

## TRIGGERING THE CREATION OF BIOMASS LOGISTIC CENTRES BY THE AGRO-INDUSTRY

Cosette Khawaja<sup>1</sup>, Rainer Janssen<sup>1</sup>,  
Eva López<sup>2</sup>, Daniel García<sup>2</sup>, Vincent Naudy<sup>3</sup>, Juan Sagarna<sup>4</sup>, Susana Rivera<sup>4</sup>, Irene Cerezo<sup>4</sup>, Camille Poutrin<sup>5</sup>, Enrico Pietrantonio<sup>6</sup>, Tanja Solar<sup>7</sup>, Alfred Kindler<sup>7</sup>, Klaus Engelmann<sup>7</sup>

<sup>1</sup>WIP Renewable Energies, Sylvensteinstr. 2, 81369 Munich, Germany,  
Tel: +49 89 720 12 740, [www.wip-munich.de](http://www.wip-munich.de),  
[cosette.khawaja@wip-munich.de](mailto:cosette.khawaja@wip-munich.de), [rainer.janssen@wip-munich.de](mailto:rainer.janssen@wip-munich.de)

<sup>2</sup>CIRCE - Research Centre for Energy Resources and Consumption, <sup>3</sup>RAGT Energie SAS,  
<sup>4</sup>SPANISH COOPERATIVES - Cooperativas Agro-alimentarias de España, <sup>5</sup>SCDF - Services Coop de France,  
<sup>6</sup>DREAM - Dimensione Ricerca Ecologia Ambiente, <sup>7</sup>Lk Stmk - Styrian Chamber of Agriculture and Forestry

**ABSTRACT:** SUCELLOG project aims to widespread the participation of the agrarian sector in the sustainable supply of solid biomass in Europe. The project focuses on the implementation of logistic centres in the agro-industries as a complement to their usual activity in France, Italy, Spain and Austria. Some industries are equipped with pelletisers, drying systems etc. and work in most cases under seasonal regime. These facilities can be utilised in the idle periods to handle and pre-treat biomass feedstock obtained from different agrarian residues existing in the area to produce quality solid biomass. This paper presents the major activities and outcomes of the project. The project offers technical support to 4 selected European agro-industries aiming to start new agro-industry logistic centres in their facilities by providing an evaluation of their boundary conditions, a complete business model for the company and monitoring the operation during their first production season. A start-up diagnosis and an auditing service will be provided to another 80 agro-industries who are interested in the project concept. Furthermore, the project will create capacity building in regional and national agrarian associations which in turn will provide support services to their associates also in other regions and countries.

**Keywords:** agricultural residues, agroindustrial residues, agropellet, bioenergy, logistics, capacity building.

### 1 INTRODUCTION

Bioenergy production in Europe currently accounts for more than 60% of renewable energy sources and is expected to grow in terms of quantity by 2020. Knowing that the biomass resources from forest are limited, agricultural residues which are often not used efficiently and sometimes even polluting have a non-negligible potential to help fulfilling this growth. Solid agricultural residues, which constitute a considerable part, can be used efficiently for heating purposes.

On the other hand, the European Agricultural Fund for Rural Development encourages Member States to use agricultural residues for bioenergy as a way to diversify business activity of farmers and increase the added value.

Agro-industries equipped with agricultural goods processing facilities offer a great opportunity to become an agro-industry logistic centre providing quality solid biomass from raw feedstock. This is possible because of the following significant synergies between agro-industries and solid biomass production facilities:

- Agro-industries have equipment/facilities able to carry out solid biomass pre-treatment for achieving quality requirements of the market (e.g. dryers in cereal industries, pelletisers in forage installations, belt conveyor stackers).
- Their facilities work under seasonal regime due to crop cycles, so they can make compatible some biomass pre-treatments with their own processes.
- Some of them already produce biomass residues. Additionally most of them are surrounded by crop-fields, other ecosystems (forests), and other agro-industries or activities

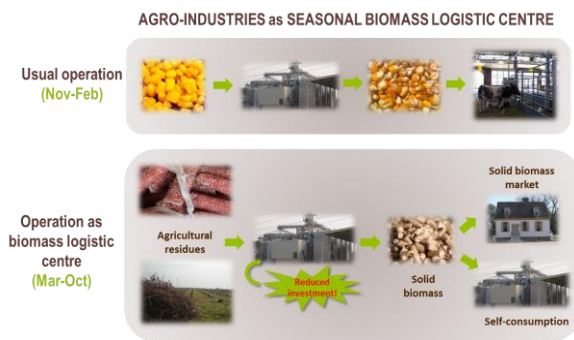
(industries, energy crops exploitations) that generate other type of biomass feedstock. Therefore they have easy access to a wide range of biomass feedstock which can be integrated in order to broaden their offer for solid biomass.

- They have experience with food-products that, somehow, are similar to solid biomass, since they both are organic feedstock (they need to be stored, dried to avoid deterioration, in some cases to be pelletised, etc.)
- Farmers and agro-industries are already quite concerned about the importance of product quality due to Common Agricultural Policy regulations. Adapting to handle and transform biomass in order to bring a product of quality to the market is definitely in line with their work.

The SUCELLOG project has been conceived with the aim of triggering the creation of logistic centres in agro-industries bearing in mind the current opportunity for the sector and the existing synergies (Figure 1).

This will be achieved by:

- Providing technical support, helping decision-making and accompanying agro-industries willing to start operating as solid biomass logistic centres
- Creating capacity building in regional and national agrarian associations to provide this service to their associates beyond the end of the project.

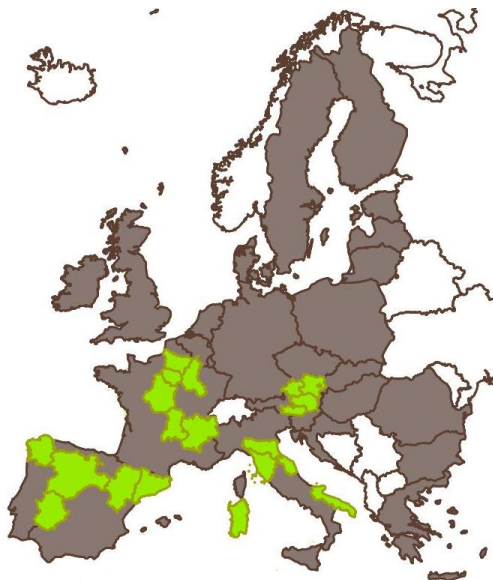


**Figure 1:** Concept of the SUCELLOG Project

## 2 TARGET REGIONS

The countries targeted for the implementation of the project precept are those who have high amounts of solid agricultural residues and a large number of agro-industries. Therefore, during the project period, the countries selected were Spain, France, Italy and Austria. For each country, target regions were also chosen based on an analysis of seasonality or in other words availability of biomass resources in the time when the facility is not in operation (idle period). The target regions are the following (Figure 2).

- Spain: Aragón, Castilla y León, Cataluña, Extremadura, Galicia
- France: Auvergne, Centre, Champagne-Ardenne, Ile de France, Picardie, Rhône-Alpes
- Italy: Emilia-Romagna, Marche, Puglia, Sardegna, Toscana
- Austria: Carinthia, Lower Austria, Styria, Upper-Austria



**Figure 2:** Target regions of the SUCELLOG Project

One aim of the project is to replicate the activities undergone in the target regions to other regions and other countries even after the project comes to an end.

## 3 MAIN ACTIVITIES

The activities in the project have been planned with the main objectives of fostering the entrepreneurship of the agro-industry in the creation of agro-industry logistic centres from agricultural residues and establishing a permanent capacity for consultancy on agro-industry logistic centres into four European countries.

### 3.1 Determination of the regional framework and stakeholders' engagement.

In a first step, an assessment of existing agro-industries and biomass resources in the target regions and the identification of potential local areas of action will be conducted. Furthermore, technical and non-technical barriers for the implementation of the project concept will be evaluated.

Engaging stakeholders mainly agro-industries and biomass suppliers is an important step to identify suitable beneficiaries and mobilise them to take part in the project in order to benefit from the offered services. It is planned to invite stakeholders to workshops and take direct contact with them through bilateral meetings. In addition, the workshops will help gathering information about the real situation of the region in order to complete the framework and validate the results that were previously assessed.

As a result of this action, agro-industries including farmers, cooperatives, companies (SME's) will be classified in three categories depending on their current interest in becoming an agro-industry logistic centre. The categories are the following:

- Category 1: Agro-industries which already have a solid willingness to start a new business as biomass logistic centre. During the project, one beneficiary per country will create an agro-industry logistic centre in its facilities with the support of the project. They will be the best practice example on which SUCELLOG will replicate its knowledge and awareness.
- Category 2: Agro-industries which are interested in biomass logistics, but still require more knowledge before decision-making. 10 beneficiaries per country will receive consultancy on the best business option to be followed through an auditing service.
- Category 3: Agro-industries which are still unaware of their potential to become agro-industry logistic centres. A total of 10 beneficiaries per country will be supported to carry out a start-up diagnosis on their current situation to start a new business as biomass logistic centre.

### 3.2 Development of a tailor-made business model

The Category 1 beneficiaries will be selected according to specific criteria and the project will support them to implement the logistic centre. In a first step, an evaluation of their boundary conditions will be carried out to assess their opportunities and help decision making through the development of a feasibility study, in which different business options will be presented. The agro-industry will choose the most convenient option according to their situation and their perspectives and a complete business model will be built for the selected one. Four agro-industries will be selected, one per participating country.

The beneficiaries will receive support from the corresponding regional agrarian associations (RAA) under the supervision of their corresponding national agrarian association (NAA).

The steps and input needed for the development of the business model are the following (Figure 3):

- Selection of the beneficiary and region
- Assessment of boundary conditions, biomass resources and biomass demands in terms of quality, quantity and price
- Company examination: evaluation of capacities to adapt to the new activity including facility compatibility, human resources abilities and company structure
- Feasibility study providing the beneficiaries with several options for the commercialisation of biomass. The beneficiary makes a decision. A tailor made business plan is prepared for the company

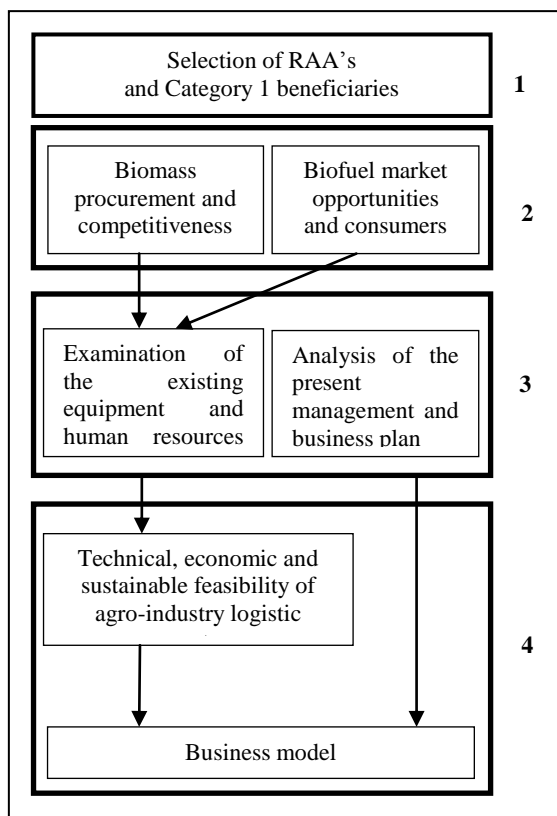
- Follow-up on the installation of the new equipment and offering training to operators executed by system suppliers
- Follow-up on the implementation of the new operational mode of the facility and restructuring of space means
- Establishment of contracts with biomass suppliers and solid biofuel consumers according to guidelines
- Rearrangement of corporative structure and establishment of collaboration with other actors of the logistic chain

The next phase is the commissioning and start-up. This phase covers initial and primary dynamic tests, including guarantee performance tests, following the commissioning execution plan. The knowledge necessary for the correct operation of the agro-industry logistic centre will be provided. Biomass will be ready to be acquired in progressive amounts to test the adequacy and performance of individual devices. Operation and maintenance executed by facility users will be evaluated and needs for further trainings will be detected. A set of operational and functional tests will be carried out in order to check if the facility properly adapts to the planned performance.

Quality is one of the most important aspects for the success of the new business line. Therefore, protocols for the quality evaluation will be implemented in order to provide the beneficiary with simple knowledge on how to evaluate and control quality. Trainings will be provided for the future responsible for the quality issues in the agro-industry (at least two people per agro-industry). The course will have a maximum duration of 1 day and will be performed in the agro-industry facilities.

Monitoring of a 1 season period will be carried out. The aim is to follow the operation of the agro-industry logistic centre and detect early deviations from the expected business plan. Biomass prices, contractors' compliance, capacity of personnel, follow-up of quality, conformity of clients, business tracking and review of achievements.

In the end a guideline for retrofitting agro-industries to function as a logistic centre will be developed based on the practical experience gained. The guideline addresses mainly the European private and public market actors with a high interest/potential to create a regional agro-industry logistic centre.



**Figure 3:** Steps for the development of a business model

### 3.3 Creation and monitoring of the agro-industry logistic centre

According to the business plan selected by the beneficiaries, a detailed planning for the implementation of the agro-industry logistic centre will be prepared. The planning will include a strategic timing of equipment purchasing and installation, change in organisational structures, professionalisation of personnel, plant commissioning and start-up, and commercial operation.

Actions related to the first step before plant commissioning will then be monitored. This will include:

- Verification that new acquired equipment fulfils the requirements according to necessities and business model chosen

### 3.4 Start-up diagnosis and auditing services

A start-up diagnosis will be performed to 20 beneficiaries per target country. The diagnosis will inform beneficiaries about their current situation and the possibility to start a new activity as an agro-industry logistic centre. The diagnosis will also serve to classify potential beneficiaries into Category 2 and 3.

After the diagnosis, 10 Category 2 beneficiaries per target country will be object to a comprehensive feasibility study completing a full audit service. The project will provide them with the most promising business option, elected among all the possible detected options, and therefore will help in the decision-making.

In total, 40 agro-industries will benefit from an auditing service in Europe and 80 agro-industries will undergo a start-up diagnosis. In both cases, auditors will be the RAA's, guided by the corresponding NAA's.

### 3.5 Transfer of knowledge

An important aim of the project is to transfer the knowledge gained during the project to other actors in different regions and countries. Therefore, 3 handbooks directed to the different categories of the target groups and to key actors with different profile will be developed. These are:

- Handbook for beginners: It will highlight the current synergies between the agro-industry activities, facilities and business on biomass logistics. It will address the following topics: concept of agro-industry logistic centre, the quality as a warranty of success for logistic operators in the scope to 2020, the need of sustainable schemes in the procurement of biomass, the specific synergies of most relevant agro-industries/activities, and a summary of the facility types in European participating countries. It will basically address the basic demands of information to be taken into account when interested in starting this new activity
- Handbook for medium aware users: It will focus on the different issues (solid biofuel related, commercial and legal) that a medium aware user should bear in mind when weighing up whether to start a new business activity related to the one SUCELLOG is addressing. The aim of this handbook is therefore to provide all items to be considered when elaborating a feasibility study of this type, acting as a guide of the information to have in mind and how to reach it. It will be a fundamental item for the promotion of entrepreneurship among the target groups
- Handbook for highly aware users: it will be developed based on the experience gained from the creation of the agro-industry logistic centres during the project. It will serve as an example to be followed by potential target groups willing to implement an agro-industry logistic centre. This handbook is of special relevance for new entrepreneurs since it includes the experiences of Category 1 beneficiaries which have started an agro-industry logistic centre during the project. This handbook will highlight the best practices and the keys for success. It will include the details of the beneficiaries' facilities and cases, the analysis of the local conditions, the different scenarios considered and the final business model adopted. It will also include relevant data like need of retrofitting, investment costs and first results of the solid biofuels marketed.

Furthermore, training sessions will be organised to train RAA's and NAA's to become auditors not only in the target regions, but also in non-target regions and countries.

Finally an analysis on the non-technical barriers will be carried out and policy recommendations will be developed to remove these barriers.

## 4 RESULTS

### 4.1 Determination of the regional framework and stakeholders' engagement

An assessment of the real potential of primary agrarian biomass supply has been carried out in the target regions in Spain, France, Italy and Austria. The methodology used corresponds to a "Resource focused approach", which starts with statistical data from agrarian inventories complemented with real availability indices gathered in the regional workshops with the agrarian sector. Firstly, primary biomass resources have been catalogued on a country level according to existing competitive uses and relevance in terms of current unused quantities. Secondly, a map of the distribution of real available primary resources and a table of the available dry tons per year were built per target region.

Furthermore, barriers and opportunities for adapting agro-industries to become logistic centres have been assessed. This was carried out through personal interviews with each target sector. Existing agro-industries from the potential sectors (those owning compatible equipment for the conditioning and storage of raw material) were asked about: equipment, 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, possible opportunities. After this analysis, target sectors were identified per region and specific agro-industry locations were included inside the biomass resource map.

The diversity and quantity of available agrarian residues and of agro-industries present in the region as well as the compatibility among them has been taken into account in order to determine the potential areas inside each target region for the development of agro-industry logistic centres. 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. Logistical issues such as good communication networks and proximity to consumption areas have been also taken into consideration. Potential areas have been identified per region.

The results of the assessment of the regional situation is summarised per country in Table I.

The engagement actions were conducted through the organisation of 27 workshops gathering more than 450 participants. Furthermore, more than 65 bilateral meetings were carried out in order to follow up with the stakeholders after the workshops for the selection of the beneficiary agro-industries.

### 4.2 Development of a tailor-made business model

The 4 agro-industries which will become logistic centres were selected based on a group of multi-criteria matrix that has been set up.

The first matrix allows the implementation of a first pre-selection through a group of excluding requirements. The potential beneficiary must fulfil all excluding requirements to be admitted to the second part of the selection process (second matrix). The weight of the excluding requirements is fixed and therefore cannot be modified by the national agrarian association.

**Table I:** Summary of the regional assessment

<b>Spain</b>	
Biomass resources	Maize, straw, pruning residues
Potential agro-industry sectors	Forage dehydration facilities, cereal dryers, rice dryers, sugar industry, nut industry, tobacco dryers, distilleries and oil pomace industries
Potential areas	All target regions
<b>France</b>	
Biomass resources	Mainly straw from herbaceous crops (cereal, rape and maize)
Potential agro-industry sectors	Forage dehydration facilities, cereal dryers, sugar industry, distilleries, tobacco dryers, cellars, oil extraction industries and feedstuff producers
Potential areas	All target regions except for Ile-de-France
<b>Italy</b>	
Biomass resources	Cereal and maize straw, prunings from olive trees and vineyards and residues from olive oil and wine agro-industries
Potential agro-industry sectors	Forage dehydration facilities, cereal dryers, rice dryers, tobacco dryers, distilleries, oil pomace industries and sugar industries
Potential areas	All target regions
<b>Austria</b>	
Biomass resources	Mainly corn cobs and cereal straw.
Potential agro-industry sectors	Cereal dryers and animal feedstuff industries
Potential areas	All target regions

The second matrix allows the evaluation of the possible beneficiaries which fulfil all excluding requirements. The matrix includes several requirements to be weighed. According to the situation of the country, every national agrarian association has to provide a weight to the requirements. The weight is the same for all potential beneficiaries of the country. The national agrarian association attributes a score for each answer through phone interviews with candidates. The candidates with the highest total score were selected and those are listed in Table II.

**Table II:** The 4 selected agro-industries and RAA's

Country	Spain	France	Italy	Austria
Region	Aragón	Champagne-Ardenne	Toscana	Styria
RAA	Cooperativas Agro-Alimentarias de Aragón	UCFF	DREAM	Lk Stmk
Agro-industry name	Cooperativa Agraria San Miguel	Luzéal	Le Rene	Tschiggerl Agrar Gmbh
Sector	Forage dehydration & cereal dryer	Alfalfa Dehydration	Cereal dryer	Cereal dryer

The biomass assessment has been completed for the beneficiaries in Spain, Italy and Austria. In France, the process is still on-going. The results of the assessment are shown in Table III.

**Table III:** Results of the biomass assessment in the region of the Category 1 beneficiaries in Spain, Italy and Austria

Country	Type	Quantity t/y	Price* €/t
Spain	Cereal straw	11,000	36-40
	Corn stalks	8,000	36
Italy	Olive pits & pomace	1,000	10-11
	Tree prunings	2,500	1
	Olive prunings	1,937	No market
	Cereal straw	1,990	40-45
Austria	Corn stalks	12,000	30
	Wheat straw	3,280	80-100
	Barley straw	1,910	80-100
	Hay (poor quality)	200	0-20
	Corn cobs	15,249	50

\*including transportation costs

It is important to mention that the available biomass assessed includes only the biomass which has no competition with other uses. In Italy the quantity of cereal straw available might have risk on competition with animal feed and bedding, therefore it will be carefully considered.

Concerning the market assessment for the consumption of solid biomass for heating in the regions of the selected agro-industries, the results were the following:

- In Spain, the agro-industry which is a cooperative would like to consume partly the produced solid biomass for their agro-industrial processes requiring heat and the rest will be sold to pig farms which are numerous in the area and require heat sometimes the whole year. As for the quality, a certified product is not a must, but they impose general requirements (e.g. ash content <7%; moisture content <25%)
- In Italy, solid biomass consumption is seasonal from October to April. The consumers in the region who are mainly households require absolutely certified products. Most of them use olive pits and wood pellets. Therefore, agro-pellets produced will require certification in order to be sold.
- In Austria, the main consumers will be farmers who are currently using wood chips for heating their houses and farms. From the quality point of view moisture content and particle size are important for them.
- In France the assessment is still on-going

The assessment on the existing equipment and human resources as well as the present management and business plan are also finalised for the beneficiaries in Spain, Italy and Spain and the corresponding feasibility studies are being currently conducted.

All reports detailing the results can be downloaded from the project website [www.sucellog.eu](http://www.sucellog.eu).

## 5 PARTNERSHIP

The SUCELLOG project is coordinated by CIRCE - Research Centre for Energy Resources and Consumption (Spain). The project consortium includes RAGT Energie SAS (France), SPANISH COOPERATIVES - Cooperativas Agro-alimentarias de España (Spain), SCDF - Services Coop de France (France), DREAM - Dimensione Ricerca Ecologia Ambiente (Italy), Lk Stmk - Styrian Chamber of Agriculture and Forestry (Austria) and WIP Renewable Energies (Germany).

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## 7 PROJECT LOGO

