POLICY PROPOSAL

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1 INTRODUCTION – BACKGROUND SCENARIO

The first part of this report is dedicated to briefly summarize the legal status of grass in different Member States: in fact according to the report originated in Task 1 of WP5, dedicated to the legal framework definition, the scenario is sometime uncertain and a clarification would help in using such material in anaerobic digesters.

The second part is dedicated to the proposal of a new legal framework both at state and community level. The legal themes have been discussed with different policy makers along the project life, while the single proposal has been illustrate to Regional policy makers who shared their view on the partners proposals. All this activity of exchange with the policy makers is documented by meeting reports annexed to this report.

1.1 BELGIUM – FLANDERS

1. Legal status of grass residues

In Flanders, grass clippings have been designated as a waste according to the Materials Decree ('Materialendecreet') and the corresponding regulations comprised in VLAREMA. This waste designation means it has to be processed by a recognized waste processing plant, such as a composting or digestion facility. An important exception to this rule, however, is the harvesting of grass with the intent of using it as cattle fodder, for example through an agreement with a farmer or organization recognized as farmer. In this case, the grass is recognized as a resource.

The waste status of grass also has further implications: for the transport and storage of grass, certain restrictions and regulations are in place through the use of permits, to ensure grass clippings aren't left to rot and enrich the soil. Most of these regulations are provided by VLAREM, or the Flemish Regulations on Environmental Permits. A clear distinction is made between storage on the mown terrain itself, which is very limited but doesn't need a permit, and storage off-site, which is for larger volumes and in need of specific permits also , depending on the volumes.

Through circular RO/2006/01, which regulates the spatial planning of digestion plants in Flanders, the waste status of grass further impacts its applicability in digestion. This circular determines 60% of the digestion feed should consist of agri- and horticultural biomass, in this case manure and agri- or horticultural products or parts of products not designated as waste, and 40% of other organic and biological biomass. The latter are secondary resources as defined by VLAREMA or organic and biological wastes which feature on the 'positive' list. This means that every organic waste, such as grass residues, is automatically assigned to the second biomass stream, where it has to compete with high biogas potential streams such as greases, while it can not compete with low potential biomass such as manure, or with energy crops such as maize.

2. Control and enforcement

Furthermore, there is no real control on how much grass is mown every year. Even though roadside verge managers are obligated by the Verge Decree of 1984 ('Bermdecreet') to collect and dispose of their grass residues (as mentioned above), in reality only a fraction of this grass is disposed of in a recognized processing facility. The remainder is left to rot, stored indefinitely in 'waiting heaps', or disposed of illegally in another way. A system of processing certificates is in place, but its accuracy depends on the faithful reporting of quantities by the organization responsible for the mowing works, as no real enforcement is carried out. As long as no clear action is taken on this point, grass residues will continue to be disposed of in other ways than

composting or digestion. Because the grass can be dumped without major consequences (read: the absence / failure of enforcement), there is little incentive to choose a legal disposal, for which an gate fee must be paid.

3. Legal status of digestate

Next, the status of the digestate after digestion could also influence willingness to take up grass. At the moment, all digestate from an AD plant which also processes manure, is automatically categorized as manure itself. This has an impact on the possible applications of the digestate: use as fertilizer on agricultural land is limited by the stringent Flemish regulations, aimed at reducing water eutrophication. Digestate containing manure falls into the same category as pure manure and is therefore more difficult to dispose of.

4. Policy implications

The Flemish Waste Regulator (OVAM) has stated clearly that dry digestion of grass residues is preferred, based on technological arguments, for example in its recent action plan on sustainable management of biomass residue streams. However, this course of action ignores the Flemish reality, which is that by far the most digestion plants are of the wet digestion type. Only 2 large plants work according to the principle of dry digestion. As the Flemish digestion sector is already in a state of crisis, additional investments in (more expensive) dry digestion are not to be expected in the near future. Flemish policy could therefore be adapted to also provide incentives for wet digestion plants to take up the digestion of grass residues.

5. Dry pocket digestion

Despite the constraints mentioned above, we found different municipalities that are still eager to produce sustainable energy from the bio-waste streams of their territory. Hence, with the GR3-project, feasibility studies were conducted to find out if small scale dry digesters (e.g. up to 5000 tons/year) could be used for this purpose (see WP5). Although this technique is new for Flanders, in surrounding countries several small scale dry digesters are already operational.

The strength of this technique is it's small scale. Hence the investment is rather small, which implies that more and smaller organizations are willing to take the risk. In addition, dry digestion is a more robust system, which could tackle many technical problems that occur in wet digestion (see WP3).

However, the feasibility studies demonstrated that, at this moment, there are still some constraints:

- Although, compared to a large scale digester, the investment costs are lower, they are still too high to reach a break even. Nevertheless, it should be possible to lower the costs, if a simple digester, specifically suited for municipalities, could be developed (cfr the spectacular increase of the use small scale wet digesters for farmers in Flanders during the last five years).
- Another issue is that many municipalities produce to little grass from verge cuttings. This can be solved by also feeding the VGF and green waste of the municipality to the digester. At this moment, this is not allowed. OVAM stated that VGF-digesters should take up at least 20,000 tons/year. However, this is based on the assumption that smaller digesters are not economically feasible and their preference for the use of proven technology. Green waste (even the digestible part of it) can only be processed in recognized composting installations. Also here, there is no clear ecological or technical reason for this restriction.
- According to OVAM, hygienisation of the digestate (more than 1hour at 70°C) is necessary to deliver a safe product. Recent research even showed that a pasteurization isn't sufficient to kill off all the weed seeds. Sterilization or a pasteurization followed by a thermofyle digestion would be more appropriate. A composting would also be an ideal processing method. Hence, the combination of a digester with a

composting installation (on the same site) would be an elegant solution. If the compost can be sold to the inhabitants of the municipality, this could also lower the disposal costs, which would lead to an important economical advantage. Moreover, such a procedure perfectly fits in with the concept of circular economy. However, the certification delivering organization (Vlaco) informed us that they are reluctant to give a license to small scale composting installations.

1.2 DENMARK

1. Legal status of grass residues

The key regulations for waste management in Denmark are found in the Danish Executive Order on Waste [Affaldsbekendtgørelsen]; the latest version at the moment of writing is 2012. As explained in Chapter 3 of this regulation, the classification of waste is defined by each of the 98 individual local councils. This leads to the consequence that similar wastes might be classified differently in Denmark (the local regulations can be found in the National Database for National Waste regulations (Provisional Order) NSTAR [1]). Local municipalities are nevertheless committed to implement The European Waste Framework Directive, and accordingly, grass from private gardens and from public parks (and presumably other public areas as cemeteries, public sports areas and playgrounds) are defined as organic waste (as highlighted in Appendix 2 of the Danish Executive Order on Waste, the Danish waste classification is identical to the European waste classification). The implications of this, for grass residues, are quite meaningless in Denmark.

The reason for this is that grass residues, and even garden waste as a category of organic waste, is not covered by the Ministerial Order regarding use of waste for agricultural purposes (The Danish Ministry of the Environment, 2006)[2]. Accordingly, these can be used as amendments to soils without prior approval and used in manure-based biogas plants without prior analysis for environmentally harmful substances (e.g. heavy metals) (for other waste types used in manure-based biogas plants, there are requirements of taking samples and analysis). This represents a legal advantage for grass residues. However, it is important to note that there are 2 distinct regulations for soil amendments: the above Ministerial Order regarding use of waste for agricultural purposes (The Danish Ministry of the Environment, 2006), which applies when the material to apply on land contains less than 75% manure (in dry matter basis). If this condition is not met (e.g. if grass is mixed with manure), then the Ministerial Order on agricultural use of fertilizers[3] applies. There are key differences regarding between these regarding the total amount of nitrogen and phosphorus that can be applied on a given field.

It is also worth noticing that farmers (or owners) with grasslands and permanent pasture areas receive subsidies for not using the grass clippings from nature areas, under two key Danish laws[4,5], both implementing

[1] The Danish Ministry of the Environment (2012b): National Database for AffaldsRegulativer – NSTAR - https://www3.mst.dk/Nstar/Regulation/Search.aspx

[2] The Danish Ministry of the Environment (2006). Slambekendtgørelsen. https://www.retsinformation.dk/forms/R0710.aspx?id=13056

[3] The Danish Ministry of the Environment and of AgriFood (2015). https://www.retsinformation.dk/Forms/R0710.aspx?id=173478

[4] The Danish Protection Agency (2007): Bekendtgørelse om udpegning og administration af internationale naturbeskyttelsesområder samt beskyttelse af visse arter. BEK nr 408 af 01/05/2007 Gældende. Offentliggørelsesdato: 15-05-2007. www.retsinformation.dk/Forms/r0710.aspx?id=13043&exp=1 and changes to this:

- The Danish Protection Agency (2007): Bekendtgørelse om ændring af bekendtgørelse om udpegning og administration af internationale naturbeskyttelsesområder samt beskyttelse af visse arter. BEK nr 1443 af 11/12/2007 Gældende. Offentliggørelsesdato: 21-12-2007. www.retsinformation.dk/Forms/r0710.aspx?id=113620&exp=1

European regulations (European Habitats Directive 92/43/EEC; European Commission Regulation (EC) No 1120/2009). Though the value of the subsidies depends on the type of area (e.g. its HNV – High Nature Value – score, the percentage of the area under "Natura 2000" areas, etc.), this can be used as an indicator, e.g. in monetary units per tonne of total solids, of the "nature value", in other words what the society is willing to pay for nature preservation.

2. Current management of grass residues

Management possibilities for grass residues in Denmark include, at the moment of writing, a little bit of everything, with the exception of deposit in landfill sites, given the ban on landfilling organic waste from January 1997[6]. Residues from nature areas and roadside are most often left on-site after mowing, as there are no regulations prohibiting this (though there are regulations about when and how to mow permanent pasture and temporary grassland[7]*)*. Urban grass residues (household, public areas) are often composted, while a mior amount ends in incineration plants (household clippings in residual waste bin, for the municipalities allowing this, and a minor portion of garden waste from public areas and parks). The use of grass residues as a substrate for biogas plants remains uncommon at the time of writing (one notable exception is the municipality of Vejle, where large portions of household grass clippings are treated in a facility, Aikan, where biogas and composting are integrated). Similarly, albeit a growing interest for grass-based biorefineries involving the combined production of protein and biogas, the use of residual grass for this is non-existent at the moment of writing.

3. Key national strategies to influence the management of residual grass in the future

Resource Strategy

In October 2013, The Danish Government launched a new Resource Strategy for Waste Management: "Denmark without Waste" [8], the key aim of which is to reduce the amount of waste incinerated in Denmark. This Strategy among others suggests the following goals:

- Energy recovery from 25 % of garden waste in 2018 (compared to 4 % today)
- Increased collection of organic waste for biogasification

Though these suggest a favorable legal framework for the digestion of grass residues, it has not, at the moment of writing, yet translated to concrete regulations favoring this.

- The Danish Protection Agency (2011): Bekendtgørelse om ændring af bekendtgørelse om udpegning og administration af internationale naturbeskyttelsesområder samt beskyttelse af visse arter. BEK nr 63 af 11/01/2010 Gældende. Offentliggørelsesdato: 21-01-2010. www.retsinformation.dk/Forms/r0710.aspx?id=127759&exp=1
- The Danish Protection Agency (2011): Bekendtgørelse om ændring af bekendtgørelse om udpegning og administration af internationale naturbeskyttelsesområder samt beskyttelse af visse arter. BEK nr 1079 af 25/11/2011 Gældende. Offentliggørelsesdato: 29-11-2011. www.retsinformation.dk/Forms/r0710.aspx?id=139370&exp=1

[5] The Danish laws in the Danish Executive Order on direct support schemes for farmers: Ministry of Food, Agriculture and Fisheries of Denmark (2012): BEK nr 29 af 18/01/2012 Gældende. Bekendtgørelse om direkte støtte til landbrugere efter enkeltbetalingsordningen www.retsinformation.dk/forms/R0710.aspx?id=140092

[6] Executive Order No. 581 of 24 June 1996. The Danish Ministry of the Environment (1996): Bekendtgørelse om affald . Bekendtgørelse nr. 581 af 24. juni 1996. https://www.retsinformation.dk/forms/R0710.aspx?id=84669 (Outdated today).

[7] Ministry of Food, Agriculture and Fisheries of Denmark (2014):Bekendtgørelse om god landbrugs- og miljømæssig stand (GLM) BEK nr 106 af 29/01/2014 Gældende https://www.retsinformation.dk/Forms/R0710.aspx?id=161432&exp=1 : "Permanent pasture and Temporary grassland must be cut once every year during the period 1st of July to 15th of September. Mowing can be replaced by grazing, so that areas by 15th of September appears trimmed, i.e. that more than 50% of the plant cover by 15th of September has a grass height of less than 40 cm. Subareas under 100 m^2 with a grass height of more than 40 cm are acceptable. The land must be kept free of trees and shrubs."

[8] The Danish Government (2013): Denmark without waste. Recycle more – incinerate less. November 2013. ISBN 978-87-03026-59-5. http://www.mim.dk/NR/rdonlyres/F58E8C8B-3EB9-47DF-8DF3-4BF9207C9DFE/0/Ressourcestrategi_UK_web.pdf

Biogas

In 2009, the Danish Government launched the "Green Growth" Agreement ("Grøn vækst[9]"), which is among other known for putting forward the aim of using 50% of the manure produced in the country for green energy (biogas) by 2020.

In 2012, new subsidies and initiatives for biogas[10] were adopted by The Danish Parliament supporting all uses of biogas, including also subsidies for the establishment of new biogas plants[11] [12]

Fot the latter, it should be mentioned, that it is a condition of the commitment of funding that manure from livestock accounts for at least 75% of the biomass used for the production of biogas (measured in tonnes of wet weight, yearly average)[11]. This means that most likely, grass for biogas production will be mixed with manure – thereby serving as a co-substrate rather than the main substrate. For biogas plants on organic farms, livestock manure should account for only 50% (minimum) of the biomass used for biogas production. In addition, the amount of energy crops is limited to 25% (up to 2018, and 12% thereafter; measured in tonnes of wet weight, yearly average)[13].

1.3 GERMANY – SAARLAND

In the past ten years, the German Renewable Energy Act (EEG) has changed several times. Each amendment has modified the situation for bioenergy incentives. In 2014, the last amendment of the EEG has set up a binding corridor for renewable energies. This amendment has especially affected the bioenergy sector. The annual additional installation is limited to a maximum of 100 MW. Therefore, the expected growth rate will considerably be lower than in the previous years with 300 or even 700 MW growth.

The German legislation divides grass into an agricultural product or a biowaste material. The considered agricultural grass materials are originating from extensive agricultural permanent grassland, unexploited agricultural grassland or from protected areas. If these materials are used in bioenergy plants, the basic tariff will be applied. Depending on the capacity of the energy plant, agricultural grass as a input material will be no higher remunerated than 13,66 ct/kWh.

Waste criteria apply for grass originating from municipal greenery cuttings, sports areas, children playgrounds, (private and public) garden and park areas, verges, airports, cemeteries and floral remains from rivers. If these waste materials are used for bioenergy production, the waste fee will be

[9] The Danish Government (April 2010): Aftale mellem Regeringen og Dansk Folkeparti om Grøn Vækst 2.0. http://mst.dk/media/mst/67080/grønvækst2.pdf

[10] The Danish Parliament (2012) https://www.retsinformation.dk/forms/R0710.aspx?id=142263

[11] The Danish Ministry of Environment and of Food, Agriculture and Fisheries (2015): Bekendtgørelse om ophævelse af visse bekendtgørelser inden for NaturErhvervstyrelsens område. https://www.retsinformation.dk/Forms/R0710.aspx?id=176521

[12] Danish Energy Agency. http://www.ens.dk/biogas Retrieved in 2016.

[13] Danish Ministry of Climate, Energy and Building (2015). Bekendtgørelse om bæredygtig produktion af biogas. BEK 301 af 25/03/2015. https://www.retsinformation.dk/Forms/R0710.aspx?id=168945

applied. The waste fee is max. 15,26 ct/kWh. Requirement for the higher payment is a 90 % mass input of waste materials over the year. Additionally, the plants have to meet certain efficiency criteria as well as the integration of a residues composting unit. A heat use obligation is not mandatory. If these criteria are not matched, the single materials are paid-off in accordance with the basic fee.

Small biogas installations up to 75 kW receive a higher feed in tariff. However, with these installations the input amount of manure has to be at least 80°% of the totally digested input substrates. Therefore, only small amounts of grass can be digested in these biogas facilities.

The SWOT analysis has highlighted the difficulties that came with the last amendment of the German Renewable Energy Act (EEG). The conditions for bioenergy production have never been less interesting for investments. Only the utilization of waste material seems sufficient. The interviews conducted with stakeholders proof these findings and underline the problems with the new incentive structure. The interviewees say, that the uncertainty of the German incentive structure and the amended EEG worries investors and creates no or low investment in bioenergy.

Additionally, the interviewed stakeholders address further problems. For example, the federal department for roadworks being responsible for the maintenance of the verges. Presently, the grass remains at the roadside and is not treated to any higher recycling standards. This is attributed to two main problems concerning the grass collection process. First, a vehicle for combined mowing and collection of grass is not affordable for the department. The other option would be a second workflow, but manpower is not available and closing streets for a longer time is not possible because of safety reasons. Another stakeholder mentioned that in Saarland, grass from nature conservation areas has a low energy content because of a mowing period that starts in August due to nature conservation obligations. Additionally, this kind of grass material contains a higher amount of fibre, which complicates the fermentation process and increases the operation cost for biogas plants.

In conclusion, the utilization of grass is highly dependent on the national framework that outlines the possibilities for sufficient usage. Frequent amendments of the German Renewable Energy Act and modification of the bio waste ordinance have created an unstable situation for investments. Besides that, regional regulation and practical issues often hinder the best possible utilization of grass.

1.4 ITALY – VENETO

In the Italian scenario there is a clear distinction between biomass referred as a waste and other biomass (by-products or residues), which are under the umbrella of the definition of by-products or residues.

Despite this “phylosphical” distintion, laws are not particularly clear on this matter. The different concept of waste and by-product was firstly introduced by the so-called "environment act", Legislative Decree 152 of 3 April 2006 "Environmental Regulations" (Ordinary Supplement to the Official Journal - General Series - No. 88 of 14 April 2006). The current concept of "by-product" is laid down in Legislative Decree 205/2010, which amends part IV of Legislative Decree 152/2006 by introducing section 184(b). For the laws regarding waste, a by-product is "any substance or object that complies with the conditions laid down in section 184(b),

subsection 1, or that meets the criteria laid down in section 184(b), subsection 2". A substance or an object which complies with these requirements is not subject to the legal provisions laid down for waste as regards its use. As for "waste", this is defined in section 183 subsection 1(a) of Legislative Decree 152/2006, as amended by section 10 of Legislative Decree 205/2010, which defines waste as "any substance or object which the holder discards or intends or is required to discard."

Unfortunately, these definitions and their continuous modifications do not help the management of materials like grass which can have a different nature (waste / no waste) thus follow a different management route.

According to the Italian legislation grass can be considered either as a waste, when collected in urban areas and along roadsides, or a byproduct, if collected in agricultural areas (see deliverable 6.1 on legal framework). According to this classification (waste/no waste), grass can be fed either to digesters treating waste or to agricultural digesters treating manure and energy crops or other agro residues and byproducts (no waste).

This distinction between waste and by-product is clearly reflected also in the authorization iter for anaerobic digestion plants: industrial digesters, treating biowaste, sludge and other organic waste follow one iter, while farm digesters, treating manure, energy crops and othernorganic by-products follow a different iter.

In particular, the possible macro-categories of materials that arrive at biogas plants are summarized below (after which the laws themselves will be looked at more closely):

- Products or raw material from farming, livestock and agro-industrial activities (e.g. dedicated crops, small vegetables and fruit, etc.).
- Material from farming and livestock activities excluded from the scope of part IV of Legislative Decree 152/06, which is excluded a priori from the definition of waste (e.g. crop residues, residues from the preparation of vegetables for consumption, etc.).
- Material from farming, agro-industrial and food activities treated as "by-products" from when they are formed pursuant to the laws regarding waste (section 184(b) of Legislative Decree 152/06).
- Animal by-products.
- Residual material from agro-industrial and food activities managed as "waste" since it is classified as such according to the laws applicable to the industry.
- Specific categories of waste, such as organic urban waste (organic fraction of MSW and sewage sludge), expired and imperfect packaged food, etc.

The last two categories are clearly related to “organic waste” and can be treated only in industrial AD plants while the others categories are not waste can be treated in farm-based AD.

According to this scenario and considering the interviews with stakeholders it was found that there is no interest in using waste grass in municipal anaerobic reactors because of the low energy content of grass and the difficulties in the chain of collection and storage- This grass is therefore composted together with clippings and other organic waste (e.g., food waste).

On the other hand, there is a strong interest in using grass coming from management of landscape and watercourses in the agricultural digesters as a substitute of energy crops because of economic issues.

However, grass can be accepted in agricultural anaerobic digesters only if the delivered material is clean (free from stones and ground, plastic, wood, other inert materials ….) and ready to be fed (size < 10 mm).

It should however noticed that today most of grass mowed in natural areas is left in place because of the costs related to the transportation chain, while a small part is used for animal feeding.

1.5 PORTUGAL – GREAT LISBON

Anaerobic Digestion is a high cost solution, especially if combined with mechanical pretreatments of the feedstock, and it is not a popular technology in Portugal for renewable energy production. It is essentially used for treating, solid wastes, sludge and some specific industrial effluents, where this technology is highly competitive. Energetic tariff does not is enough to justify investments on biogas technology.

About ten solid waste digesters system are disseminated today in Portugal, used for solid waste fraction of urban solid wastes. Mostly operate in combination with mechanical pre-treatment, for organic separation. A costly solution which oblige to charge a high gate fee to accept the organic matter in the system. Landfilling is by far a more economical solution and system operating with landfills are able to charge a much lesser gate fee tariff.

Urban and suburban areas are rich in green areas already planted for recreational, aesthetic, leisure etc. reasons, generating a green residue (VR) that can feed anaerobic digestion and contributes to generate the fertilizer residue resulting from digestion. Its **production cost is zero**, once it is supported by the beneficiaries of green areas. This is a favorable situation compared with energy crops, and certainly favorable in country where energy crops are promoted by specific tariff. The (GW) is generated within the areas served by the collection of MSW, another potentially favorable circumstance. A significant percentage of (GW) is dispatched to the regional system MSW treatment and is converted into biogas, when an anaerobic digester is available. This is the case of (GW) from small producers, up to 110 l / day, who see their waste sent to recycling centers without any fees or charge.

The main barrier arises when larger GW producers are involved, due to the rules guiding the interface between the municipalities and the multi-municipal or regional system of waste management. The established gate fee, variable from case to case, discourages the delivery of the Green Waste (GW). Thus, according to the research carried out by LNEG staff, some systems receive insignificant amounts of (GW) while others record important values. The GW that are not forwarded to the central system are buried locally or undertake a proper treatment as grinding, composting, etc., which result in a lower costs.

In some municipalities (e.g. Cascais) with higher life standard, the grass is collected and the gate fee is assumed by the municipality, in order to avoid grass wastes retention in the roads and green areas, which becomes dry in summertime and is blown everywhere.

In Algarve region there are many touristic green areas in resorts, golf courses, parks, etc., which produce a great amount of grass cuttings all around the year. In this region the economy is highly dependent on tourism and green areas are a relevant component of the environmental quality. The owners of the touristic facilities take a great care of waste production and to ensure high living standard. In this region the grass management operators have a better business than in other part of Portugal and deliver their greeneries to the company in charge for solid waste management: Algar Company. On this regard the regional waste operator established a lower gate fee for the grass delivered clean and exempted from others pollutants, encouraging the source separation of grass. With the high quality selected grass it is produced a premium quality compost, which is highly appreciated in the market and sold at good price. So the big constraints in Algarve does not regard grass collection and delivery but the availability of anaerobic digesters, having only one plant, actually at the end of start-up, which has the potential to accommodate only a portion of national green wastes. Another portion is

used for composting and those with worst quality are directed to landfilling, where its energetic potential is converted in electricity there.

According to the EU Waste directive, landfilling will be gradually dismissed. To achieve the targets, Portugal in recent years invested in MBT systems which are quite costly. The big differences in gate-fee values which are applied by the Portuguese waste operators reflects the treatment technology. The systems provided with MTB and digesters are much more expensive than landfilling, incineration and source selected composting. So the more advanced operators with AD solutions have economic problems to run the plant and disadvantaged relatively to the operators which are still operating mostly with landfills. This is an additional reason for the very long digester start-up time in Portugal.

Thus, although there are many and obvious potential advantages, the digestion of grass and its energy potential is still underutilized in Portugal, depending mainly from solid waste operators, which have economic problems and need to reduce costs. Practically the value chain suited to valorization of residual grass in biogas plants is missing in Portugal. There are also technical, not technical and economic barriers that lead to this occurrence. Among them, the lack of awareness regarding technologies for cutting, storage and anaerobic digestion of waste grass, in addition to scarce cooperation between value chain actors and obstacles of a legal nature.

Otherwise there are not available agricultural or manure based digesters which can accommodate GW.

It is necessary to introduce measures that stimulate interest and cooperation among all stakeholders (producers of waste, companies which collect the grass, waste management companies, farmers, etc.), which should dialogue with each other.

2 POLICY PROPOSAL

After considering the *status quo* of the legal framework in chapter 1, in this chapter the proposal for a new regulatory framework in different target Regions is proposed and discussed. Moreover, a global policy proposal at European level is outlined.

2.1 REGIONAL LEVEL PROPOSALS

2.1.1 BELGIUM-FLANDERS

Several measures could be implemented to enhance the uptake of grass in digestion plants:

1. The status of grass could be adapted from “waste” to “secondary resource”, to reflect the energy potential contained in this biomass stream and to address the discrepancy between “fodder” and “waste grass”. This difference depends solely on the status of the organization which carries out the mowing works. For example, the two biggest nature conservancy organizations, the Flemish Agency for Nature and Woods (ANB) and Natuurpunt, can be legally construed as farmers, resulting in grass with a status denied to most other roadside verge or grassland managers. In addition, grass cultivated as an energy crop should be considered as a resource, cfr. maize.

   If this adaptation proves unfeasible, other measures could be implemented, such as adapting the circular RO/2006/1 to reflect that grass is an agricultural or horticultural product so that is taken up in the 60% biomass stream, which would enable it to compete with manure and energy crops.

2. A control system, based on actual mown volumes of grass, could be implemented to ensure correct implementation of the Verge Decree (e.g. the municipalities know exactly how many running meters verges they have and how many tons of grass these produce). Enforcement of this law would also incentivize stakeholders to dispose of their residues correctly. This would also result in a more correct view of the market potential of this biomass stream.

3. With regard to the status of the digestate from anaerobic digestion of grass with manure, nutrients originating from the grass (NPK) should not automatically be assigned the status of 'manure'. The ascribing of the status 'manure' has an impact on the marketability of the digestate and thus on the disposal costs. In a research consortium, Ghent University, Inagro, VCM and Biogas-E are advocating to apply the 'pro rata' principle on digestate, in which only the nutrients that enter the digester in the form of manure, also carry this statute in the resulting digestate. Application of 'pro rata', linked to accompanying conditions for higher mineral nutrient efficacy of the digestate compared to manure, will indeed lead to both environmental and economic benefits.

4. Policy could be adapted to incentivize the uptake of grass financially. This can be achieved by a remuneration with a higher support framework for grass-digestion compared to other substrates. This would make the digestion of grass more attractive in comparison with the digestion of energy crops (with a higher biogas potential). This additional financial incentive is defensible given the more sustainable nature of using grass clippings versus energy crops (eg. Energy maize).

5. The government could facilitate or subsidize pilot projects in which small scale digesters are developed and taken into use. In the context of such a project, legal and other restrictions introduced by e.g. OVAM, Vlaco,… could be minimized to study if a feasible business is possible and which legal adjustments are necessary.

6. The advantages in terms of CO2 reduction, can be met, either through the European framework in this regard (currently under revision), or through efforts from the Flemish Climate Fund. This can also lead to a more triaged policy, in which the use more sustainable input streams are also stimulated in a more intensive way.

2.1.2 DENMARK

Several measures could be implemented to enhance the uptake of grass residues in digestion plants:

1. The amount of allowed energy crops could be further limited, as 12% (wet tonnes, annual average) is relatively high, i.e. ca. 3 times higher than what is used on biogas plants today. Further, the limitation could apply per tonne of volatile solids (or total solids) instead of per wet weight.

2. Roadside grass: Increasing awareness against dumping waste on roadside grass; so the municipalities could use the money currently used to clean the verges for harvesting the mowed roadside grass instead.

3. Grass from nature areas: a key question is, what is the price of nature preservation/biodiversity? If there is a value in removing the macro nutrients from the grass residues to preserve/enhance biodiversity, this value could be given to the owners of such grass areas to pay for the harvesting/baling of the grass. This could involve a revision of the current subsidies system under the application of European regulations (European Habitats Directive 92/43/EEC; European Commission Regulation (EC) No 1120/2009).

4. Urban grass (household, parks, etc.): the urban grass that is already collected is typically used by composting plants. Yet, it was shown that this use of residual grass significantely increases the emissions of greenhouse gases, in comparison to using it for biogas[14]. In an endeavour to reduce greenhouse gas emissions, there could be regulations limiting the amount of collected grass used for composting (central composting facilities, not home composing which does not involve “collected grass”).

[14] Hamelin (2015). Life Cycle Assessment of management strategies for residual grass. Version 1.0. https://issuu.com/biogas-e/docs/lca_report/1?e=14806113/30004908

2.1.3 GERMANY-SAARLAND

The current situation for renewable energies in Germany and the forthcoming of the German Energiewende requires adaption in several areas. An ideal setting for bioenergy needs several changes. Some of this changes are on policy level. Other changes are regarding to practical handling of the supply chain. Especially, the legislation on grass utilization might need amendmends. Some of these amendments have to be done on national level because it tackels federal law. Other regulations and ordiances are on regional level.

Probably the most important proposal for the German bioenergy community would be an accountable legislative for more than a couple of years. This would definitely help to secure investments and make it easier to find investors for new bioenergy plants. Within new legislation amendments, (i) the EEG - fee for biogas installation has to increase or (ii) the biogas production from grass has to be especially supported in another way. Without any new incentives, the implementation of future facilities is obstructed.

Grass as a product

Legal certainty would also ensure the utilization of grass from protected areas. Depending on individual decisions, grass from protected areas can be classified as waste or as agricultural product. This frequently creates an uncertain space because these case dependent decisions might change and do not apply for other cases. For legal security, the policy should be changed to a directive that ensures the handling of grass from protected areas as an agricultural product. These grass materials do not need any sanitization processes regarding the input materials itself, or the byproduct digestate. Grass residues, also sometimes being called as landscaping materials from public or private parks and other organic waste that is clearly labeled as waste by the bio-waste ordinance, should be following the waste treatment chain.

Besides legal certainty, the economic risk should be accountable. Investing into bioenergy is cost-intensive due to expensive technical equipment. One objective should be to provide a security for these long-term investments; therefore, reasonable amortization rates are necessary for being profitable for potential investors. Stakeholder advises are, that a separate remuneration for grass would be reasonable. For example establishing a bonus for landscape conservation with a rate of 2- 4 cents /kWh depending on installations size. This amount would make the establishment of a bioenergy plant with grass as input material financially sufficient.

Grass as an input material seems to be still an unexploited resource. Grass is constantly available because of its storage features. Nevertheless, production cost for mowing, collection and digesting especially for landscaping materials will be not competitive to other substrates collated to the biogas potential. Certain grass fractions are harder to harvest than others. Therefore, it is necessary to create a financially balanced concept to cover the higher production costs.

The maintanance of permanent grassland has several positive effects for the environment. First of all the ecological effects, the mantainance of grassland helps to avoid soil erosion. It also prevents nutrition leaching into groundwater and enhances biodiversity. Furthermore, grassland provides an higher carbon storage than arable land. The agricultural subsidies, provided by the European Union, support these positive effects on the mantainance of grassland.

These issuses can be obtained through the following ways:

- The incentive structure for bioenergy in Germany needs a solid foundation and stable conditions. This will help to secure investment and foster the utilization of grass for bioenergy.
- Legal case descision should be kept to a minimum because legally binding norms will secure the rights of grass producers.
- The price for grass used in bioenergy plants should guarantee cost-efficient production.
- The area payment for the maintanance of grassland should be kept as it is. It ensures the ecological and econmical benefits of the agricultural sector.
- Eco-system-services need to be financed by own funding programmes, independently from renewable energy programmes.

Grass as waste

Greenery cuttings and other grass waste materials still possess a significant biogas potential, which is frequently unused as a source for energy production. The grass material is either collected and brought to composting plants, burned or mulched and left at the place of origin. The main problem of grass waste material is the assumption, that these kind of materials are always happen to have an high contamination with heavy metals, plastics and other impurities. However, this only applies currently for some kind of grass materials, e.g. grass originating from roadsides or main waterways. Improving the seperation process for greenery cuttings would provide a better overview about the amount of grass potential, which could be used as an input material for bioenergy plants.

- Comprehension of ecological benefits of collection and utilization of unexploited grass materials
- Improvement of the separation system for greenery cuttings necessary and financial support for implementation of a pretreatment process.

2.1.4 ITALY-VENETO

Considering the actual Italian scenario depicted in section 1.4 there are basically two possible lines of intervention: one dedicated to the legal framework and the other one to a system of incentives in the sectors of grass management and social works.

With specific reference to the legal framework, the main point which needs clarification at legal level is the status of mowed grass: in fact, as discussed above, grass can be classified as a waste or not, depending basically on the area (urban or not) where it is mowed.

There is therefore the need for a certain legal definition of organic waste, by-products and other residual organic material suitable for biogas production. Definitions of the Laws 152/2006 and 205/2010 should be revised and new claer definitions emended.

Coming to the second line of intervention, related to incentives policy makers should consider to subsidee grass chain especially when the work is carried out by social cooperatives giving a job to disadvantaged categories.

Studied conducted in the framework of the GR3 project pointed out how costs for grass mowings, transport and storage can be in the range 20-30 Euro per ton of fresh material. The need for an incentive seems to be the keypoint to exploi this material. Clearly, part of these costs are covered by biogas production and energy recovery. Moreover, the environmental and societal implications should be taken into account.

The biogas sector has been greatly supported during years between 2009 and 2012 and Italy is now the second European market for biogas after Germany and the third in the world after China. As a consequnce, it seems difficult to introduce a system of incentives in this sector. Therefore, the incentive system should only support the grass chain, considering mowing, collection and delivery.

This can be obtained through several ways:

a) Incentive for collected material (gate fee)
b) Defiscalisation system for companies involved in the grass chian
c) Incentives for (social) cooperatives involved in the grass chain

2.1.5 PORTUGAL-GREAT LISBON

In order to define a politic strategy to enhance the application of grass to digesters it is necessary to evaluate the entire set of benefits that this solution can provide, in Portugal.

The economic potential of biogas from anaerobic digestion of grass

In economic terms biogas from (GW) provides revenues as electric energy, organic fertilizer and heat generation. Table 1 contains the economic values per ton of (GW) in terms of electricity (0.011 €/kWh), heat and fertilizer:

Table 1: Value of a ton of grass in Portugal

Type of grass	electricity (€/t)	fertilizer (€/t)	heat (€/t)	Total Value (€/t)	Total Value (€/ha. year)
No watering and cutting infrequent	33	4,5	15	53,5	400
With irrigation and frequent cutting	52	4,5	21	95,5	1195

This income may offset the production cost of grass crops.

Environmental, economic and social benefits

The production, recovery and use of biogas from (GW) are based on principles of economic and environmental sustainability. The environmental benefits can be summarized as follows:

- Decrease of CO_2, NOx, SOx and CH_4 emissions due to fossil fuel replacement to produce electricity and heat.
- Decrease of odors.
- Improvement of sanitary conditions in the transportation of waste.
- Improves the moisture of the waste and the performance of the digester.
- Contribution to the treatment and final disposal of grass.
- Promoting a more favorable environmental image.

From the macroeconomic point of view, the use of GW will contribute to the creation of regional value added and reduce imports of fossil fuels.

One m^3 of biogas with 70% methane, when used, prevents considerable amounts of CO_2 according to table 2:

Table 2: Reduction of emissions provided by Biogas

Fuel replaced	Fuel Economy	Saving of CO_2 Emissions (kg/m^3)
Natural gas (m^3)	0,7	1,36
Propane (lt)	0,73	1,09
Diesel (lt)	0,52	1,3
Coal Carvão (kg)	0,47	1,15

The carbon market can be a strong incentive to the production of biogas. However Green Energy Certification is not yet available to producers of renewable electricity in Portugal, such as biogas plants, so this source is still not accessible.

The Implementation of sustainable system, using the GW as a renewable resource for the production of endogenous energy leads also to the following social benefits:

- Less pollution.
- Creation of employment and income.
- The promotion of an environmental consciousness.
- Participation of local community in solving its waste, encouraging the separate collection of MSW.
- Stimulus to practice gardening and defense of the territory, in accordance with regional policies in this area.

Incentives and measures

The codigestion of grass wastes in a SW digester involves additional costs for transportation and pre-treatment of the biomass, as well as the payment of a gate-fee, creating a quite unfavorable perspective for a grass cutting operator, relatively to others technologies as mulching. If their business area has many competitors and the profits are very low, this option is not feasible, and the increase of grass processing GW by anaerobic digestion requires serious promotional measures.

Concerning the grass collection it is necessary to remove or reduce the gate-fee in order to encourage the delivery at regional Solid waste management systems and biogas plants. Grass provides valuable biogas, fertilizing digestate and biomass for composting, resulting in an added value to AD operator. Grass, when adequately separated and clean should be regarded as a primary matter or a special additive, and not be considered as equivalent to a putrescible waste. So it is necessary to **modify the grass classification** and introduce criteria for distinguishing high quality grass, coming from good areas, pre-selected and pretreated, from low grade grass waste. The legislation should promote in some way grass pretreatment and selection, reducing the fee or introducing a bonus.

Policy regarding biogas promotion in Portugal is limited. In Portugal the electricity from biogas has a very low remunerative rate (80 €/MWh for new connections and 110 €/MWh, for old contracts) and is not attractive for private investments. This tariff is difficult to be changed in short terms, once is dependent on the national economic strategy. Actually only projects necessary to fulfill waste treatment goals and co-financed by cohesion funds have the opportunity to be carried-out.

However the value of produced energy from grass should be promoted with a specific incentive or bonus, as occur with energy crops, in some EU countries, in order to compensate the transportation and treatment costs and facilitate cooperation between grass operators and AD plant owners.

The promotional measures should motivate the companies in charge for grass management to look at biogas as a complement of its main agricultural practice and plan the construction of new digesters and related cogeneration system. On the other hand the owner of the digester must be positively motivated to increase the energy production and insert in the lay-out AD before composting.

The payment of carbon credits for the avoided emissions should be also considered in the incentive framework.

In evaluating the necessary financial means should be considered that each 50 ha of grass cultivated to feed a new digester can create allows two new jobs, saving at least € 14,000/year in unemployment benefits. Another contribution may come from the increase in tax revenue and taxes paid for each new job: 3500 €/year (€ 7,000/year for both). Such funds from unemployment can favorably finance biogas and the energy area, helping the local development. These income are not currently predicted and took into consideration during the business plans preparation, in Portugal, diminishing the competitive advantage of AD.

Biomethane is still not financed at all in Portugal. On this regards, LNEG elaborated a roadmap study for 2015/2020 to define a strategy for implementing biomethane projects. This report includes a recommendation to use grass as resource for biogas/biomethane production. [15]

The use of biomethane in vehicles is a high-value application and provides good incomes to the producers, and vehicle owners. From 2014, In Portugal there is a reduced taxation for NG/biomethane vehicles which is a good mesure for the promotion of alternative fuels. The application of biomethane contributes to reaching the established EU cote for biofuels for transportation. Also the biomethane can occupy a portion of the quote established for the biodiesel, avoiding extra governmental support. If the biogas has been produced from digestion of wastes and the biodiesel from agricultural and imported crops, the use of biomethane in transportation, is an advantageous option for a country. This has been the Swedish option. In other countries the use of methane as biofuel is dependent on the diffusion of the methane fuelled vehicles and can be in competition with electric cars as the fuel of future.

In the framework of GR3 project the main responsible of the waste management systems were contacted in order encourage collaboration in this direction. Also directors and authorities from Energy Directorate and Environmental directorate were contacted and invited to promote enhancement of grass to AD.

[15] Cabrita I., Silva L., Marques I. P., Di Berardino S., Girio F.,2015. Avaliação do Potencial e Impacto do Biometano em Portugal, LNEG, ISBN 978-989-675-037-4

2.2 EUROPEAN LEVEL PROPOSAL

Considering the policy proposals developed during the project for the five targeted regions it turns out clear that there are two different levels of required action: one is specifically directed to the legal status of mowed grass, while a second one is related to the necessity to subside the use of such substrate.

In particular, these two levels should be considered:

1) Revise the legal status of mowed grass and clearly define if and when it is a waste or it can be considered a by-product (residue). Anaerobic digesters both operating in the waste or in the agricultural sectors will largely benefit from this clarification. It should be remembered here that according to the European Biogas Association some 15,000 AD plants are in operation within the EU and 80% of these are using agricultural feedstocks. The definition of mowed grass from landscape management and natural areas as a by-product or residual material will clearly open the possibility to easily use this material which is not already used for feeding animals purposes as bioenergy feedstock in farm-based AD;
2) Management of grass, from mowing to transport and eventually storage is costly. Reported costs are in the range 20-30 € per ton of grass. This is the reason why grass mowed in natural areas or along river banks is very often left on the place. If the need to use this material as feedstock for the bioenergy sector is stated then an incentive to sustain the management chain is requested. This subside can have different forms: payment per ton of mowed grass (gate fee), incentives for social workers, defiscalisation of labour costs for cooperative or, still, incentive for produced energy (c€ per kWh produced).

These two actions can respond to a number of goals defined from European institutions:

1) Renewable energy from biomass which is not used for food/feed purposes is produced
2) Organic waste or residual material is recycled: beside methane also digestate rich in nutrients which can be used as a fertilizer is produced
3) A number of job opportunities are created along the chain of grass management. Most of these jobs can interest social workers thus enforcing inclusive concepts.

ANNEXES

- Reports “proof of meeting”
- Letters of interest of Regional policy makers