

**SUCELLOG: IEE/13/638/SI2.675535**

## **D3.2d Summary of the regional situation, biomass resources and priority areas of action in Austria**

**1st December 2014**



## About SUCELLOG project

The SUCELLOG project - Triggering the creation of biomass logistic Lower Austrias 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 Austria 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](http://www.sucellog.eu).

## Project Coordinator



## Project Partners



## About this document

This report corresponds to D3.2 of the SUCELLOG project - Summary of the regional situation, biomass resources and priority areas of action in Austria. It has been prepared by:

*CIRCE-Research Centre for Energy Resources and Consumption*  
*C/Mariano Esquillor Gómez 15, 50018, Zaragoza*  
E-mail: [sucellog@fcirce.es](mailto:sucellog@fcirce.es)  
Tel: +34 876 555 511

*This project is co-funded by the European Commission, contract N°: IEE/13/638/SI2.675535*  
*The sole responsibility of this publication lies with the author. The European Union is not responsible for any use that may be made of the information contained therein.*

## Table of contents

<b>About SUCELLOG project .....</b>	<b>1</b>
<b>About this document.....</b>	<b>1</b>
<b>Table of contents.....</b>	<b>2</b>
<b>List of Tables .....</b>	<b>3</b>
<b>List of Figures.....</b>	<b>3</b>
<b>1. Introduction .....</b>	<b>4</b>
<b>2. Agro-industries in Austria: profile, barriers and opportunities to become a logistic centre. ....</b>	<b>5</b>
<b>3. Evaluation of available biomass resources .....</b>	<b>9</b>
3.1. Agricultural residues:.....	9
3.2. Other biomass resources: .....	11
3.3. Methodology of work .....	12
<b>4. Regional Framework of Carinthia .....</b>	<b>15</b>
4.1. Identification of agro-industries in Carinthia .....	15
4.2. Identification of biomass resources in Carinthia .....	15
4.3. Localization of resources, agro-industries and priority areas in Carinthia.	16
<b>5. Regional Framework of LOWER AUSTRIA.....</b>	<b>17</b>
5.1. Identification of agro-industries in Lower Austria .....	17
5.2. Identification of biomass resources in Lower Austria .....	17
5.3. Localization of resources, agro-industries and priority areas in Lower Austria	18
<b>6. Regional Framework of STYRIA.....</b>	<b>20</b>
6.1. Identification of agro-industries in Styria.....	20
6.2. Identification of biomass resources in Styria .....	20
6.3. Localization of resources, agro-industries and priority areas in Styria .....	21
<b>7. Regional Framework of UPPER AUSTRIA.....</b>	<b>23</b>
7.1. Identification of agro-industries in Upper Austria .....	23
7.2. Identification of biomass resources in Upper Austria .....	23
7.3. Localization of resources, agro-industries and priority areas in Upper Austria	24
<b>8. Summary of the situation in Austria .....</b>	<b>26</b>
<b>Annex I: Table of ratios y availability percentage per region .....</b>	<b>27</b>

## List of Tables

Table 1: Classification of biomass resources in Austria.....	10
Table 2: Most strategic resources by target region.....	14
Table 3: Availability of equipment and biomass resources in Lower Austria.....	18
Table 4: Availability of equipment and biomass resources in Styria. ....	21
Table 5: Availability of equipment and biomass resources in Upper Austria.....	24
Table 6: Ratios of biomass production (t/ha) in AUSTRIAN target regions. ....	27
Table 7: Percentage of availability of biomass (%) in AUSTRIAN target regions. ....	27

## List of Figures

Figure 1: Summary of available agricultural biomass residues in Carinthia.....	15
Figure 2: Localization and type of agro-industries and resources in Carinthia.....	16
Figure 3: Summary of available agricultural biomass residues in Lower Austria. ....	17
Figure 4: Localization and type of agro-industries and resources in Lower Austria. ....	19
Figure 5: Summary of available agricultural biomass residues in Styria.....	20
Figure 6: Localization and type of agro-industries and resources in Styria.....	22
Figure 7: Summary of available agricultural biomass residues in Upper Austria. ....	23
Figure 8: Localization and type of agro-industries and resources in Upper Austria. ....	25

## 1. Introduction

SUCELLOG focuses on the implementation of biomass logistic centres into agro-industries as complement to their usual activity with minor investments. Agro-industry facilities can be utilised in their idle periods to handle and pre-treat biomass feedstock (mainly from their own residues or agricultural residues nearby) to produce solid biomass to be introduced into the market.

This document shows the results of the work carried out within SUCELLOG WP3-“Regional framework and stakeholders’ engagement” in Austria. During this WP, four main actions were carried out in the project target regions (Carinthia, Lower Austria, Styria and Upper Austria):

- Allocate biomass resources.
- Evaluate with the stakeholders both the technical and the non-technical barriers of the implementation of SUCELLOG concept in the agro-industries.
- Determine the potential areas for the development of agro-industry logistic centres.
- Engage agro-industries to the project.

For the first action, an evaluation of the real potential of primary agrarian biomass has been carried out inside Task 3.1. The methodology selected corresponds to a “Resource focussed approach”, as described by BEE standardised classification (project Biomass Energy for Europe), which starts with statistical data from agrarian inventories. This data has been complemented with the real availability indices (the share of biomass that is not currently being used for other aims including soil sustainability issues) gathered in the regional workshops with the agrarian sector during Task 3.3. As a first result, primary biomass resources have been firstly catalogued according to existing competitive uses and relevance in terms of current unused quantities. This assessment has been performed in by country level since no regional differences has been observed. Secondly, a map of the distribution of real available primary resources and a table of the available tons per year in dry base were built per target region. Even though the use of agro-industry residues is a target of SUCELLOG, the data of the inventories was not sufficient to produce a reliable inventory of the biomass residues produced in the agro-industries processes. Therefore the maps and tables presented do not include this type of resources, which will be deeply assessed for particular cases of logistic centres monitored or audited during in WP4-WP6.

As a second action, an assessment of the barriers and opportunities for the development of logistic centres was carried out through personal interviews with each target sector in Task 3.2. Existing agro-industries from the potential sectors (those owning compatible equipment for the conditioning and storage of raw material) were asked about: idle periods, residues produced in their facilities and upstream in the crop cultivation, the economic situation of the sector and possible upcoming changes

due to the Common Agricultural Policy, practical and legal incompatibilities in using their facilities for the production of solid biomass, social barriers for the development of this new activity and, finally, opportunities detected. Section 2 presents the situation of the country since no regional differences were appreciated. After this analysis, target sectors were identified per region and specific agro-industry locations were included inside the biomass resource map.

To determine the potential areas inside each target region for the development of agro-industry logistic centres, it has taken been into account the diversity and quantity of available agrarian resources (both woody and herbaceous) and of agro-industries present in the region as well as the compatibility among them. Compatibility has been defined according to their seasonality (matching the months of biomass production with the idle period of the agro-industry) and their technical compatibility of use. Logistic issues such as good communication networks and proximity to consumption areas has also been taken into consideration. Potential areas have been identified per region and are shown in this document. However, it is important to highlight that the selection of a potential area does not mean that an agro-industry non belonging to it could not start a new activity and the opposite. The size of the future logistic centre has not been a limiting factor for the selection of the potential area (even if SUCELLOG target is a production of 10 kt/yr per centre) since no data of the total amount of biomass is available (agro-industry residues missing as mentioned before).

The following sections show the results obtained about the above mentioned issues (passing from a country to a regional perspective). A summary of the situation in Austria is included in the last part.

As a last activity belonging to this WP, workshops and personal contacts were carried out with agro-industries in Task 3.3 with the aim of engaging them to the services offered by the project (technical and decision-making support to become biomass logistic centres). The result of this action is shown in the document “D3.1-Report on engagement actions”.

## **2. Agro-industries in Austria: profile, barriers and opportunities to become a logistic centre.**

The main potential agro-industry sectors to become a solid biomass logistic centre in Austria have been evaluated in the following lines, describing the equipment they usually own and their idle period, as well as the residues produced both in the agrarian practice and the production process. Finally, the barriers and opportunities they would face when thinking to start this new activity have been identified. The information has been provided through interviews with representative industries of the sector and agrarian experts.

### Cereal dryers:

The cereal drying sector in Austria presents a high potential to become a solid biomass logistic centre from the technical point of view, since the working period of the year is reduced (the idle period in this sector is from January to September)

They have equipment (dryer, silos) that can be used for pre-treatment of other raw materials and in very minor cases they also own pelletisers. However, the drying equipment of these facilities cannot be used for drying other type of raw material, so for the creation of a logistic centre in this sector considerable investments should be done. Their pelletisers, silos and handling equipment could be used without any barrier.

Regarding the raw material available for a possible logistic centre, farmers supplying the grain to be dried in the facilities produce important quantities of straw which is normally given for animal feed or left on the soil, leaving some still available straw that could be used for energy purposes.

Corn cobs are starting to be considered as a biomass resource for combustion in Austria, either than left on the soil and some machinery has been developed to collect them. A special method allows farmers to harvest the entire cob. This approach, which takes place directly on the field, accomplishes the entire harvest without a significant amount of additional effort and holds impurities to a minimum. Equipped with a special module, the harvester separates the corn from the cobs, which are then placed in a separate container for transport.

The agro-industry itself produce residues such as the grain that for some reasons do not satisfy the quality/aesthetics requirements to be sold in the market or the silo dust. Both are normally sold for animal feeding industry.

The professionalization of the sector is very high and they are familiar with bioenergy issues. About their economic situation to start a new activity as a biomass logistic centre, investments will depend on a legal basis for the combustion of agrarian biomass in Austria. At this stage a respective law is under discussion.

### Sugar industry:

The sugar industry presents, on the one side, an important idle period of 7 months which goes from February to September approximately and, on the other side, compatible equipment for the production of solid biomass such as horizontal dryers and pelletizers.

This equipment is used in the conditioning of the residues generated during the sugar production process. The majority of the processed waste (small parts of turnips, beet pulp and molasses) goes, due to the high nutrients contained, into the animal feed industry. The sector does not produce residues during the agrarian practice.

Even if it seems a very interesting sector from the SUCELLOG point of view, there is only one sugar industry in Austria and it has not shown a great interest for initiating a new activity as biomass logistic centre since they are not really familiar with bioenergy issues. The production of biomass fuels will be feasible for them if the price of the sub-produced destined to animal feed decrease by the half. In that case they would consider serious investments in technical adjustments of the installed plants in order to start with the production of agrarian fuels for energetic use.

#### Feedstuff producers

This sector has been identified as a potential one to become a solid biomass logistic in Austria. It counts with many proper equipment types that might be used for the new activity such as pelletisers, silos for storage and, in rare cases, also dryers. However, pelletisers present no fixed idle periods, meaning that they stop production according to demand.

No available residue is produced in the process, so biomass residues should be acquired.

Although high interest has been shown by part of the sector, the main barrier would be technical since it is expensive and difficult to change from the production of feedstuff to solid biomass in short periods. The machines must be re-cleaned due to high hygiene standards and adjusted. However, SUCELLOG considers that this sector has a potentiality to become a logistic centre and therefore it will be considered in the study.

#### Oil extraction industries:

The oil extraction industries are dedicated to rape and pumpkin seeds mainly working all the year. The facilities count with pressers and silos but not with driers, since they buy the material already dried from farmers.

In the production of oil from oil seeds, oil scrap and press cake is produced as residue. These residues are very rich in protein and are sold as animal feed. Almost 100% of oil scrap is sold as animal feed and achieve good prices on the market. Regarding the residues obtained in the field, the straw from rape and soya is normally dedicated to animal feed and left on the soil, leaving some still available straw that could be harvested and used for the production of solid biomass.

They could be considered as a target industry for SUCELLOG only if the production decreases and there is some line that it is not used.

#### Cellars:

The sector of the wine production do not own compatible equipment for the production of solid biomass (no dryers, nor pelletiser) but it has been studied due to their easy access to the agrarian or production residues.

Regarding the agro-industry residues obtained during the wine elaboration, first of all the stems and combs are removed. After pressing the grapes, the press cake remains (consisting of shell remains, pulp and seeds). In Austria this pomace is mainly returned as humus and nutrient suppliers for the most part in the vineyard, although large producers are selling it to biogas plants.

Concerning the vineyard prunings, the sector considers the collection expensive and time-consuming. The recommendations from the wine department in the Chamber of Agriculture and Forestry advice against the removal of the prunings, as this not only reduces the humus content, but also increases erosion damage. These are big issues especially on the steep slopes, as they can be found quite often in Styria. In Lower Austria, in the wine district area it is because of other geographic features more feasible.

If the sector would be interesting in stating a new activity as logistic centre a new line should be installed for that purpose. For this reason, they will not be considered as main target for SUCELLOG project.

#### Breweries:

As it happens with the cellars, the breweries do not own compatible equipment for the production of solid biomass but they have the capacity to reach residues. A completely new line for the production should be built in case they would be interested in becoming logistic centres.

The residues of beer production, 78% spent grains and yeast residues 9% hot and cold break (9%) are currently used exclusively as animal feed. The still available barley straw (with no market or sustainability uses) could however be a source of biomass for agro-fuel pellet production.

They have shown interest in the project concept but an analysis of possible biomass to be used and investments to be made should be studied. For this reason, they will not be considered as main target for SUCELLOG project.

### 3. Evaluation of available biomass resources

SUCELLOG has considered that the development of agro-industry logistic centre should rely on agrarian biomass coming both from the agrarian practices (like straw or prunings) and from the agro-industry process (for example distilleries residues). The fact is that, for the first case, agro-industries have already a network with farmers providing the raw feedstock to be processed. For the second case, the use of their own residues is the opportunity to reduce their fuel consumption or avoid the cost of disposal if there is no market for it. Quantifying the biomass resources up-stream and down-stream the agro-industry is the object of this section since it is strategic for establishing new commercial relations with usual providers and clients.

A study about the available biomass resources has been performed, focusing in the agrarian biomass since it was not possible to have data about the production of agro-industries residues per region/country. When talking about availability of the residue, it is meant the amount of resources that do not have a market or that is not left on the soil to improve organic content, therefore having the opportunity to be used for energy purposes. Three examples to explain what availability is (see more detail about the methodology of work in section 3.3 and availability percentage in Annex I):

- If a farmer, after taking the wheat grain, leaves the straw on the soil due to agrarian recommendations then availability should be considered 0%.
- On the contrary, if the farmer leaves the straw on the soil just because the cost for harvesting does not cover the value in the animal feed market then availability is 100%.
- It can also happen that in one region the 40% of the straw is commercialized for animal feed (so it has a market), a 20% is left on the soil as a recommended agrarian practice. Therefore, 40% of the straw is available for other uses like the production of solid biomass.

#### 3.1. Agricultural residues:

Agricultural biomass resources can be catalogued in different groups according to next two criteria:

- Competitiveness: existing competitive uses.
- Amount of available biomass: relevance in terms of current unused quantities.

From this scope, agricultural biomass resources in Austrian target regions can be catalogued in average as next:

**Table 1: Classification of biomass resources in Austria.**

Criteria		Biomass resources
Competitiveness	Available unused biomass	
Many competitive uses	Some source still available	Cereal straw
Some competitive uses	Important source still available	Rape and other seed crop stalks
Few or non-competitive uses	Relevant in some areas	Woody prunings
Some or few competitive uses	Marginal local amounts (may play a role in a singular facility)	Soya stalks
Environmental concerns for soil organic matter preservation limit its use	None	Sunflower, maize
Competitive uses and utilisation for soils	None (crops with small cultivated land).	Beans and pulses stalks

The crops resulting in larger available amounts of agricultural residues in Austrian target regions are either cereals or rape and oilseed crops. In case of cereals, there are several competitive uses that can make straw unavailable in some local areas or in some moments along the year. Main uses for straw are cattle bedding, even though also a part of the straw is usually left on the soil to prevent soils to be impoverished in terms of organic carbon. The fact that cereals (wheat, oat, barley, rye, etc.) are the most extended cultivated crops, make that, even there are competitive uses existing, there is still sufficient amounts ready to be utilised.

The case of rape and oilseed crops is also an issue. Several Austrian target regions account with important shares of agricultural land dedicated to produce oil seeds. Rape is by far the most extended oil crop in the target regions. Even though part of the straw is left on the soil to keep organic carbon levels of the topsoil, it is considered that half of the straw is available for new uses. Currently some uses already exist but they are not much extended.

Other oil seed crops can also be object of biomass production. However they have not been reflected in the analysis as regard of lack of statistical data from the sources consulted. The case is similar to rape, and their residues may play a role in the target areas where the project will be operating.

Soya bean is quite extended also in Austria, even though in the target regions its growth is not predominant over other oil seed crops. Soya is present in almost all the groups of districts (*Gruppen von Bezirken*) in the target regions, even though are relevant only in Oberösterreich from the point of view of the analysis of the potentials

at country level. Similarly to rest of oil crops, it has been considered that half of the total straw biomass produced is available.

Maize and sunflower stalks have been considered totally unavailable. The fact is that in the last years in Austria it has been stated the reduction of organic carbon in the soils of some crops like maize and sunflower. For this reason the biomass is not available and currently fully dedicated to keep good soil conditions.

With respect to woody agricultural prunings, they are the agricultural residue with lowest competitive uses, and keep practically unused in most of places. However permanent crops in Austria are only present in some groups of districts, namely in Upper-Austria (Waldviertel, Weinviertel, Wiener Umland/Nordtei and Wiener Umland/Südteilan) and in Steiermark (Oststeiermark and West-und Südsteiermark). However, its use involves the challenge to local farmers to start a new logistic chain although most of them have already shown interest in using them as a fuel and several initiatives have been carried out. The fact that the woody residues have good properties as biomass for energy and cause fewer problems in the combustion, make them quite interesting to complement and improve the quality of herbaceous biomass.

Other crops like beans and pulses are much less extended. The usual preferred form to manage their residues is to integrate in the soil or be used for animal feeding due to its nutritive properties.

### **3.2. Other biomass resources:**

SUCELLOG has carried out a comprehensive search for potential agro-industries beneficiaries for the project. With this list of agro-industries it would have been possible to create a database of agro-industry residues. However two facts impeded its configuration. Firstly the fact that the data of the inventories was not sufficient to produce a reliable inventory of the biomass residues produced in the agro-industries processes. Secondly because it was stated that in the Austrian target regions agro-industry residues are already subject of use for other purposes. Here a list: oilseed oil extraction cake (utilised already for animal feeding), apple pomace (for animal feeding and which in any case is a wet residue), or pumpkin oil seed cake (used for animal feeding).

These agro-industry residues have revealed to be completely unavailable from a regional perspective, even though at local scale some contracts may be feasible. The use of agro-industry residues is a target of SUCELLOG, but its actual use will be decided for the particular cases of logistic centres monitored or audited during WPs 4, 5 and 6. There, the local reality and capacity of neighbour facilities to become reliable biomass suppliers will be assessed.

It was however stated that two residues can play a role for the purposes of SUCELLOG. The most important is corn cobs, which quantity and availability makes

it the most important resource to be taken into account for the possible development of a logistic centre. Also grapevine oilseed cake (residue after pressing seeds to extract its oil), that currently is sold for biogas production, can be a possible complement but in very small amounts in the wine producing areas.

With respect to forestry biomass, SUCELLOG has not carried out any specific assessment since the project is focused on fostering agricultural residues as a source of solid biomass. However, the feedback obtained from the target regions shows that forestry residues may be at the reach of future logistic centres, and can be an option in few provinces for upgrading the properties of biomass mixtures to be commercialised. Biomass directly from forestry exploitation for energy purposes has been considered as not a source for the short-time term in SUCELLOG. The research done in the project has shown that in Austria forestry residues and sawmill residues are quite unavailable. Therefore except at local scale, they are not considered for any decision-making.

### 3.3. Methodology of work

An analysis performed by regions instead of by resources is carried out in sections 4 to 7. Biomass assessment in the present work involves the study of 4 regions of Austria, adding a total area of around 57.000 km<sup>2</sup>, about 68% of the total area of Austria. For this scale of work the use of existing data from inventories was needed as an input data source. The aim of the approach is to provide a framework of the available sources in the region. It is not aimed to be the specific biomass assessment for a facility, which will be object of task 4.2, and which requires other type of approaches.

The methodology selected corresponds to a “Resource focused approach”, as described by BEE standardised classification (project Biomass Energy for Europe). It starts with statistical data from agrarian inventories, and complemented with the availability indices and utilization for soil preservation leads to a technical potential, including soil sustainability issues.

The method followed is based on ratios of residual biomass production per hectare of cultivated area (tons of residue per hectare). The use of ratios is a widespread methodology for biomass assessments, appropriate for both large and small scale. The main issue is to account with reliable inventories and ratios. By multiplying the cultivated area (ha) by the ratios (t/ha) the theoretical potential is obtained:

$$\text{Biomass Potential [t]} = \text{Ratio [t/ha]} * \text{Area [ha]}$$

The methodology used here brings a step forward in the country analysis by including the competitiveness for biomass resources. For that purpose it is necessary to know the share of biomass that is currently being used for other aims, and that will be considered as not available for the present study. The availability index ( $I_{AV}$ ) expressed as percentage is defined as next:

$$I_{AV} = 100 - I_{COMPET} - I_{SOILS}$$

Where :

$I_{COMPET}$ : is the percentage of the total biomass in a region that other uses (power plants, cattle, industry) already are using.

$I_{SOILS}$ : is the percentage of total produced biomass that remains in the soil. E.g.: if farmers prefer to leave part of the straw as soil organic amendment.

By using these indices it is possible to obtain the final biomass available by doing next operation:

$$\text{Available Biomass [t]} = \text{Potential Biomass [t]} * I_{AV} = \text{Ratio [t/ha]} * \text{Area [ha]} * I_{AV}$$

The data sources have been obtained as next:

- **Agricultural areas:** the biomass has been calculated on the base S2Biom project land areas ([www.s2biom.eu](http://www.s2biom.eu)) given by NUTs3 (groups of districts, "Gruppen von Bezirken"), in order to have same base units than on-going referential projects like S2Biom is. Since NUTs3 is a too large scale for the purposes of the SUCELLOG work to make any local analysis, the biomass obtained by NUTs3 has been downscaled at the level of land use (Corine Land Cover).
- **Land distribution:** Corine Land Cover version 2006. Biomass per NUTs3 has been directly assigned to the land parcels actually used for agriculture.
- **Ratios and availability indices:** a specific work has been carried out by region. For each region ratios have been obtained from direct contact with specialists and cooperatives, and in few cases, complemented with literature. The purpose of this effort has been to use ratios and availability indices representing the reality of the region, and not just ratios found in literature. The workshops done in task 3.3 have served to include the feedback from the sector to improve the final datasets. Ratio and availability percentage are shown in Annex I.

Next table classifies provinces according to the most strategic resources for SUCELLOG.

**Table 2: Most strategic resources by target region.**

Region	Cereal straw	Maize + Sunflower straw	Rape and oil seed plant straw	Olive + Fruit + Vineyard prunings	Others
<b>Carinthia</b>	Small amount in Unternkärnten	---	Marginal in Unternkärnten	---	ALL (Corn cob)
<b>Upper-Austria</b>	ALL Ç (mainly Innviertel and Linz-Wels)	---	Innviertel and Linz-Wels (as complement)	---	ALL (Corn cob)
<b>Steiermark</b>	Oststeiermark and West-Und Südsteiermerk	---	ALL	Öststeriemark. Locally West-und Südsteiermark	ALL (Corn cob)  Locally grape seed oil cake
	Linzen and Westliche and Östliche Obersteiermark groups of districts have practically no resources				
<b>Lower-Austria</b>	ALL (Mostviertel-Eisenwurzen to a lesser extent)	---	Mainly Waldviertel and Weinviertel. Rest to a lesser extent.	Mainly Waldviertel and Weinviertel. Rest as complement for industries)	ALL (Corn cob)  Possible grape seed oil cake
	Niederösterreich-Süd and Sankt Pölten groups of districts have scarce biomass resources (about 10 kt/yr), mainly cereal straw. For purposes of the project the biomass may be a limiting factor.				

## 4. Regional Framework of Carinthia

### 4.1. Identification of agro-industries in Carinthia

Carinthia presents very small variety of agro-industry sectors from the ones evaluated in section 2: cereal dryers and breweries.

However, the potential agro-industries to become a logistic centre in the region are the cereal dryers, although for the drying technology, as said previously, a separate line should be constructed. Handling, storage and transport means could be used in the idle periods. Those owning a pelletiser could also use it also for solid biomass production in the idle periods.

### 4.2. Identification of biomass resources in Carinthia

Agricultural resources to be used as biomass in Carinthia are quite scarce. The main reason is that, for those predominant agricultural activities, there is no availability of resources or it is very low due to a very competitive uses existing. The total amounts of biomass considered to be available (still not demanded by other final users) is quite under 10 kt, and therefore it can be considered a region with no available agricultural residues.

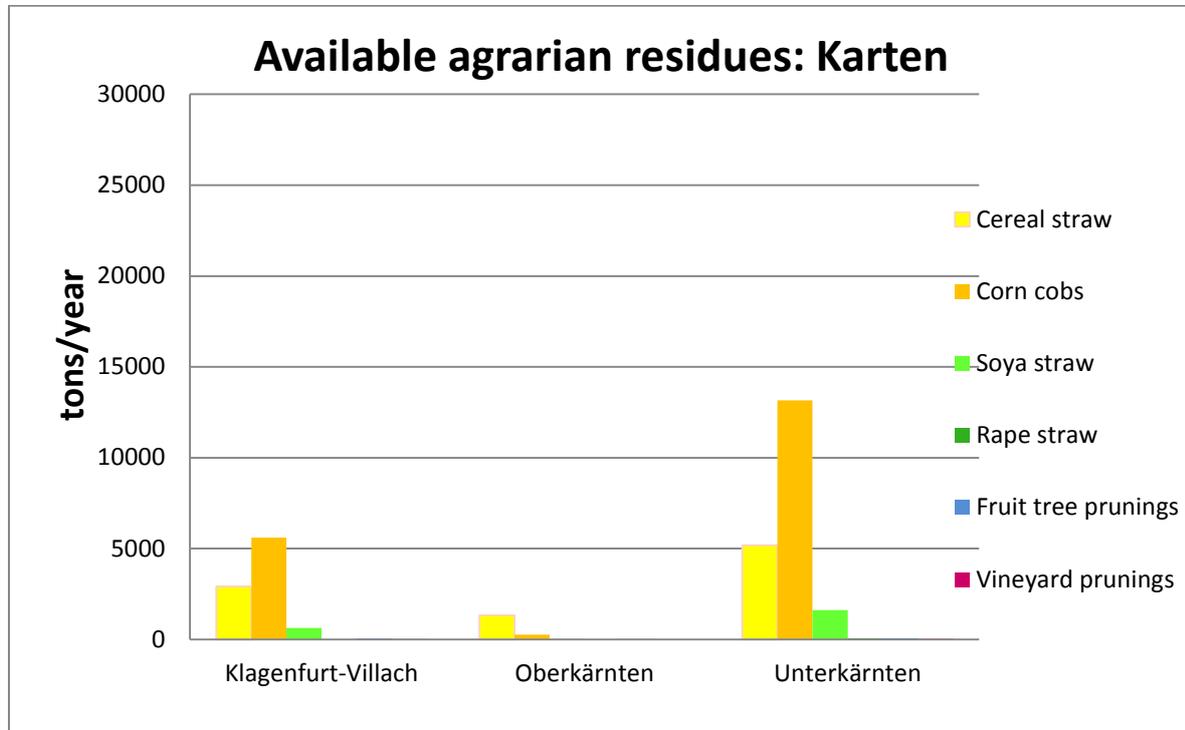


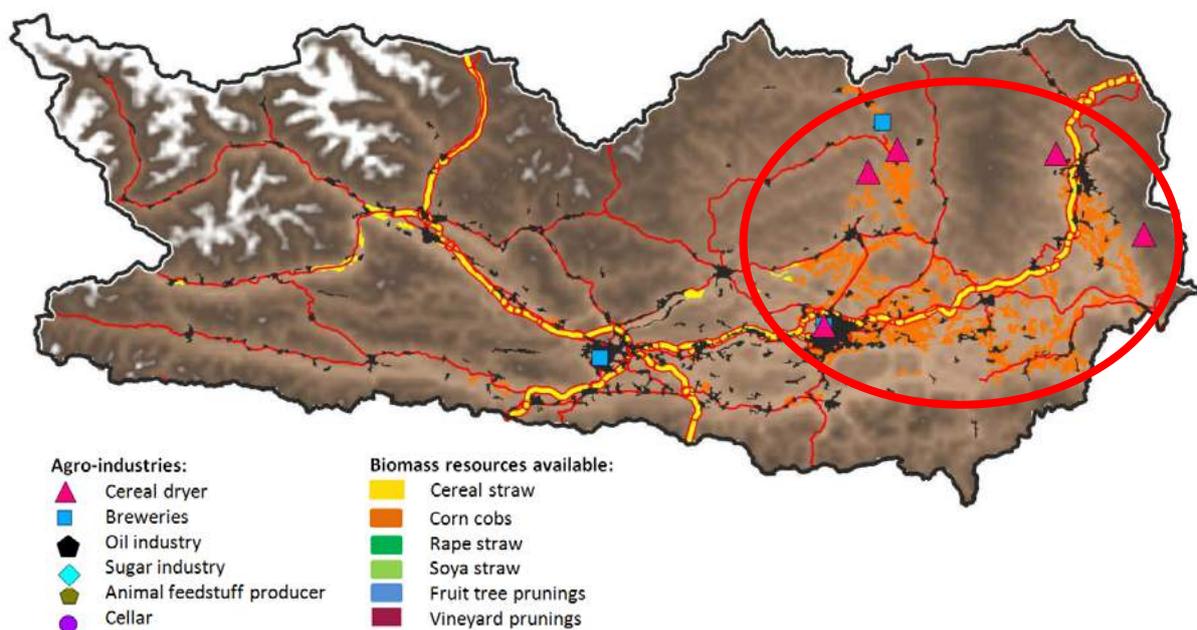
Figure 1: Summary of available agricultural biomass residues in Carinthia.

Main conclusions in Carinthia:

- The groups of districts of Carinthia (“Gruppen von Bezirken”) show that agricultural biomass is not relevant source of energy.
- Residues from cereal dryers and breweries could be considered if there is not market for animal feed.
- Corn cob is the only important source of biomass for this region. According to conversations with the agrarian sector of the area, the amount available is 20.000 tons/year.

**4.3. Localization of resources, agro-industries and priority areas in Carinthia.**

In Figure 2 it is shown the distribution of resources and agro-industries along the territory. One potential area for the development of agro-industry logistic centres has been detected in Carinthia (marked in the map). Due to the scarce resources available, the logistic centre should rely on corn cobs. Furthermore, cereal straw could be used only as a complement to produce a mixed pellet. The logistic centre could be installed in one of the cereal dryers and could supply solid biomass to the rest of industries present in the region.



**Figure 2: Localization and type of agro-industries and resources in Carinthia.**

## 5. Regional Framework of LOWER AUSTRIA

### 5.1. Identification of agro-industries in Lower Austria

The interesting agro-industries to become a logistic centre in Lower Austria are:

- **Cereal dryers:** handling and storage facilities, transport means and pelletisers (if existing) could be used in their idle periods. A new drying line should be installed.
- **Sugar industry:** there is only one industry in Austria and is sited in this region.
- **Feedstuff industry:** have pelletisers, handling and storage means working with a no fixed period along the year but according to demand.

### 5.2. Identification of biomass resources in Lower Austria

Lower Austria is by far the Austrian target region with the largest amount and variety of biomass sources available. Here the total biomass sums up more than 450 kt per year. These ready available residues with no current competitive uses consists mainly of cereal straw as predominant source as well as corn cobs and rape straw. There are also some groups of districts where the vineyard pruning could complement or be an important source of energy.

There are however, few groups of districts where the biomass resources are scarce, and may limit their capacity for starting new logistics centres. They are Mostviertel-Eisenwurzen, Niederösterreich-Süd and Sankt Pölten.

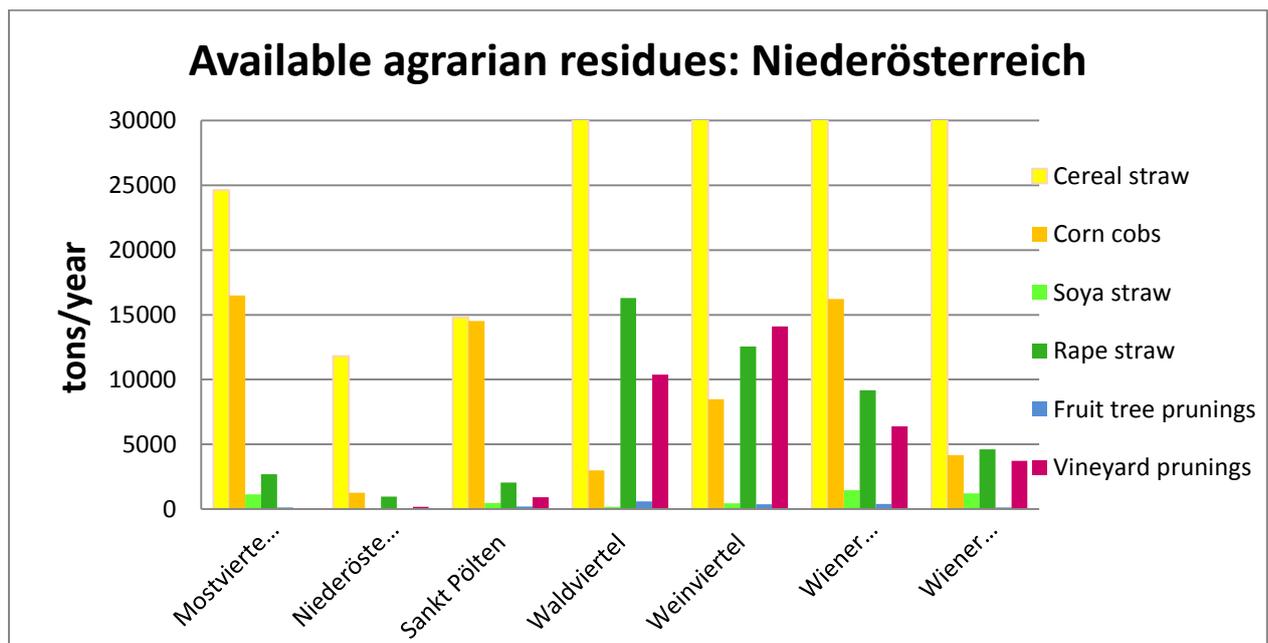


Figure 3: Summary of available agricultural biomass residues in Lower Austria.

### Main conclusions in Lower Austria:

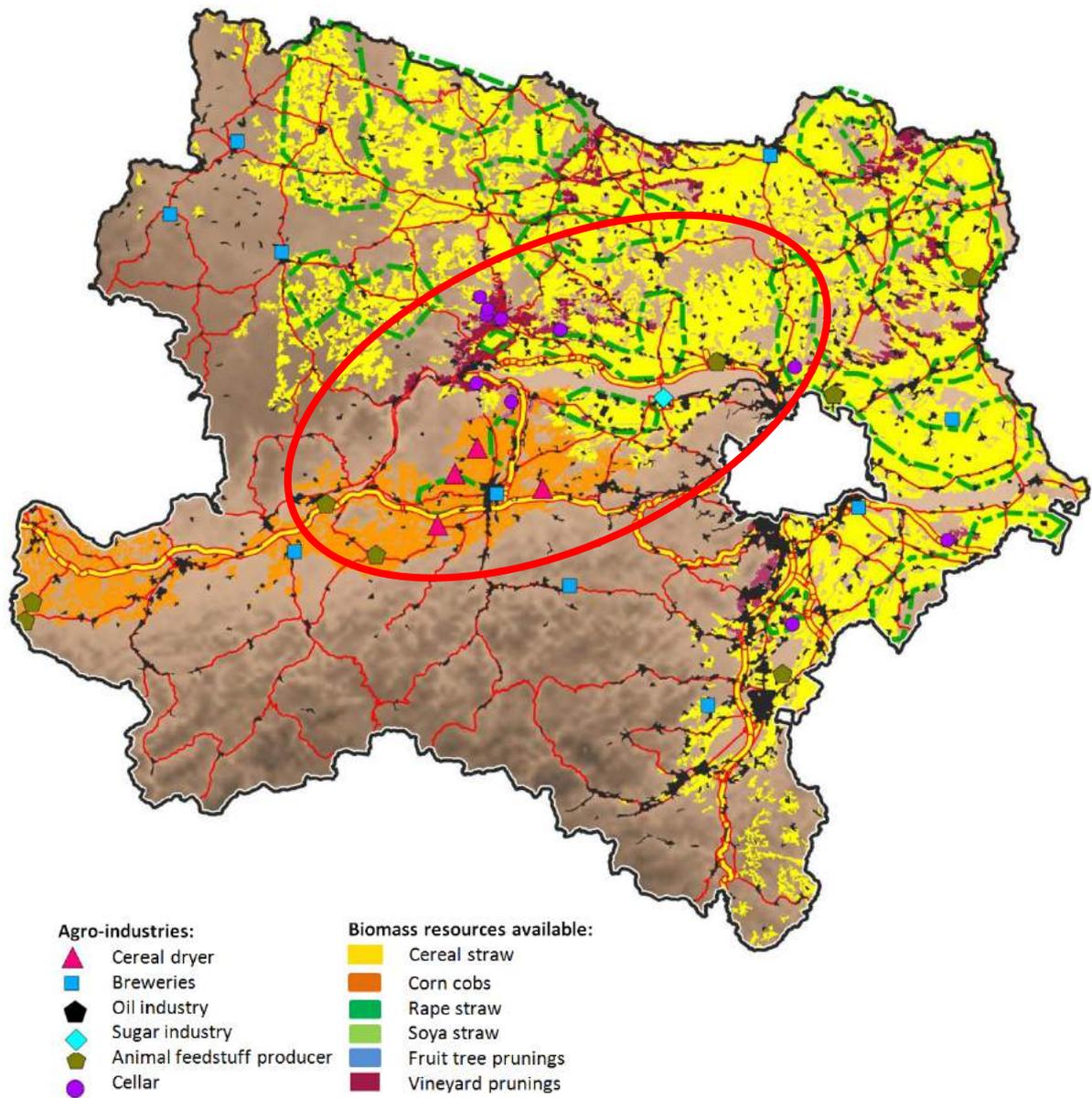
- The groups of districts with better biomass potentials are Waldviertel, Weinviertel, Wiener Umland/Nordteil and Wiener Umland/Südteil.
- The main available biomass resource in these states is cereal straw. Rape straw can contribute as well with important resources in Waldviertel, Weinviertel and Wiener Umland/Nordteil.
- Prunings from vineyards are relevant in Waldviertel and Weinviertel groups of districts. They can be also a complement more locally in Wiener Umland/Nordteil and Wiener Umland/Südteil.
- As regard of the activity in the production of wine, agro-industry residues like grapevine oilseed cake (residue after pressing seeds to extract its oil), can be a possible complement in the grape producing areas (see previous paragraph).
- Corn cobs can play a decisive role in the implementation of the logistic centre. Moreover, interviews with the sector stated an availability of 60.000 tons/year, being most important in Mostviertel-Eisenwurzen, Sankt Pölte, Wiener Umland/Nordteil.

### 5.3. Localization of resources, agro-industries and priority areas in Lower Austria

Here below it is shown the situation of available biomass resources and existing agro-industries in the region. Areas where rape is straw is produced are surrounded in green It is also marked the area considered for the project as the most feasible for the development of an agro-industry logistic centre. This area presents a high synergy potential between cereal dryers and feedstuff industries which can stablish a degree of association taking advantage on their equipment available (pelletisers, storage and handling systems) in order to built a logistic centre. Specially corn cobs should be taken into consideration as the raw material to be used. Straw from herbaceous crops (cereal mainly) and the punings from vineyards mainly, could also be an important source of raw material for the production of solid biomass depending on the months of production (see availability periods in Table 3). Grapevine oilseed cake could also be considered as a complement for a mixed pellet.

**Table 3: Availability of equipment and biomass resources in Lower Austria.**

	Jan	Feb	Mar	April	May	Jun	Jul	Agos	Sep	Oct	Nov	Dec
Cereal dryer												
Feedstuff producers												
Cereal straw												
Maize cobs												
Rape stalks												
Permanent crop prunings												
Grapevine oilseed cake												



**Figure 4: Localization and type of agro-industries and resources in Lower Austria.**

## 6. Regional Framework of STYRIA

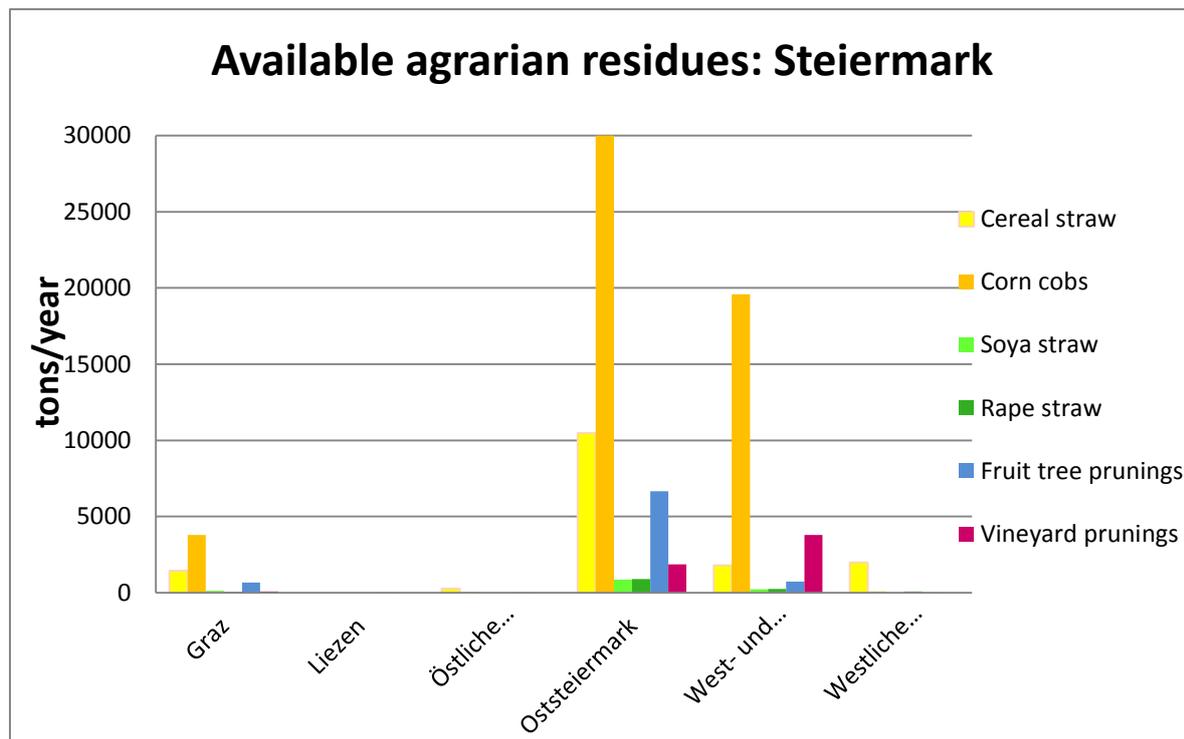
### 6.1. Identification of agro-industries in Styria

The interesting agro-industries to become a logistic centre in Styria are again cereal dryers and animal feedstuff producers with the conditions stated for the Lower Austria (see section 5.1).

Apart from those sectors, the oil extraction industries could also be considered as target if they dedicate on line to the production of solid biomass when for example production decreases.

### 6.2. Identification of biomass resources in Styria

Styria, together with Upper-Austria, are states with a predominant abundance of rape straw as unused agricultural residue. Rest of residues are quite scarce, or fully used as organic input for soils or for animal bedding. Linzen and Westliche and Östliche Obersteiermark groups of districts have practically no resources. The total biomass to be considered available is about 120 kt/yr.



**Figure 5: Summary of available agricultural biomass residues in Styria.**

#### Main conclusions in Styria:

- Corn cob should play a decisive role when implementing a logistic centre due to the lack of other uses, accounting for more than 60.000 tons per year according to conversations with the agrarian sector.

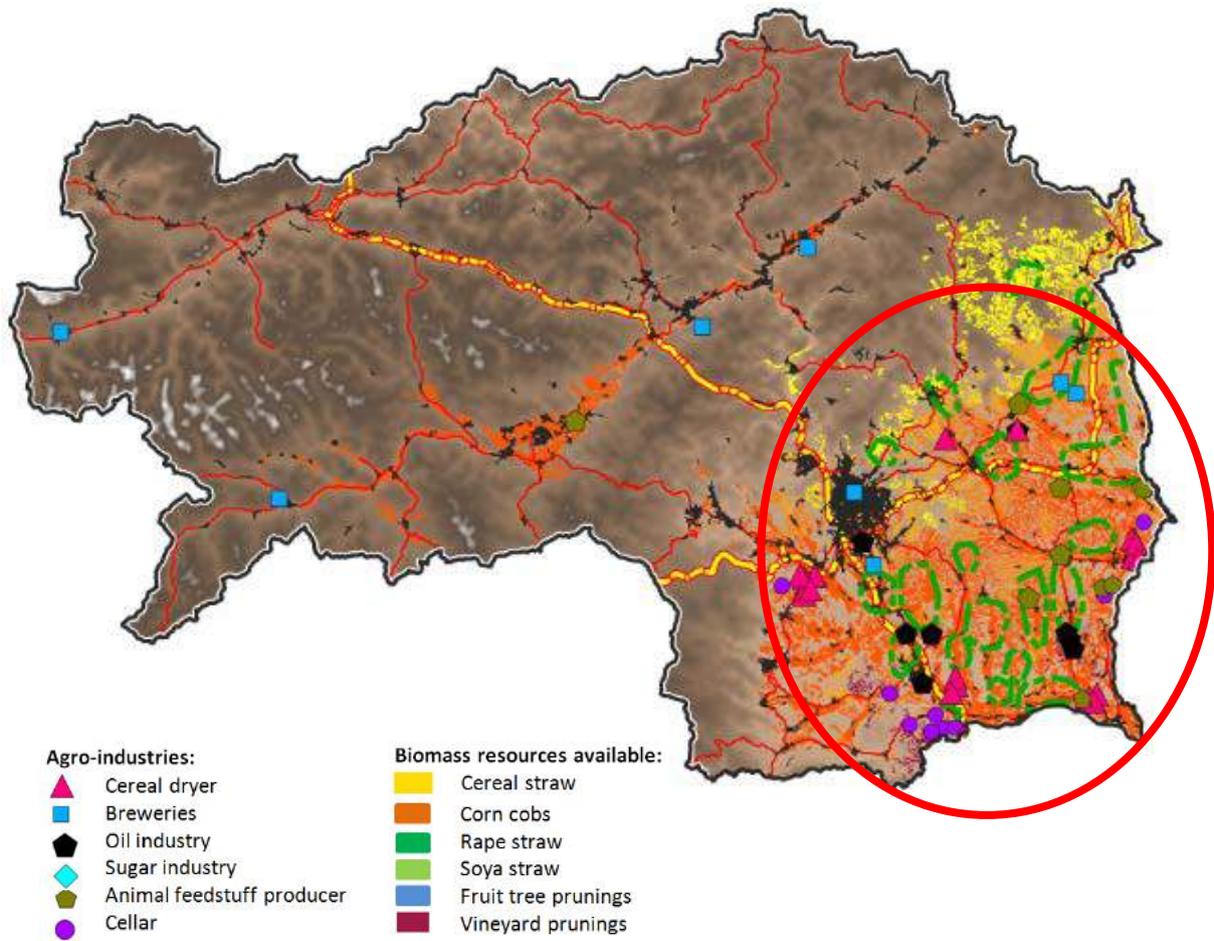
- The groups of districts that can be object of new biomass logistic centres sited in the agro-industry are Oststeiermark and West-und Südsteiermark. They account with important amount of cobs and, in case of Oststeiermark also some relevant amounts of cereal straw
- In Oststeiermark pruning from fruit tree plantations and vineyards can be an interesting complement as secondary feedstock
- Agro-industry residues are considered unavailable, and not subject of analysis at state scale. However oilseed cake (residue after pressing seeds to extract its oil), can be a possible complement, but in very small amounts in Oststeiermark.

### 6.3. Localization of resources, agro-industries and priority areas in Styria

As it can be observed in Figure 6, the available resources and agro-industries of the region are concentrated in one area, which has been defined as the potential area for SUCELLOG. It presents a great amount of cereal dryers and some feedstuff producers that, as it was pointed out in other regions, could create and association to take advantage on their synergies in equipment and idle periods. The main resource to be considered in this case is the corn cobs. The logistic centre should focus their production mainly in this period. Cereal straw and prunings from fruit trees could be a puntual and local matter of raw material for a possible mixed pellet although their storage till production period should be optimised to ensure a natural drying of the wood. Areas where rape is straw is produced are surrounded in green. The seasonality of production of them can be seen in Table 4.

**Table 4: Availability of equipment and biomass resources in Styria.**

	Jan	Feb	Mar	April	May	Jun	Jul	Agos	Sep	Oct	Nov	Dec
Cereal dryer												
Feedstuff producers												
Cereal straw												
Maize cobs												
Permanent crop prunings												



**Figure 6: Localization and type of agro-industries and resources in Styria.**

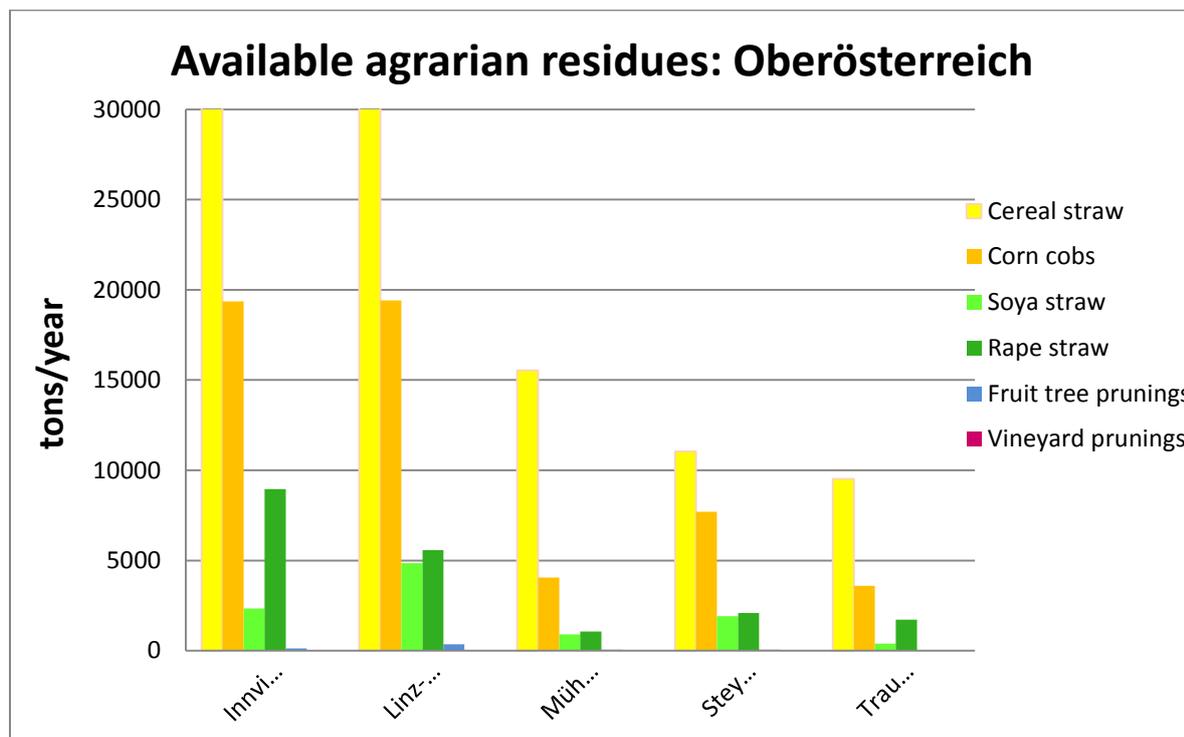
## 7. Regional Framework of UPPER AUSTRIA

### 7.1. Identification of agro-industries in Upper Austria

The interesting agro-industries to become a logistic centre in Upper Austria are the cereal dryers and the feedstuff producers as it happens in Lower Austria and Styria (see section 5.1).

### 7.2. Identification of biomass resources in Upper Austria

Upper Austria is a state with important sources specially from cereal straw in all the groups of districts. Rape straw is a second relevant resource. Woody biomass from permanent crops is a marginal by-product and cannot be considered in the analysis of the state. The total biomass sums more than 130 kt per year of herbaceous material, mainly sited in Innviertel and Linz-Wels groups of districts.



**Figure 7: Summary of available agricultural biomass residues in Upper Austria.**

#### Main conclusions in Upper Austria

- The groups of districts of in Upper-Austria account with an acceptable amount of biomass for starting new supply chains through agro-industry logistic centres based on herbaceous agricultural residues. Main resource is cereal straw and corn cobs.
- Corn cob is, as in the rest of region, a residue to be taken into consideration as biomass source whose potential is 50.000 tons/year.
- Rape and soya straw can be a complement to produce biomass mixtures.

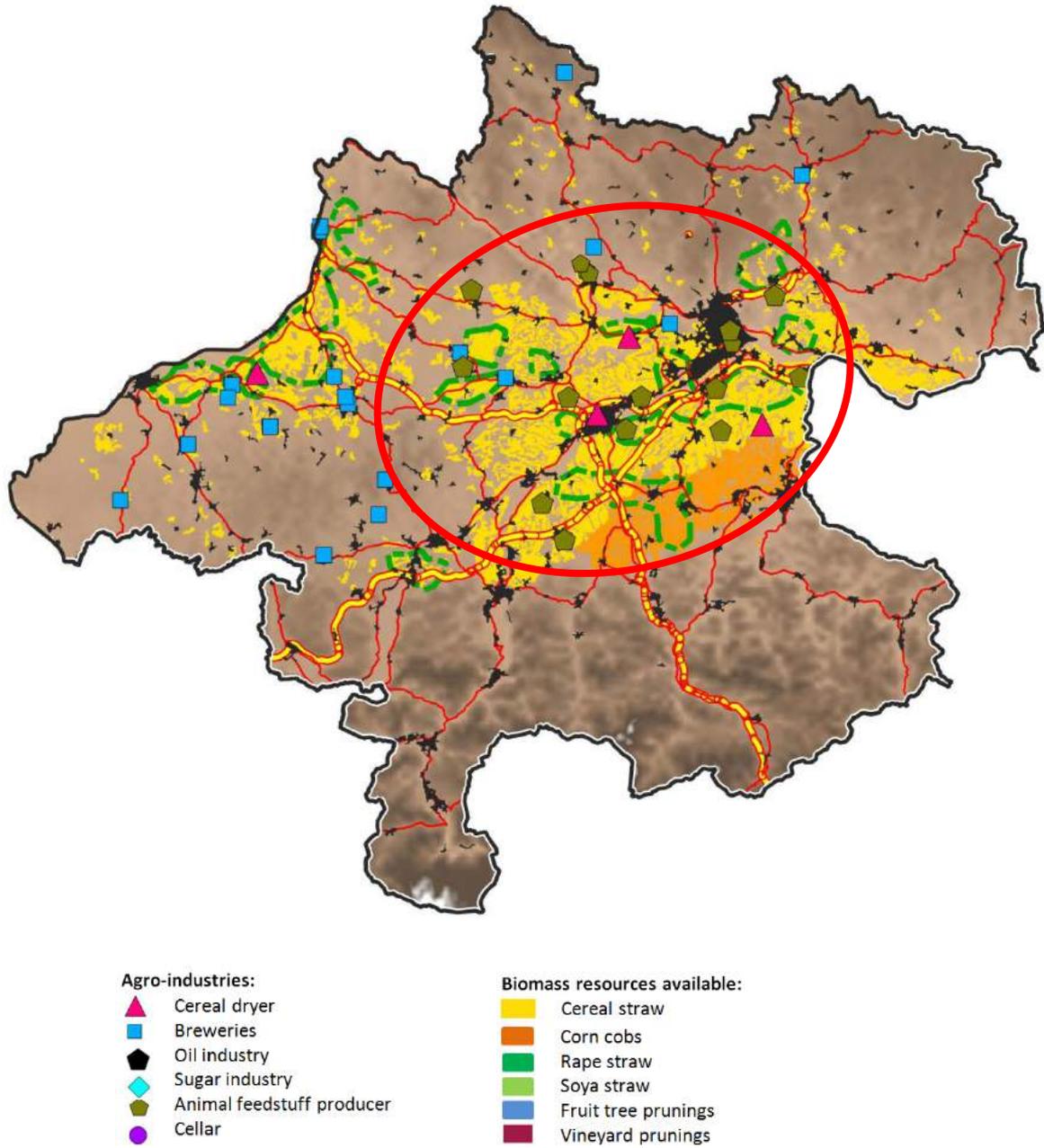
- There are few plantations of fruit and grape crops and so, it cannot be considered as a resource, but at very locally scale
- Agro-industry residues, as in the rest of states, are already utilised for other purposes. Locally they may play a role, but they are not accounted for the region

### 7.3. Localization of resources, agro-industries and priority areas in Upper Austria

Figure 8 presents the situation of available biomass resources and their type as well as the situation of the agro-industry sectors present in the region. Areas where rape is straw is produced are surrounded in green It is also marked in the map the potential area for the development of a logistic centre to be placed, as in other regions, in the facilities of the cereal dryers and the feedstuff industries (taking into account available equipment and idle periods). Resources available for the production of solid biomass in the area are coming from corn cobs mainly but also straw from herbaceous crops (straw and rape) that are produced mainly from July to October as can be seen in Table 5. The production of the logistic centre should be therefore focused on this period (July-October).

**Table 5: Availability of equipment and biomass resources in Upper Austria.**

	Jan	Feb	Mar	April	May	Jun	Jul	Agos	Sep	Oct	Nov	Dec
Cereal dryer												
Feedstuff producers												
Cereal straw												
Maize cobs												
Rape stalks												



**Figure 8: Localization and type of agro-industries and resources in Upper Austria.**

## 8. Summary of the situation in Austria

The situation of the four target regions in Austria (Carinthia, Lower Austria, Styria and Upper Austria) was evaluated by SUCELLOG project in order to see the potential of the agro-industries to become solid biomass logistic centres.

From all the agro-industry sectors evaluated in Austria (cereal dryers, animal feedstuff producers, sugar industry, oil extraction industries, cellar and breweries) the project considers the cereal dryers and the animal feedstuff industry the only two sectors able to implement SUCELLOG concept, although with minor modifications. Sugar industry has been discarded since there is only one present in the target Austrian territory and their interest in starting this new activity has been low, even if their potential is interesting. The rest, either do not have compatible equipment or do not have idle period in the production.

In contrast to what happens in other countries, in Austria, the main biomass feedstock available to be used in a future logistic centre is clear: the corn cobs. In the case of cereal straw, even if some part is sold in the feed market and some is left on the soil there is still a 33% of availability. Maize straw has no availability mainly since it is used to increase the amount of organic content in the soil, which is currently a problem in the country. Residues produced in the agro-industries are also used for animal feed having an important market. In the cereal dryers, a new drying line should be implemented in the facility to be able to process this kind of biomass, but handling equipment as well as storage and transport means (and in minor cases also pelletisers) could be utilised in the idle period (9 months). The feedstuff producers own a drying system that works all the year but their pelletisers work according to demand, having the possibility to be adjusted for the production of agro-pellets. Even if both industries could work as logistic centres on their own, it is considered that an association among them, taking advantage on the synergies of available equipment and periods of work, could play an important role in the success of the new business activity.

Although the agro-industries see the idea as a good opportunity to diversify their activity, their main concern is the market of the product (reduced to large consumers or also to household), which will depend on the legal aspects of the combustion of agrarian biomass in Austria, currently under discussion. The situation in some regions, where corn cobs are already allowed to be used in households make the sector be optimistic about this new business line.

## Annex I: Table of ratios y availability percentage per region

**Table 6: Ratios of biomass production (t/ha) in AUSTRIAN target regions.**

Crop	Austrian target regions
Wheat	4
Rye	4
Barley	3,5
Oat	2,6
Maize	4
Rice	10,3
Beans/Pulses	-
Tobacco	-
Hemp	0
Rape	4
Sunflower	10
Soya	2
Linseed	-
Seed_other	7
Fruit_temp	2
Fruit_subtrop	-
Berry	1
Nuts	1
Citrus	-
Olive	-
Vineyard	3

**Table 7: Percentage of availability of biomass (%) in AUSTRIAN target regions.**

Crop	Austrian target regions
Wheat	33
Rye	33
Barley	33
Oat	33
Maize	0
Rice	-
Beans/Pulses	0
Tobacco	-
Hemp	0
Rape	50
Sunflower	0
Soya	50
Linseed	-
Seed_other	50
Fruit_temp	70
Fruit_subtrop	-
Berry	70
Nuts	70
Citrus	-
Olive	-
Vineyard	70