Triggering the creation of biomass logistic centres by the agro-industry

SUCELLOG: IEE/13/638/SI2.675535

D7.8
Summary on non-technological barriers and policy recommendations - Energy production from solid agricultural residues

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About SUCELLOG project

The SUCELLOG project - Triggering the creation of biomass logistic centres by the agro-industry - aims to widespread the participation of the agrarian sector in the sustainable supply of solid biofuels in Europe. SUCELLOG action focuses in an almost unexploited logistic concept: the implementation of agro-industry logistic centres in the agro-industry as a complement to their usual activity evidencing the large synergy existing between the agro-economy and the bio-economy. Further information about the project and the partners involved are available under www.sucellog.eu.

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About this document

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1. Introduction

The purpose of the SUCELLOG project is to trigger the creation of biomass logistic centres by the agro-industry aiming to use agricultural residues for the production of solid biomass which will be then used for energy purposes.

Besides techno-economic and sustainability requirements which can be adjusted and overcome by the agro-industry, some non-technical barriers related to market approaches, policy regulations and laws can arise hindering the creation of those logistic centres. This report gives an overview of those barriers in the target countries at national and regional levels detected during the development of SUCELLOG actions and proposes recommendations to overcome these barriers.

2. Overview of the EU legal framework

For the production of solid biomass from agricultural residues for energy purposes, the EU legal framework should be considered from 3 perspectives: regarding the energy policy i.e. **bioenergy policy,** regarding the policy of **feedstock (biomass type)** used and from the perspective of **agricultural policy**.

2.1. Bioenergy policy

Due to climate change, increasing import dependence and higher energy prices, the EU has been developing its climate and energy policy as an integrated approach that pursues the three key objectives of:

- Security of supply: to better coordinate the EU's supply of and demand for energy within an international context;
- Competitiveness: to ensure the competitiveness of European economies and the availability of affordable energy;
- Sustainability: to combat climate change by promoting renewable energy sources and energy efficiency.

These objectives have been translated into binding targets. By 2020, the EU has committed itself to reducing its greenhouse-gas (GHG) emissions by 20%, increasing the share of renewable energies to 20% of total EU energy consumption, increasing the share of renewable energies in transport to 10% and improving energy efficiency by 20%.

Further targets has been set for 2030 – reduction of GHG emissions by 40% and increasing the share of renewable energy in final energy consumption to 27% as compared to 1990. In a long term the Energy Roadmap 2050 describes several decarbonisation scenarios to reduce GHG emissions in Europe by 80-95% below the 1990 emission levels. It is foreseen that non-food sustainable biomass, including agricultural waste and by-products addressed by SUCELLOG project, will play an important role in reaching the expected future GHG emission savings.

As part of the 2020 Energy and Climate package, the Commission issued the Directive 2009/28/EC to enhance the promotion of energy use from renewable sources. The directive establishes a common framework and gives to each Member State its national target. It introduces mandatory national overall targets. Each Member State shall ensure that the share of energy from renewable sources in gross final consumption of energy in 2020 at least matches its national overall target defined in the Directive.

Moreover, the Directive sets out sustainability criteria for biofuels and bio-liquids in order to ensure a coherent approach between energy and environment policies, but does not specify any sustainability criteria for solid and gaseous biomass. However, to minimise the risk of the development of varied and possibly incompatible criteria at national level, leading to varying degrees of mitigation, barriers to trade and stifling the growth of the bio-energy sector (and imposing increased costs on Member States for meeting their national targets), the European Commission listed non-binding sustainability criteria regarding biomass for electricity and heating, and recommended their adoption by Member States In 2010. These

recommendations are meant to apply to energy installations of at least 1MW thermal heat or electrical power. They:

- forbid the use of biomass from land converted from forest, and other high carbon stock areas, as well as highly biodiverse areas;
- ensure that biofuels emit at least 35% less greenhouse gases over their lifecycle (cultivation, processing, transport, etc.) when compared to fossil fuels. For new installations this amount rises to 50% in 2017 and 60% in 2018;
- favour national biofuels support schemes for highly efficient installations;
- encourage the monitoring of the origin of all biomass consumed in the EU to ensure their sustainability.

According to the Report from Commission to the Council and the European Parliament COM(2010)11 – on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling, residues to produce solid biomass should fulfil the criteria of minimum GHG emission saving values of 35%, rising to 50% on 1st of January 2017 and to 60% from 1st of January 2018 for biomass produced in installations in which production started on or after 1st of January 2017.

Classification of biomass fuels and their sustainability aspects are covered by several European Standards. Regarding fuels produced from agricultural residues at least two groups of standards are applicable: EN ISO 17225 – Solid biofuels and EN 16214 – Sustainability criteria for the production of biofuels and bio-liquids for energy applications.

Solid biofuels – Fuel specification and classes (EN ISO 17225-1) was published in 2014 and superseded the existing EN 14961-1 standard. ISO 17225 had 7 sub-norms determining the fuel quality classes and specifications for solid biofuels. All solid biofuels mentioned in the standard are for non-industrial use, except woody pellets which have been also set for industrial purposes. Distinction is made between (1) wood pellets, (2) wood briquettes, (3) wood chips, (4) firewood, (5) non-woody pellets, and (6) non-woody briquettes. Standards for fuel quality assurance are dealt within EN 15324. The European Standard covers the raw material supply, production and delivery chain, from purchasing of raw materials to point of delivery to the end-user.

EN 16214 defines sustainability principles, criteria and indicators including their verification and auditing schemes, for as a minimum, but not restricted to, biomass for energy applications. This includes greenhouse gas emission and fossil fuel balances, biodiversity, environmental, economic and social aspects and indirect effects within each of the aspects.

2.2. Feedstock (biomass type) policy

In EU directives, national legislation, EU and national policy and strategy papers, etc. the term “biomass” has different meanings. According to the aforementioned Directive 2009/28/EC: “‘biomass’ means the biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste”.

The identification of the exact waste/product status of biomass is critically important for the promotion or the downfall of the whole biomass industry, given the different legal constraints such a status may entail. The collection and transportation of residues and wastes, for instance, does raise practicability problems for those who work in this field because, depending on the qualification of the material, they will need special authorisation to transport and stock waste. Qualification problems come at stake when biomass is made of residues, because if it derives from an activity devoted to produce biomass it is clearly considered as a product.

At European level, "waste" is very broadly defined as "any substance or object which the holder discards or intends or is required to discard" (Article 3.1 Directive 2008/98/EC). In order to better understand the definition of waste, it is worth considering article 7 of the Directive which clarifies that just because a substance or object appears in the List of Waste, this does not mean it is waste under all circumstances. It is waste only where the definition 'any substance or object which the holder discards or intends or is required to discard' is met. That means that it is not sufficient to find a substance in the list of wastes to classify it as a waste. Thus, if biomass is produced as a side stream from agricultural or industrial activities, which one wants to discard (e.g., waste streams for agriculture), it may obviously merely be seen as waste and the production process itself – as waste treatment. The status of biomass according to the definition of waste depends on the conduct or on the intention of holder.

The inclusion of a substance or object in the definition of waste have relevant practical implication for the potential valorisation of the residues as the EU waste law requires strict obligation for the management of waste. Nevertheless, biomass may escape the mere 'waste' status, as the European waste legislation defines other concepts, namely the status 'by-products'. If biomass meets all the conditions to be qualified as 'by-product' it is no longer seen as waste but as a product and as a consequence does not have to comply with all the legal regulations regarding waste and the arising constraints.

Article 5 of the Waste Directive defines by-product as: "a substance or object, resulting from a production process, the primary aim of which is not the production of that item, may be regarded as not being waste but as being a by-product only if the following conditions are met:

(a) further use of the substance or object is certain;

(b) the substance or object can be used directly without any further processing other than normal industrial practice;

c) the substance or object is produced as an integral part of a production process; and

(d) further use is lawful, i.e. the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts."

Moreover some substances may be excluded from the scope of the Directive and not being considered as a waste such as agricultural and forestry material. Article 2(1)(f) of the Directive excludes "*faecal matter, if not covered by paragraph 2(b), straw and other natural non-hazardous agricultural or forestry material used in farming, forestry or for the production of energy from such biomass through processes or methods which do not harm the*

environment or endanger human health". Faecal matter consists of faeces and urine excreted by animals in an agricultural or forestry setting. It does not include human faecal matter. Examples of materials from agriculture or forestry that could be considered natural non-hazardous materials are: straw from grain and other crops, cut grass, natural wood, wood off-cuts, wood chips, sawdust and other biomass. The minimum standard for not harming the environment or endangering human health is compliance with the standards of EU environmental legislation.

2.3. Agricultural policy

Agriculture sector in EU is regulated by common agricultural policy (CAP). The main objectives of CAP are to provide a stable, sustainably produced supply of safe food at affordable prices for consumers, while also ensuring a decent standard of living for farmers and agricultural workers. CAP is one of the oldest policies in EU and during the last decades has been reformed many times. The most recent reform of the CAP has been introduced in 2103 and foresees four basic regulations and transition rules for the period of 2014-2020 based on the Europe 2020 strategy.

In this context, through its response to the new economic, social, environmental, climate-related and technological challenges, the CAP can contribute more to developing intelligent, sustainable and inclusive growth. The CAP must also take greater account of the wealth and diversity of agriculture in the EU Member States. The reformed CAP introduces a new architecture of direct payments; better targeted, more equitable and greener, an enhanced safety net and strengthened rural development. As a result it has been adapted to meet the challenges ahead by being more efficient and contributing to a more competitive and sustainable EU agriculture.

Regarding bioenergy production the reformed CAP sets conditions for use of agricultural land through two pillars: Direct Payments and Rural Development.

The first pillar – Direct Payments – will move away from allocations per Member State and per farmer within the Member State based on historical references. This will mean a clear and genuine convergence of payments not only between Member States, but also within Member States. Direct payments are largely decoupled: there will be no direct incentives supporting the production of bioenergy from energy crops. Moreover, Greening Payment is introduced meaning that a significant share of the subsidy will in future be linked to rewarding farmers for the provision of environmental public goods.

The second pillar of the CAP, through its Rural Development measures, encourages the supply of bioenergy from agriculture and forestry and the use of bioenergy on farms and in rural areas. It will be up to Member States / regions to decide which measures they use (and how) in order to achieve targets set against six broad "priorities" and their more detailed "focus areas" (sub-priorities). The six priorities cover:

- Fostering knowledge transfer and innovation;
- Enhancing competitiveness of all types of agriculture and the sustainable management of forests;

- Promoting food chain organisation, including processing and marketing and risk management;
- Restoring, preserving and enhancing ecosystems;
- Promoting resource efficiency and the transition to a low-carbon economy;
- Promoting social inclusion, poverty reduction and economic development in rural areas

Reformed CAP conditions are beneficial for the development of new bioenergy supply chains based on agricultural residues and by-products – which are the basis of the SUCELLOG project concept.

2.4. Policy developments regarding the use of agricultural biomass for energy

Beyond 2020 the policy regarding biofuels and bioenergy could change dramatically. On 22 January 2014, the EC set out its vision for EU climate and energy policy up to 2030 proposing significant changes from the current status. The EC envisages no 'public support' for biofuels produced from food-based feedstocks, and no longer foresees any transport specific targets for renewables post 2020.

Policy makers have started to address the impact of land use change, both – direct and indirect (iLUC), associated with the use of conventional (food and feed) crops for conversion into biofuels. In 2015 a new iLUC Directive (EU) 2015/1513 of the European Parliament and of the Council came into force, which amend the current legislation on biofuels – specifically the Renewable Energy Directive and the Fuel Quality Directive – to reduce the risk of indirect land use change and to prepare the transition towards advanced biofuels. Among others, the amendment limits the share of biofuels from crops grown on agricultural land that can be counted towards the 2020 renewable energy targets to 7%, sets an indicative 0.5% target for advanced biofuels, harmonises the list of feedstocks for biofuels across the EU whose contribution would count double towards the 2020 target of 10% for renewable energy in transport and requires that biofuels produced in new installations emit at least 60% fewer GHG emissions than fossil fuels.

As the debate has progressed there has been an increasing perception that non-food lignocellulosic crops, which can be grown on marginal and degraded land, and increased valorisation of agricultural residues and by-products offer good opportunities to limit impacts of displacing food and feed production from current farmland. Depending on how the future policy will be implemented, this may offer better development opportunities for non-food lignocellulosic crops and for agricultural residues and improve their competitiveness compared to fossil fuels and first generation biofuels.

3. Non-technical barriers

In this chapter the non-technical barriers hindering the production of solid biomass from agricultural residues for energy purposes are summarized. The summary includes all relevant barriers which were identified during the implementation of SUCELLOG project activities at national and regional level in Spain, France, Italy and Austria (for detailed information see SUCELLOG project report D7.7 – Report on meetings with policy makers). In addition, experiences made in SUCELLOG project were compared to findings of other European funded projects (e.g. MixBioPells, S2Biom, Biomass Policies).

In this report the identified barriers are divided and further described in four categories:

1) Policy, regulatory and legislative barriers
2) Knowledge and awareness barriers
3) Market barriers
4) Financial and organisational barriers

3.1. Policy, regulatory and legislative barriers

- **Uncertainty what biomass can be used and if it is waste or not:** Different interpretation of the origin of biomass in national and regional legislation exist. In some regions, the fuels produced from biomass classified as “waste” are not allowed to be used in small-scale boilers (e.g. in households). For example, in Styria (Austria) households were not able to use corn cobs pellets as fuel. In 2016 this situation changed with the amendment of regional regulations, however, some other types of biomass is still not clearly categorized – for example, roadside wood, in Upper Austria.
- The concept is new and often **other – more widespread renewable energy sources are preferred and planned as investment options** by national and regional policy makers, e.g., wind and solar energy or biogas production (in France). Thus the availability and access to funding incentives is limited.
- Lack of political commitment: Wood biomass is used as the reference. **Agricultural biomass not recognized, particularly mentioned or distinguished** when addressing sustainable energy issues on national or regional level. In some regions (e.g. Champagne and Rhône-Alpes regions in France) the general statement is that first the use of wood biomass must be developed and there is a concern that introduction of agro-fuels in the market would disturb these developments.
- In some countries **different taxing rates** are applied to raw material, product and fuel.

3.2. Knowledge and awareness barriers

- **Issue of social acceptance**: in Italy, dark pellets are considered as a bad quality product and cannot find a market. According to the general perception, pellets must be white (light colours).
- **Existing farming practices**: it is difficult to change the habits and existing well-rooted farming practices, e.g. burning or chopping and leaving agro-prunings on the fields.

- **Lack of information at biomass users**: in many regions the average opinion is that agricultural biomass cannot be used, that their properties are not as good as for wood fuels, that organization of the supply is too difficult and regular supplies during the year or in several years are not possible. Moreover, biomass users are not well informed about technologies that can be used for agro-fuel combustion.
- **Lack of information at agro-industries and cooperatives**: agro-industries and cooperatives generate biomass residues during their activities or have access to the by-product streams through their members/suppliers; however generally there is no clear strategy on how to use them and what opportunities they have.

3.3. Market barriers

- **General lack of experience and knowledge about using solid biomass** for energy production. This prevents overall confidence in biomass as reliable energy source.
- In some regions due to climate phenomena (e.g. heavy storms) in the last years there is a **large excess of wood biomass in the market**. Therefore alternative solid biomass sources from agricultural residues are either currently not on the agenda and there is no interest in this issue, or wood biomass prices are very low making it difficult for agricultural by-products to compete in the wood biomass saturated market.

Example from Lower Austria: *There are big amounts of wood-chips available on the market for the price of 80-100 €/t (including transportation to the boiler). Agricultural by-products (e.g. corn-cobs) often have low energy content per volume (low energy density) and their transportation is cost-intensive. The solution would be biomass pelletizing, however, this kind of pre-treatment brings significant increase of the product costs (around 100 €/t), thus it is difficult to compete with woodchips on the local market.*

- **Low oil and gas prices**: it is difficult for biomass fuels to be competitive in the market dominated by natural gas heating, especially for the agricultural biomass since its use is more complicate compared to natural gas (delivery of fuel needs to be organised, storage is needed, occurring costs for ash disposal, etc.). Therefore, **consumers will switch to biomass only if it is considerable cheaper, since fossil fuels are always linked to commodity.**

Example from Ile de France Sud: *Ile de France Sud is a cooperative in the South of Paris producing mainly cereals. As a by-product of the production, silo dust is generated. The company tried to find new uses for it and started using silo dust for production of pellets. They invested in a pelletizing line and made a partnership with a municipality (the cooperative is located in the territory of this municipality).*
The heating in the municipality is provided by external energy company. The city council invested in around 10 boilers (around 100 000 € per boiler) and announced in local media the use of biomass for heating of the swimming pool and other public buildings. However, shortly after starting the operation of some boilers (some others were never used), the energy company decided that using biomass is too complicated and turned back to natural gas boilers. To be able to cover the investment costs, the municipality asked the energy company to pay back the difference between the price of gas (more expensive) and biomass. However, the market price of natural gas has now decreased reaching approximately the same cost level as the biomass. Under these conditions there is no interest any more or means to insist on further use of biomass for heating.

In the described case, the main obstacles for the success of intended project were ash issues ("too complicated" for the energy company compared to the use of natural gas), noise (during loading the silos for boilers the noise were causing complaints from local merchants) and the lack of political commitment.

- **Low market activity**: the current production rate of agro-fuels is quite low and it will take time to up-take the market to facilitate both – demand and production.

Example from Bourgogne (France): *There is a lack of appropriate technology and experience of using alternative pellets in the area. There are two larger capacity (>300 kW) boilers in Bourgogne working with pellets (one is installed in a high school and another one in retirement home), but none of them is adapted for using agro-pellets. In the region there are installed more boilers with smaller capacity (<100 kW), which are technically able to use agro-pellets. Less than 5 are using miscanthus as fuel. Market activity in the area is very low, almost non-existent. Company "Bourgogne pellets" is working on developing this market, but without significant success for the moment.*

- **Lack of appropriate technologies** for biomass transformation (boilers, combustion burners and gasifiers) **on the market** for the combustion of agro-fuels at a reasonable price (low demand, low activity of specialized boiler producers only tailor made equipment whose price is considerably higher). Even if it is technically possible to combust agricultural solid biomass in a conventional wood fuel boiler, the owner risks losing the warranty due to using another type of fuel which is not included in the boiler specification.

3.4. Financial barriers

- **Lack of funding and low financial capacity** of the agroindustry and the consumers to make new investments in existing facilities. To have more flexibility the best for consumers would be to have a heating system working mainly with biomass, but to have a back-up system running on fossil fuel as well. However, such a double system requires additional investment.
- The use of agro-fuels compared to wood fuel requires **higher investment costs** resulting from critical fuel parameters and **increased costs for maintenance** and repair due to critical fuel parameters, abrasion and increased ash content.
- **Additional costs imposed by the need of the implementation of flue gas treatment technology to fulfil emission thresholds in some cases.** Critical and varying fuel parameters are causing additional costs along the whole biomass value chain to ensure fulfilling emission thresholds and correct ash disposal. With respect to potential applications for bioenergy production, agricultural residues face constraints due to their relatively high ash content, potential presence of agrochemicals on the biomass surface and high concentrations of mineral compounds in the raw material. These conditions lead to increased concentrations of flue gas emissions and may cause problems with ash slagging and disposal imposing additional costs.
- **Increase of specific costs with lower capacity** makes small combustion units for agro-fuels less profitable.

3.5. Organisational barriers

- **Insecure, seasonal raw material supply and availability** as well as difficulties to assess the feasibility of the project due to **high and fluctuating raw material prices**.
- **Difficulties in securing signed commitments** for the purchase or supply, in terms of quantity and price of materials, due to the period of economic crisis and due to the uncertainty that characterises the agricultural sector in its production. The integrated supply chain agreements between farms often require more time than the duration for funding programmes.
- **Logistic efforts** limit upscaling of projects.

4. Summary of the most important barriers in SUCELLOG project countries

In the next sections, SUCELLOG partners have stated the most important barriers in order of importance that are currently an obstacle for the development of logistic centres into agro-industries. These barriers, as it has been explained in the previous sections, are non-technical and linked to the fact that SUCELLOG aims to introduce a new solid biomass product coming from agricultural sources.

Differences among countries are briefly discussed in the final part of this section.

4.1. Most important barriers in Austria

Importance (1 is the most important)	Type of the barrier	Description of the barrier
1	Policy	Lack of political commitment: Wood biomass is used as the reference. **Agricultural biomass is not recognized, particularly mentioned or distinguished** when addressing sustainable energy issues on national or regional level.
2	Awareness/ knowledge	**Lack of information at biomass users**: in many regions the general opinion is that agricultural biomass cannot be used, that their properties are not as good as for wood fuels, that organization of the supply is too difficult and regular supplies during the year or in several years are not possible
3	Market	**Large excess of wood biomass in the market.** Therefore alternative solid biomass sources from agricultural residues are either currently not on the agenda and there is no interest in this issue, or wood biomass prices are very low making it difficult for agricultural by-products to compete in the wood biomass saturated market.
4	Organizational	**Difficulties in securing signed commitments** for the purchase or supply, in terms of quantity and price of materials, due to the period of economic crisis and due to the uncertainty that characterizes the agricultural sector in its production. The contracts in the energy sector are normally longer than the agriculture ones.
5	Market	**Low oil and gas prices:** it is difficult for biomass fuels to be competitive in the market dominated by natural gas heating, especially for the agricultural biomass since its use is more complicate compared to natural gas (delivery of fuel needs to be organised, storage is needed, occurring costs for ash disposal, etc.). **Therefore, consumers will switch to biomass only if it is considerable cheaper, since fossil fuels are always linked to commodity.**
6	Market	**Lack of appropriate technologies** (boilers, combustion burners and gasifiers) **on the market** at a reasonable price (low demand, low activity of specialized boiler producers) for transformation of agro-fuels into energy.

4.2. Most important barriers in France

Importance (1 is the most important)	Type of the barrier	Description of the barrier
1	Market	**Low oil and gas prices:** it is difficult for biomass fuels to be competitive in the market dominated by natural gas heating, especially for the agricultural biomass since its use is more complicate compared to natural gas (delivery of fuel needs to be organised, storage is needed, occurring costs for ash disposal, etc.). **Therefore, consumers will switch to biomass only if it is considerable cheaper, since fossil fuels are always linked to commodity.**
2	Awareness/ knowledge	**Lack of information at biomass users**: in many regions, the general opinion is that agricultural biomass cannot be used, that its properties are not as good as for wood fuels, that organization of the supply is too difficult and regular supplies during the year or in several years are not possible. This is why wood is generally preferred in biomass projects. The feasibility of complex logistic chains using agricultural biomass still has to be proved in France.
3	Organisational	**The agro-biomass sector is not structured. There is no lobby group to defend its interests or to develop communication on agro-biomass** (mainly agro-pellets) as it is for a wood or other energy sources. Project developers (cooperatives or farmers) are not applying for the calls for tenders. Agricultural biomass thus still remains unknown and under developed. Moreover, there is a lack of communication between stakeholders dealing with agricultural biomass.
4	Market	**Lack of appropriate technologies** (boilers, combustion burners and gasifiers) **on the market** (low demand, low activity of specialized boiler producers) for transformation of agro-fuels into energy for households **at a reasonable price**. As multi-fuel boilers are more expensive than wood boilers, the market is not developing. Development of the market is partially hindered as well due to the publicity of bad experiences made in the past while using un-appropriate technology for agricultural biomass combustion.
5	Awareness/ knowledge	**The agriculture is a very conventional sector which is not likely to give steps towards innovation practices** (when not directly link to their usual activities): some says that biomass is not their job. The implication of the agricultural sector, mainly cooperatives or farmers, is essential as they know how to treat biomass and can already collect residues; nevertheless, they are considering that using residues is not their work.
6	Policy	**There is no clear position from government regarding agricultural biomass.**

4.3. Most important barriers in Italy

Importance (1 is the most important)	Type of the barrier	Description of the barrier
1	Market	**Large excess of wood biomass in the market.** Therefore alternative solid biomass sources from agricultural residues are either currently not on the agenda and there is no interest in this issue, or wood biomass prices are very low making it difficult for agricultural by-products to compete in the wood biomass saturated market.
2	Policy	Lack of political commitment: Wood biomass is used as the reference. **Agricultural biomass is not recognized, particularly mentioned or distinguished** when addressing sustainable energy issues on national or regional level.
3	Market	**Lack of appropriate technologies** (boilers, combustion burners and gasifiers) **on the market** at a reasonable price (low demand, low activity of specialized boiler producers) for transformation of agro-fuels into energy.
4	Financial	**Higher investment costs and cost of maintenance** for equipment working with agro-fuels that with wood fuel.
5	Financial	**Lack of funding and low financial capacity** to invest on facilities to become a logistics centre or to consume agro-biomass.
6	Awareness/ knowledge	**Distance between the agriculture and the energy sector.** When people working in the agriculture sector want to start a project related to energy, they do not have an existing network of stakeholders to build on. Agriculture machinery producers do not have the necessary knowledge to make the machinery compatible with the requirements of biomass sector. Additionally, **agriculture is a very conventional sector which is not likely to give steps towards innovation practices in a field that is completely unknown for them.**

4.4. Most important barriers in Spain

Importance (1 is the most important)	Type of the barrier	Description of the barrier
1	Market	**Low oil and gas prices:** it is difficult for biomass fuels to be competitive in the market dominated by natural gas heating, especially for the agricultural biomass since its use is more complicate compared to natural gas (delivery of fuel needs to be organised, storage is needed, occurring costs for ash disposal, etc.). **Therefore, consumers will switch to biomass only if it is considerable cheaper, since fossil fuels are always linked to commodity.**
2	Organisational	**High logistic efforts limit upscaling of projects.**
3	Market	**Large excess of wood biomass in the market.** Therefore alternative solid biomass sources from agricultural residues are either currently not on the agenda and there is no interest in this issue, or wood biomass prices are very low making it difficult for agricultural by-products to compete in the wood biomass saturated market.

Importance (1 is the most important)	Type of the barrier	Description of the barrier
4	Awareness/ knowledge	**Existing farming practices**: it is difficult to change the habits and existing well-rooted farming practices.
5	Policy	Lack of political commitment: wood biomass is used as the reference. **Agricultural biomass is not recognized, particularly mentioned or distinguished** when addressing sustainable energy issues on national or regional level.
6	Awareness/ knowledge	**Lack of information at biomass users**: in many regions the general opinion is that agricultural biomass cannot be used, that its properties are not as good as for wood fuels, that organization of the supply is too difficult and regular supplies during the year or in several years are not possible.

4.5. Differences across Europe

The figure below shows the difference in the relevance of the identified barriers across countries. The relevance of each barrier has been evaluated based on the experiences gained during the development of SUCELLOG project.

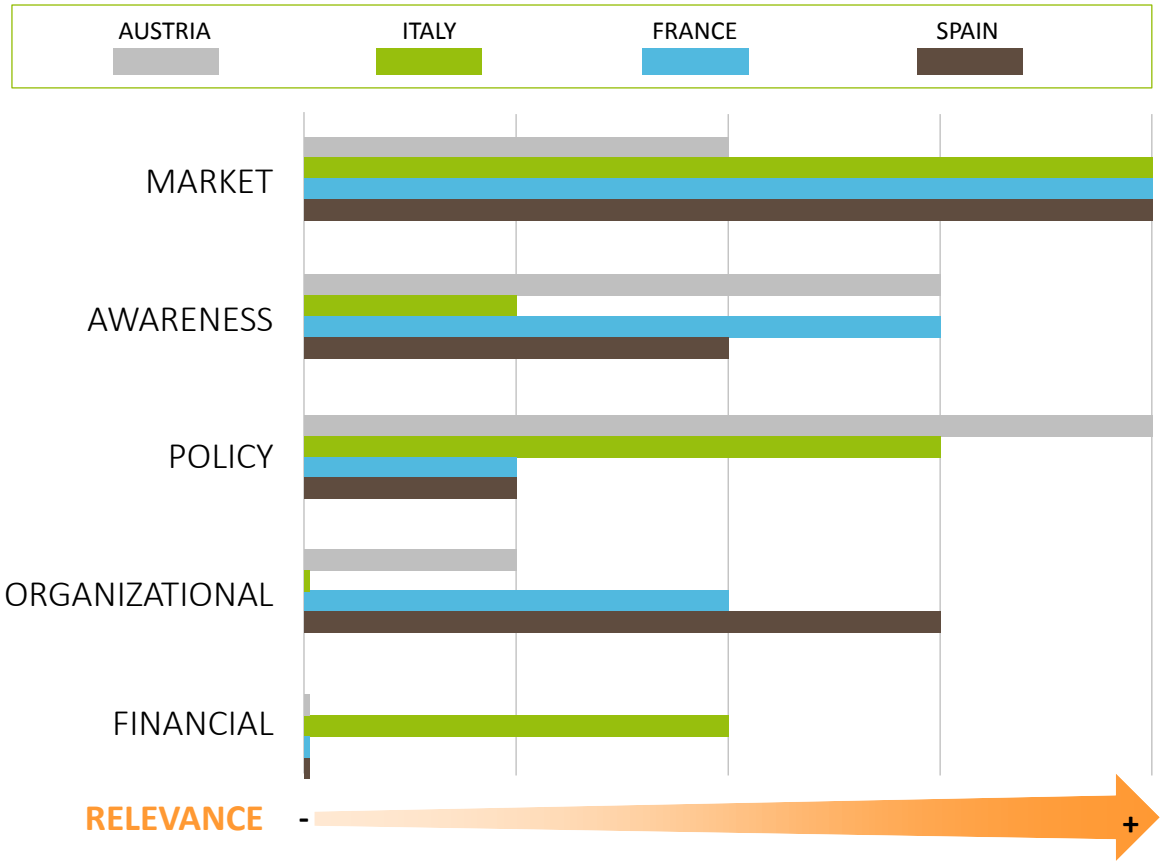

Figure 1: Relevance of barriers in SUCELLOG countries.

Even though, providing conclusions in some cases is not an adequate practice since the type of agro-industries addressed during the project are not always comparable (sometimes cooperatives, sometimes companies), the main aspects to be highlighted are the following:

- The most relevant barrier for Spain, France and Italy is the difficult competition of agriculture solid biomass with other fuels in the market, which are available at a low price (fossil fuels and wood products).
- The most relevant barrier for SUCELLOG concept in Austria was the lack of political commitment. Their previous experiences on how to build a successful and solid market of woody biomass in the country, has taught them that a strong and clear political commitment makes the difference.
- The lack of economic incentives as one of the main obstacles for entrepreneurship in this field is stressed as relevant barrier only in the case of Italy.
- Spain and France provide a similar relevance of barriers, meaning that situation in these markets is to some extent comparable.

5. Policy recommendations

Barriers mentioned in the previous sections were discussed with stakeholders and policy makers during European, regional and national workshops and within the direct meetings with policy makers in SUCELLOG project countries. This chapter is summarizing recommendations regarding improvement of policy framework conditions, transfer of knowledge, improving market conditions and recommendations for overcoming financial and organisational barriers.

Described policy recommendations are derived from the recommendations received during SUCELLOG project events (meetings with policy makers, national and regional workshops) as well as from the conclusions and findings of other relevant EU funded projects (Biomass Policies and MixBioPells).

5.1. Recommendations for improvement of policy framework conditions

Mobilisation of agricultural residues and by-products for bioenergy production: Due to the diversity of agro-food chains among regions and farming systems, Biomass Policies project experiences show that policy coherence is a critical element required to mobilise agricultural residue streams. Sectoral policies between agriculture, food, energy, environment and economy must also be aligned in the formation of future policy at national, regional and local level. Biomass policies project is proposing following key policy suggestions:

- Design expenditure mechanisms which will support the integration of food production with energy both at field (field residues) and within agro-industries (processing residues). These mechanisms can be combined with respective regulations that foster sustainable farming and renewable energy in agro-industries.
- Expenditure measures should favour the development and/ or upgrade of biomass logistics/trade centres in order to facilitate the development of local capacities with high quality standards which will further trade un-mobilised indigenous biomass sources.
- Introduce specific contents on agricultural biomass energy use in regular training activities and/ or awareness campaigns for farmers and farmer cooperatives.

To reinforce agricultural biomass mobilisation at local and regional level:

- Ensure CAP measures from Pillar I and Pillar II are integrated into local planning and there are provisions for indigenous agricultural biomass feedstocks. In CAP, Pillar 2 (Rural development) – introduce (where they are not existing) targeted national and/or regional rural development programmes focusing on shift to low-carbon economy (including on-farm renewable energy production).
- Adapt and/ or develop local support/ financing actions for biomass logistics at local scales (e.g. trade centres):
    - CAP, Pillar 1 (Direct Payments): Ensure that budget from ‘Green Direct Payments’ includes appropriate crop diversification activities matched to local

ecosystems and practices which can lead to optimised biomass mobilisation, including sustainable harvesting of residues;
    - Provide support in the form of grant or tax exemptions for improving existing wood trade centres to include other biomass forms, such as straw bales, prunings, etc.;
- Transfer knowledge and improve human resource capital (see more in Chapter 4.2).

Improvement of regulatory framework: Clear regulations on usable biomass, emission thresholds and regulatory approval on national and regional level are needed.

Measures for facilitating the demand of alternative fuels in regional and local markets: Binding national or regional targets may help to create the demand.

Strengthening the position of agricultural biomass for solid fuels by strengthening the organisational structure behind the sector (e.g., establishment of working group or lobbying organisation) representing all parts of the agricultural biomass value chain.

5.2. Recommendations for raising awareness and knowledge transfer

Social acceptance: Social acceptance of alternative fuels and pellets is essential for enlarging the user groups and utilisation. SUCELLOG Project experiences in the regions and also the results of the investigation within the MixBioPells project show that there are regional differences regarding the social acceptance of the energetic utilisation of biomass. Social acceptance can be increased through awareness raising activities. Suggestions from regional policy makers participating in the events of SUCELLOG project include:

- Providing information to biomass consumers during local fairs of agricultural products and other events about good practice examples and findings of scientific studies (e.g., give information about the quality comparison between light and dark colour pellets that would disprove the prejudice in Italian regions of dark pellets being low quality product).
- Informing farmers during local fairs, events and meetings on agricultural products or equipment in the region, for example, about the quality comparison between agro-prunings and traditional fuels (e.g., wood chips and pellets).
- Agricultural cooperatives need more information and detailed study to investigate their opportunities by assessing which biomass is available, what is the current use of it, what are the biomass and fuel prices, investment needs, market conditions, etc.
- In some countries like France more explanation and information shall be provided to explain the benefits and possibilities in developing both – wood biomass and agricultural biomass sectors – in parallel.

Capacity building of specific target groups and specific topics:

- Capacity building for agricultural cooperative regarding solid biomass production technology and processes, quality improvement of handling and storage of straw and other field agricultural residues (e.g. prunings, etc.) and production by-products.
- Learning from good practices.

- Capacity building of boiler installers, operators and heat consumers to promote the improvements combustion systems to be able to use agricultural products with no operational problems (e.g. fuel feeding and ash removal systems).
- Capacity building of heat producers to make them aware of the specifics and properties of solid fuels from agricultural origin, underlying all benefits and drawbacks of agri-fuels compared to wood biomass and fossil fuels.

5.3. Recommendations for improvement of market conditions

Enhancing demand for agricultural biomass in the regions: Alternative fuels produced from agricultural residues can be marketed only if there is demand for them. MixBioPells project concluded that in order to enhance demand, transparency and profound knowledge on the problems connected with the utilisation of alternative biomass is required. To reach this goal, experience is crucial. Furthermore, dissemination of the knowhow, of possible obstacles and possibilities to resolve the problems is important. Ideally, first-hand experience with the specific raw materials of each region together with experienced key actors in close proximity is desired.

Demonstration of good practice examples from the region: The market in the region should be developed step-by-step, including more commercial issues and more communication about agro-pellets and specific technologies. Reduction of downtime of the facility for maintenance and cleaning can be obtained by using better quality fuels in appropriate combustion installations (e.g. multi-fuel biomass boilers). These examples should be promoted and demonstrated. For example, combustion tests of respective pellets in household boilers should be carried out and emission performance values shall be compared with the threshold values set by the national or regional regulations.

5.4. Recommendations to overcome financial and organisational barriers

Secure support options: Financial support options through regional development programmes or rural development plans will provide better chances for economic viability of projects developing new agricultural biomass value chains. Support measures include also the tax reduction, e.g., reduction on taxes for the transportation of agricultural by-products as an incentive to deliver farm residues to a logistics centre for agro-biomass production.

Cooperation and networking support: Many European funding programmes support clusters among companies and integrated chain projects (private) or territorial projects (public-private). Regional and local trade associations are potential organisations which might help to facilitate the links and cooperation among agro-industries. Their involvement shall be more promoted.

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