bolzano is located in the South Tirol, a mountainous area at the North of Italy. After bad precedents in the 80's with three composting facilities with serious design problems, local authorities focused in look for a mix of centralized and decentralized model for the management of bio-waste. There is an anaerobic digestion facility centralized for the food waste from dense urban areas. In the rural and more disperse areas, the combination of household composting, farm composting sites and 8 medium-scale composting facilities (2,000 to 10,000 $t \cdot y^{-1}$) is promoted as a strategy for the treatment of organic waste. The composting model in these facilities is quite simple, using turning windrows and forced aeration. The use of the compost produced is local, for agriculture and landscaping.

Pros:

- Collection of bio-waste is made under a door-to-door model, using paper bags that are distributed without cost for the households. It results in a high quality in the material, with a low content in contaminants.
- Under these conditions the local production of high quality compost is perfectly possible and its return to local farmers for use as fertilizer and/or organic amendment.
- The whole project combines the centralized and decentralized strategies according to the characteristics, resources and circumstances of the territory, in a mountainous area at the South Tirol.

Cons:

- There is not much information provided about their farm composting and the results they have. Being a region so close to Austria, it is easy to suppose that they know about rural departments or regions in that country that have a bio-waste management strategy based on farm composting, where farmers play an essential role in collection and/or composting of food waste in urban areas. This has been a successful model for 30 years and could give a lot of ideas and support to what they are doing in Bolzano. Farm composting could absorb significative quantities of food waste and encourage citizenship participation in selective collection. Reduction of the distances for transportation, in a so mountainous area, should be a priority.
- Community composting is not taken into account in this model, and could perhaps also find a niche application.

Good practices on Anaerobic Digestion in Province of Bolzano (Italy)

Presented by [redacted], Italy.

Objective: Bolzano is located in the South Tirol, a mountainous area at the North of Italy. There is an anaerobic digestion facility centralized (20,000 t·y^{-1} of capacity) for the food waste from dense urban areas, with 53 municipalities involved for a cost over 20 M€. The energy produced is partially sold (2/3) and for self-consumption (1/3) and the biogas production rate is really high.

The lack of space it is a problem for the post-treatment of the digestate produced (> 2,000 t·y^{-1}).

Pros:

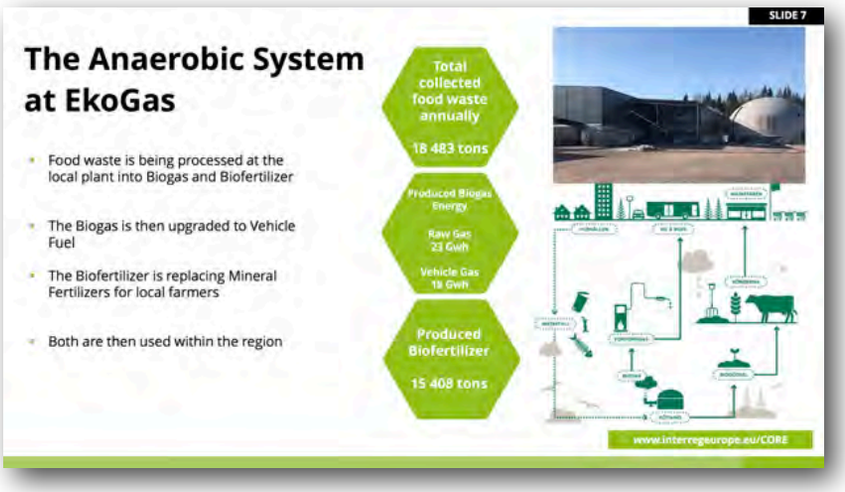
- In Bolzano, collection of bio-waste is made under a door-to-door model, using paper bags that are distributed without cost for the households. It results in a high quality in the material, with a low content in contaminants.
- The rate of biogas production at the anaerobic digestion facility is quite high for food waste, with values around 780 Nm^3 per tonne of organic matter. It means that the biological process have been optimized for the technology and work protocol in the facility.
- The facility have been optimized to be adapted to a limited space disposable.
- The whole project combines the centralized and decentralized strategies according to the characteristics, resources and circumstances of the territory, in a mountainous area at the South Tirol. This facility could support those dense urban centres where there is a significant presence of tourists during the holiday seasons, taking pressure off small, decentralised composting facilities where increased food waste generation at certain times of the year can be a problem.

Cons:

- Treatment costs for the anaerobic digestion facility, according to the information provided, is about 79 € per tonne of bio-waste (including benefits). A value that it can be considered medium only for treatment. Transportation costs for bio-waste, but also for the management of the digestate (transportation/application, post-treatment) seems that are not included in the economic balance.
- There is not information regarding the management of digestate beyond they are looking for composting it locally. The lack of space in the facility (only 10,000 m^2) makes it extremely hard that there can be a composting facility inside the terrains of this plant under conventional systems. It leads to two main options: find some high-tech composting system to optimize process conditions and reduce the needs of time and space (at a high costs) or divert the digestate to other facilities in the region, where it is composted. In both cases, the treatment costs will be increased.

Food Waste Collection and Anaerobic Digestion System for Biogas and Biofertilizer (Sweden)

Presented by [redacted] from the Municipality of Söderhamn, Sweden.



Objective: This example is about selective collection of bio-waste in different municipalities of centre Sweden and its transportation to an anaerobic digestion facility for its treatment. It began in 2012 and it was implemented in the following two years. The collection of the food-waste is made with paper bags that are freely distributed to the households. At this moment, 81 % of the households participate in the source separate collection of the organic fraction, but there is also some households that perform household composting. It is estimated that annually 28.8 tones of food waste are treated by home composting. The facility is treating around 20,000 tons of bio-waste per year and the biogas produced is being primarily used for fuel of vehicles, while the digestate is considered like a fertilizer.

Pros:

- As in other examples above, the fact that anaerobic digestion is applied in the waste management strategy usually gives a positive vision to the public.
- The collection of bio-waste has a high quality, with 4 % of contaminants, but it should be improved.
- The use of the energy produced is local and, under some point of view, decentralized. As the biogas produced is used as fuel for public transportation vehicles, but it also involves intense post-treatment of the biogas for upgrading and depuration.
- The facility and its management is publicly owned and operated, which should allow for very close and efficient monitoring of its operation, as well as problem detection and resolution.

Cons:

- This is a centralised management model, relying on a single facility. Although some households participate in home composting, it does not seem to be encouraged, as the authorities plan to expand separate collection. Such facilities need as much waste as possible to maintain their economic balance and be profitable.
- The digestate does not have a post-treatment. It means that if it is not used in a short term, something that it is not feasible at every time of the year because crop fields cannot accept fertilization at any time, it has to be storage. This storage of an organic material that it is not stabilized can lead to its uncontrolled degradation and generation of GHG emissions as well as the recontamination by pathogens.