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

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D5.2c
Summary report of start-up and commercial operation of Cooperativa Le Rene

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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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Table of contents

1. Introduction

This report includes a description of the activities done by the agro-industrial cooperative Le Rene supported by the SUCELLOG project to create an agro-industry logistic centre. After a preceding creation of a feasibility study and a business model by the project, this report shows the precise steps done during the start-up process.

The aim of the project in this work package is to give the agro-industries support in those steps.

2. Company description

Le Rene was founded in 1973 as a cooperative that gathers several farmers of the area between the cities of Pisa, Livorno and Lucca. The cooperative is located in the North of Tuscany in Italy. Over time, the cooperative has increased its activities, building two different plants (Coltano and Caligi, 4.7 km from each other) and buying fields for cultivation.

Currently the cooperative particularly in Caligi plant, where the new business line as logistic centre is planned to be developed, is dealing with sunflower harvesting, treatment and trading; cereal (maize and rarely wheat) drying; pine nuts production; olive oil production.

After the feasibility study performed showed the potential of a logistic centre (D4.3) and a business model (D4.4) was created by SUCELLOG project, the cooperative has decided to test the agro-pellet production.

This report shows the steps done by Le Rene to move towards the start-up of an agro-industry logistic centre.

3. Primary tests

After a positive feasibility from the techno-economic point of view, the first step in starting up a new logistic centre within an existing agro-industry is to make first production and combustion tests and the quality analysis of the produced fuel.

3.1. First production tests

The feasibility study indicated three possible production scenarios:

- ✓ Scenario of no investment, to produce:
  - Wood chips and hog fuel (with bark and leaves) from prunings of permanent crops, renting a chipper and a screening.
  - Agro-pellets from mixed prunings wood, residues from the cereal dryer and sawdust from forest wood, using the existing pelletiser.
- ➢ Scenario of low investment, to produce:

    - Olive pits, buying a centrifugation system.
    - Corn cob grits, renting a chipper.
    - Wood chips and hog fuel from mixed prunings of permanent crops, renting a chipper.
- Scenario of high investment, buying a new more efficient dryer, a biomass burner to supply the energy needed in the dryer and a new screening system, to produce:
    - Olive pits sold in bags.
    - Dried corn cob grits sold in bags.
    - Chips and hog fuel from olive prunings and mixed prunings.
    - Chips from forest wood and mixed prunings.

The cooperative has chosen to no investment in new equipment, putting into operation an existing pelletiser and exploiting more their chipper.

Therefore, although these existing machineries theoretically can be used for the production of agro-fuels, it is absolutely necessary to make a real production test. Often it is difficult to adjust the machinery in a way that agro-fuels of a good quality can be produced.

At the beginning, Le Rene decided to make a test for the production of agro-pellet made by forestry wood sawdust, mixed agro-prunings, cereal bad quality stock and bran, according to the feasibility study results. However, the person from Le Rene in charge of the processing was worried about the pelletization of forestry wood sawdust in terms of product durability.

Therefore it was decided to carry out a preliminary test by mixing only cereal bad quality stock (more workable material in the pelletiser) with forestry wood sawdust. The mix of raw materials was manually inserted into the pelletiser that after a few minutes stops on jamming, because the outer rings of the pressure rollers of the pelletiser were damaged. For the second test the agro-industry decided not to use the forestry wood sawdust being afraid to damage the pelletiser again.

Then, the pelletiser had problems in the variation in speed increase, due to a malfunction in the electrical panel. Finally, they tested the production of agro-pellets from olive pomace, corn residues, silo waste of cereal flour and silo waste of oat.

3.1.1. Goal of the production test

The goal of the production tests at the Cooperative Le Rene was to produce agro-pellets from olive pomace, corn residues, silo waste of cereal flour and silo waste of oat. It was decided to vary the composition of pellet, making three different batches or lots of pellets:

1. 33% of olive pomace, 33% of silo waste of cereal flour, 33% of silo waste of oat;
2. 50% of olive pomace and 50% of silo waste of cereal flour;

3. 60% of silo waste of oat, 15% of silo waste of cereal flour, 15% of corn residues and 10% of olive pomace;

Every type of pellet was produced without additives and water added. Afterwards all the samples were analysed in terms of quality (moisture, durability, percentage of fine particles and bulk density) and their suitability for selling them in the agro-fuel market.

3.1.2. Results

The production rate of the first mixture batch was as expected. The bulk density was high and the moisture content indicated that there is no need for drying. However, the share of fines was too high and durability was low.

The second lot was pelletized slightly slower. The bulk density was high, the moisture and the ash content were good. The share of fines was less than the previous pellet, though still not appropriate. Also this sample had no high durability.

The third batch of pellets had a better production rate than the previous samples. The ash content was high, the moisture content and the bulk density were good. The share of fines was less than the previous pellet, quite good but the results from durability were not so good.

Figure 1: Sample of the 3 pellets

The three different batches were used for the combustion test in a pellet heating stove.

3.2. Combustion tests

3.2.1. Goal of the combustion tests

The goal was to make a visual analysis of the working performance of the stove with the agro-fuel, a measurement of emissions and a visual analysis of the ash. With these results, possible problems during the combustion in regular stoves normally fired with other kind of biomass could be detected. This step is therefore important to identify possible problems before the start-up of logistic centre so that the agro-industry could react on those possible problems trying to improve the product quality.

3.2.2. Results

The 3 pellet mixtures were tested in a wood pellets stove of a company installing boilers and cogeneration plants with a full load output of 8 kW. The ignition was as for the

regular used pellets only for the second sample, while in the other cases decreasing pellets feeding was needed for a better combustion. Emissions were measured for CO, NOx and dust with a gas analyser. In any case, all measured emissions were below the limits of EN 303-5. Some slagging problems occurred. The majority of the ash remaining in the stove after combustion was smaller than 3 mm in the first two cases, the third sample was the limit.

4. Summary and Conclusions

SUCELLOG project supported La Rene agro-industry to become a logistic centre of biomass produced from agriculture resources with no current use in the area. At a first stage the project performed a study to determine the technical and economic feasibility (evaluating resources, market and production costs) and a business model to propose a business strategy for the new products. Since the results (to be consulted in D4.3 and D4.4) were attractive enough, the project supported the cooperative in a more practical way to become logistic centre by performing production and combustion tests.

However, because difficulties in the management of the cooperative facilities, especially the shed with the pelletizing line leased to another company, this is not the best time for Le Rene to implement a logistics center of agricultural biomass. Once the two companies will manage to reach an agreement, the cooperative will continue with the necessary changes and the steps to start the new business.