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

SUCELLOG: IEE/13/638/SI2.675535

D6.5c
Report on individual auditing studies and diagnosis in Italy

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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 agricultural 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

This report corresponds to a part of the D6.4 Report on individual auditing studies and diagnosis in Spain, France, Italy and Austria of the SUCELLOG project. Lead by SPANISH COOPERATIVES, it has been prepared by:

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1. Introduction

SUCELLOG supports the creation of biomass logistic centres inside agro-industries covering the gap of knowledge faced when willing to start this new activity. Within WP6, SUCELLOG provides an auditing service facilitating the decision-making to agro-industries interested in becoming a logistic centre. Beneficiaries have been object of a previous diagnosis in order to evaluate the degree of matureness to start-up the new activity, their potential and their knowledge gaps.

A total of 22 agro-industries have been diagnosed in Italy and 9 of them were supported with a techno-economic feasibility study through an audit.

This document includes, in a first part, a collection of the individual reports of diagnosis carried out in Italy and, in the second part, the collection of the reports of the auditing services. Finally, a summary of the state of the country with respect to the implementation of the logistic centre in Italy is included.

2. Companies diagnosed in Italy

The following table presents the list of diagnosed agro-industries.

Table 1: List of diagnosed agro-industries in Italy.

Region	Agro-industry name	Sector
Calabria	Serragiumenta Agricola snc *	Farm (olive trees, fruit trees and vineyards)
Emilia Romagna	Progeo	Animal feed factory and cereal dryer
Marche	Ambiente e Territorio Soc. Coop. *	Agroforestry works
Marche	Coop. Agr. For. Natura Viva Soc. Coop.	Agroforestry works
Marche	Coveco	Agroforestry works
Marche	La Matrecina Soc. Coop.*	Agroforestry works
Puglia	Agricola Latianese	Oil mill & winery
Puglia	ATS Monte Maggiore Soc. Coop. Agr. For.*	Agroforestry works
Puglia	La Pugliese	Oil mill
Puglia	Oleificio Cooperativo Produttori Agricoli di Molfetta*	Oil mill
Puglia	OP Terra di Bari Soc. Coop.	Table grapes
Puglia	Ortofrutticola Alberobellese Soc. Coop. a r.l.	Oil mill and fruit agro-industry
Sardegna	La Profenda	Animal feed factory
Sardegna	La Rinascita Oliena*	Cheese factory
Sardegna	Santa Maria La Palma	Winery
Toscana	Agriambiente Mugello coop agr multifunzionale	Agroforestry works, livestock, farm
Toscana	Agricola Forestale Paolo Macchia *	Agroforestry works
Toscana	Azienda Agricola Il Bello *	Agroforestry works, farm, winery
Toscana	Consorzio Agrario Tirreno	Animal feed factory and cereal dryer
Toscana	Leo Verde Soc. Agr.*	Olive trees cultivation and agricultural biomass cogeneration plant
Toscana	Cooperativa Agricola IL FORTETO	Agroforestry works, diary and agricultural farm, olive tree grower
Toscana	Azienda Agricola Rapaccio*	Agroforestry works, olive tree grower

The diagnosis served to evaluate the potentialities of these agro-industries to become biomass logistic centres. After a fair and transparent process, some of them (marked

with an asterisk * in the table above) were selected to be beneficiaries of a more detailed study inside an auditing service.

2.1. Diagnosis of Serragiumenta Agricola snc

2.1.1. Company description

Serragiumenta Agricola snc is an important agricultural society and is mainly engaged in the cultivation of grape, olive and fruits. It is headquartered in Contrada Serragiumenta, in the municipality of Altomonte (Cosenza Province).

The farm has an area of 500 hectares, about the 30% is leased to third parties. It deals with the cultivation of orchards (mainly peach), olive trees and vineyards to produce table grapes. In addition, a certain percentage of land is taken up by arable lands.

In recent years, the agro-industry has invested several resources in the renewable energy sector, with the construction of a photovoltaic park of more than 20 hectares and the realization of a feasibility study for the construction of a bio digester. Furthermore, in the past they thought about the possibility of implanting a short cycle woody crops (short rotation forestry) to produce woody biomass (especially pauwlonia).

The farm has a strong interest on biomass sector and considers SUCELLOG a very interesting project as it can have access to many agricultural residues, resulting from different types of crops and almost all the year.

2.1.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

As agro-industry, Serragiumenta Agricola has a large cultivated area and therefore has access to a large amount of agricultural residues. Then, it has contacts with many local farms and agro-industries, which may provide useful raw material to produce agro-pellet.

For what it concerns the equipment, it has not yet useful devices to the purposes of the project.

B. Type of biomass resources available

The farm has access to many agricultural residues:

- Herbaceous residues: cereal straw, corn stalks, etc. resulting from growing arable crops in the property and also from other farms working in a neighbourhood of 10-35 km from Serragiumenta.
- Wood residues: vineyards, olive and fruit trees pruning, resulting from property and from other farms that work in a neighbourhood of 10-35 km.

- Agro residues: olive pomace.

Such residues are produced mainly in autumn and winter months.

There is not a logistic chain to supply raw materials, but residues are marginally used for other purposes (especially soil fertilization).

The agro-industry has access also to forestry wood and waste wood too.

C. Existing equipment in the agro-industry and availability

Serragiumenta, unfortunately, has not got any machinery useful for the production process, but they could afford investments to buy them.

In the table below are reported the periods of production of the residues:

RESOURCES	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Herbaceous resources	x	x	x							x	x	x
Woody resources	x	x	x							x	x	x
Agro-industries residues	x	x	x							x	x	x

It can be observed that there are several months in which it would be possible to start the production of solid biomass

D. Knowledge on the bioenergy sector

The farm is not a consumer of biomass and it has no experience in production of solid biomass, even though since several years they invest and work in the field of bioenergy.

They are surely well aware of the limits and opportunities offered by this type of production diversification linked to agricultural activities, but denounces a certain knowledge gap concerning the quality to be obtained from a biomass supplier when you want to compare different biofuels (excluding the price).

E. Biomass market in the region

The market relating to solid biomass in the area of the agro-industry is currently underdeveloped: it refers only to some agro-industries or farmers which currently consume forestry wood pellets within a radius of 35-50 km. The demand is mainly in winter but it doesn't provided information on the technical and economic characteristics of the material that is required.

2.1.3. Conclusions

Serragiumenta was immediately very interested in the project, in which it sees the possibility of being able to diversify the production and to reuse agricultural residues that are currently unused.

It is interested by the field of alternative energy since long time but it never explored the biomass market, for which a heightened curiosity and attention on this issue does not correspond to a depth knowledge of the technical aspects.

It sees the possibility of a positive future development, especially because of the environmental conditions surrounding the agro-industry, the amount of agricultural activity itself and its business skills.

2.2. Diagnosis of Progeo S.c.a.

2.2.1. Company description

The Progeo S.c.a. is an animal feed factory and a cereal dryer located in Masone, Reggio Emilia, where it's located the headquarter, and Ganaceto, Modena.

The cooperative has adequate equipment for agro-pellet production and they are interested in a different way to use their residues. On the other hand, they haven't idle period, they haven't enough space where put in place an eventual new production line and they are not so convinced in solid biomass as biofuel.

2.2.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

The agro-industry has two activities: production of animal feed and cereal drying. Therefore, it would have adequate equipment for the production of solid biomass and also by-products and residues to be used. However, the production plant of animal feed works the whole year always using pelletizer, screen and mill. From this point of view, it is better the plant for cereals drying, though in this case the cooperative should invest in other equipment and in civil works (because of lack of space for the storage of raw materials) in order to put in place the new business line.

B. Type of biomass resources available

The agro-industry produces by-products and residues of cereals and animal feed treatments. Furthermore, they can have access to herbaceous resources in the area, within a radio of 35 km, as cereal straw, maize stalks, sunflower straw, etc…

Even if there is not a logistic chain to harvest and supply the agro-industry with this raw material, these agricultural residues are produced by farmer members of the cooperative.

Finally, in the area there is not much availability of forest wood.

C. Existing equipment in the agro-industry and availability

The cooperative has pelletisers, screens and some mills used all over the year. Then it has some mills and dryers underused from November to March.

They should invest in other pelletisers, mills, dryers and screens to use them only for solid biomass production also to avoid risk of contamination. Furthermore, they should invest in civil works to start the new business line in order to obtain space for the storage of raw materials.

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pelletisers												
Screen												
Mill												
Dryers	x	x	x								x	x
RESOURCES												
Herbaceous resources						x	x	x	x			
Broken grains and grain dust	x	x	x	x	x	x	x	x	x	x	x	x

The activity for producing solid biomass could be settled up in some months.

D. Knowledge on the bioenergy sector

The cooperative is not a biomass consumer and it doesn't produce solid biomass for energy purposes. At the same time, they have awareness about solid biomass properties in order to reach a good quality: heating value, moisture content, ash content, etc…

Although the agro-industry has the problem of disposing of its by-products and is interested in offering additional services for the use of residues of farmer members, they are not so convinced about the success of solid biomass for energy purposes, as future business strategy.

E. Biomass market in the region

Currently, within a radio of 50 km from the agro-industry, the solid biomass market consists in few households consuming forestry wood pellets and some farmers or agro-industries, especially in winter time.

2.2.3. Conclusions

Although the agro-industry has the equipment required by the project and its availability could be set in place several days a year, they do not want to create this new business line, considering the risk of contamination of its basic products, the investments needed in equipment and civil works and the lack of trust in the solid biomass market for energy purpose.

2.3. Diagnosis of Ambiente e territorio Soc. Coop.

2.3.1. Company description

Ambiente e territorio Soc. Coop. is a cooperative agro-industry working in the maintenance of gardens, urban trees, urban gardens and forestry activities. The headquarter is in via Manzoni 65 – Osimo (Province of Ancona).

The agro-industry works for the pruning, maintenance and plantation of trees in urban areas, producing many pruning with its activities, that are currently only partially chipped: the main part is disposed of as waste.

At the same time, with the forestry activities, the agro-industry produces many different kinds of wood, such as firewood and wood chips, both deciduous and coniferous.

Currently, they are interested in evaluating the possibility of diversifying their production, using the residues they produce or in partnership with other local operators.

2.3.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

For the project, this is a quite interesting agro-forestry agro-industry, because it has some of the requested devices, that are also currently underused, and it has a large amount of agricultural residues.

B. Type of biomass resources available

In addition to the agricultural residues from pruning, which are produced during their usual activity, they could also have access to herbaceous resources, still in the area and mainly produced during the summer time, for which there isn't any market.

Same for residues from olive pruning, even them in the area and currently mainly burned in fields.

All these resources come from farmers and agro-industries without any link with the agro-industry and within a radius of 35 km from it.

It is highlighted that, for the moment, there is not any logistic chain to supply these raw materials to the agro-industry. This chain should be completely built, but the logistic concerning the storage of the material is not a problem.

The agro-industry was not able to provide the prices for the purchasing of these raw materials.

Vice versa, in the area there are some logistic chains for producing different types of forestry wood, in where even the agro-industry is working, that can be useful to support the new logistic chain for the production of the biomass from the agricultural residues.

C. Existing equipment in the agro-industry and availability

The agro-industry is not completely unfurnished of adequate equipment, because it has an horizontal dryer and a chipper.

These devices have been purchased to enlarge the activity in the market of the biomass production, mainly forestry, but for several causes not depending by their will, the devices are currently underused, in particular the dryer that is almost unused.

About the idle period and its correspondence with the production of the residues, it looks positive as it is reported in the table below:

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dryer	X	X	X	X	X	X	X	X	X	X	X	X
Chipper				X	X	X	X	X	X	X	X	
RESOURCES	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Herbaceous						X	X					
Woody	X	X	X								X	X

It can be observed that the solid biomass production can be started in different several months.

D. Knowledge on the bioenergy sector

The cooperative is not a biomass consumer but it has a strong knowledge on the biomass production, because it produces solid biomass from agricultural and urban pruning and forestry activities.

This activity enables the agro-industry to know very well which are the main properties and qualities to be evaluated when producing biomass for energy purposes, such as the influence of origin of the material on the ash content.

E. Biomass market in the region

Currently, in the area of the agro-industry, the solid biomass market is not so developed: there are just few households consuming wood pellets in a radius of 35 km from the cooperative. Moreover, there is a certain amount of solid biomass requested by some green houses in the area.

This material has a moisture content less than 10 %, and an ash content less than 1 % with a price of about 230 €/t.

Concerning the periods of the year when the biomass is requested, the green houses request is ongoing during the year, while the households request is mainly in winter time.

The agro-industry says that some public local entities are beginning to be interested in the energy and heat production from solid biomass, so it could be interesting to implement an assessment, deepening the knowledge of the local potential market, concerning costs and quantity/quality of the requested product.

Anyway, the agro-industry highlights that the product that can be produced, low quality agro-pellets from herbaceous residues and urban or olive pruning, even if mixed with a quantity of forestry wood chips, cannot fulfil the needs of the current market in terms of quality.

So that, producing and selling the biomass at a significantly lower price than consumers are paying to purchase the forestry wood pellets is essential.

Moreover, a virtuous cycle of knowledge and advertisement to the potential consumers should be set up, because the agro-industry complains in the considered area an important gap of knowledge about the use of solid biomass that, at the moment, stops any new enterprise.

2.3.3. Conclusions

Ambiente e territorio Soc. Coop. has immediately shown an interest in the project, understanding its innovative capacity and foreseeing the possibility of diversifying its production, improving at the same time the processes to reuse the residues.

Currently, the agro-industry already produces solid biomass and has a good know-how. At the same time, some critical issues of its framework are highlighted, mainly related to the lack of knowledge of the biomass market from the local operators and potential consumers.

2.4. Diagnosis of Coop. Agr. For. Natura Viva Soc. Coop.

2.4.1. Company description

Coop. Agr. For. Natura Viva Soc. Coop. is a cooperative working in the maintenance of urban gardens, olive trees and forestry activities. The headquarter is in Villa Curi, Ascoli Piceno.

The agro-industry works for the pruning, maintenance and plantation of trees in urban areas, producing with its activities many pruning that are currently only partially chipped: the main part is disposed of as waste.

At the same time, with the forestry activities, the agro-industry produces many different kinds of wood, such as firewood and wood chips, both deciduous and coniferous.

Moreover, the company deals with olive tree crops and, for this reason, produces olive tree pruning as residues.

The agro-industry is interested in evaluating the possibility of diversifying the production, using the residues they produce or in partnership with other local operators.

2.4.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

The regular activity of the agro-industry enables the production of a large amount of agricultural residues that can be treated as solid biomass in the production of an interesting bio-fuel for the local market.

Currently, excluding the chipper, a productive system including the use of the pelletiser and the dryer hasn't yet set up, but the agro-industry is interested in surveying a future potential scenario to efficiently use the produced biomass, also in partnership with other local companies.

B. Type of biomass resources available

The agro-industry has the possibility of direct supplies of biomass, through its normal production, from the urban tree pruning and olive tree pruning. In particular, the olive tree pruning are concentrated during autumn and winter.

Contrarily, even if secondly, the agro-industry can have access of biomass from the forestry and urban garden maintenance activities, more or less during the whole year.

Moreover, in the area there is the possibility to have access at herbaceous residues and also some olive pomace.

Regarding the herbaceous residues, currently they are just used as animal feedstuff, while olive tree pruning are generally burnt in fields and used as fertiliser. The olive pomace is generally sold to the oil pomace industries.

These resources are produced by the agro-industry itself or they come from farmers and agro-industries without any relationship with the cooperative, within a radius of 35 km from it.

It is highlighted that, for the moment, there isn’t any logistic chain to supply these raw materials to the agro-industry. This chain should be completely built, but the logistic concerning the storage of the material is not a problem.

The agro-industry was not able to provide the prices for the purchasing of these raw materials.

On the other hand, in the area there are some logistic chains to produce different types of forestry wood, in which even the agro-industry is working, that can be useful to support the new logistic chain for the production of the biomass from the agricultural residues.

C. Existing equipment in the agro-industry and availability

The weakness concerning the project is that the agro-industry is almost unfurnished of the equipment requested by the project, except a small chipper that is used for the materials from the urban gardens or the forestry activities.

At the same time, the agro-industry declares that they can make investments to purchase these devices.

About the idle period and its correspondence with the production of the residues, it looks positive both for herbaceous and woody as it is reported in the table below:

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chipper					X	X	X	X	X	X		
RESOURCES	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Herbaceous						X	X					
Woody	X	X								X	X	X
Agro-industrial R.										X	X	

There are at least 3 months in which the biomass production can begin.

D. Knowledge on the bioenergy sector

The cooperative is not a biomass consumer but it has a strong knowledge in the biomass production, because it produces biomass from agricultural and urban pruning, olive tree pruning and forestry activities.

Despite of that, the manager has a “gap” of know-how about the main biomass qualities; this allows supposing that the shown goodwill is not completely supported by a good knowledge concerning the managing of the biomass.

E. Biomass market in the region

Currently, in the area of the agro-industry, the solid biomass market is not yet developed: there are just few households consuming wood pellets in a radius of 35 km from the cooperative and there is also a low demand of forestry wood chips.

Not many information about the specifics of these biomass have been given, excluding the price of pellets, between 4,5 and 5 € for a 15 kg bag.

Concerning the periods of the year when the biomass is requested by households, it is mainly in winter time.

Anyway, the agro-industry highlights that the product that can be produced, low-medium quality agro-pellets from herbaceous residues and urban or olive tree pruning, even if mixed with a quantity of forestry wood chips, cannot fulfil the needs of the current market, that is used to consume a much more high-quality product.

Producing and selling the biomass at a significantly lower price than consumers are paying is essential, and a virtuous cycle of knowledge and advertisement to the potential consumers should be set up, because the agro-industry complains an important gap of knowledge (also the agro-industry needs to raise its know-how) about the use of the biomass that, at the moment, stops any new enterprise in the considered area.

2.4.3. Conclusions

Coop. Agr. For. Natura Viva Soc. Coop. has shown immediately an interest in the project, understanding its innovative capacity and foreseeing the possibility of

diversifying the production, improving at the same time the processes to reuse the agricultural residues. Anyway, at the same time, there is a certain gap of knowledge, mainly technical, that can be overcome through a specific training to the employees of the agro-industry. The agro-industry knows and understands this issue and it is working to overcome it, independently of the project.

Even if the agro-industry already produces solid biomass, it is unfurnished of the necessary devices to develop the project, so an eventual involvement should include investments or partnerships with other local operators with adequate equipment.

It has been obtained a positive answer to the interview and the project, in general, and the Cooperative has an interesting investment capacity.

2.5. Diagnosis of Coveco

2.5.1. Company description

Coveco of Claudio de Marco is an agricultural agro-industry working in the maintenance of private and urban gardens. The headquarter is in Porto Recanati, (Province of Macerata).

The agro-industry works for the pruning, maintenance and plantation of trees in urban areas, producing with its activities sawdust, wood scraps and many pruning residues, which are currently only partially chipped, in order to fertilize the soil: the main part is disposed of as waste.

So far the agro-industry had not evaluated the possibility of producing biomass for energy purpose from pruning residues from the urban gardens maintenance.

2.5.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

Coveco showed an initial interest in the project, especially due to the possibility to make greater use of the chipper, even if it’s a small equipment, in order to chop mixed agro-pruning in addition to those from urban and private gardens. The agro-pruning are produced by farmers or agro-industries in the area, but with any link with the agro-industry.

B. Type of biomass resources available

In the area there are oil mills, wineries, farmers, vineyard and olive tree growers but with any link with the agro-industry.

However, within a radius of 35 km there may be availability of olive tree pruning, olive pomace, vineyard pruning, grape pomace, fruit tree pruning. These agro-pruning are generally burned to fertilize fields or left as it is in field in most of the cases. Only olive

pomace can have an alternative use if it is sold to oil pomace industries or subjected to extraction of olive pits directly in the oil mills.

Finally, there isn't any logistic chain to harvest the resources just mentioned.

C. Existing equipment in the agro-industry and availability

The agro-industry has not pelletisers or dryers. It has just a small chipper, and it is also supposed not to want investing to increase the available devices.

However, the chipper seems to be underused between May and October so that, asking directly, the agro-industry afagro-industrys that could eventually be interested to work in partnership giving the chipper during the idle period.

About the idle period and its correspondence with the production of the residues, it can be positive implementing Coveco's storage capacity, as it can be observed in the table below.

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wood Chipper					x	x	x	x	x	x		
RESOURCES	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Mixed agro-pruning	x	x	x								x	x
Olive pomace										x	x	
Grape pomace								x	x			

D. Knowledge on the bioenergy sector

The cooperative is not a biomass consumer and it doesn't produce solid biomass for energy purposes.

However, the interviewed is aware, at least, of the importance of the calorific value, and so of moisture content, of the biomass.

E. Biomass market in the region

Currently, in the area of the agro-industry, the solid biomass market is not so developed: within a radius of 35 km from the agro-industry there are just few intensive energy demanding industries, of which however the type of biomass supply was not specified. Anyway, they ask for solid biomass all over the year.

2.5.3. Conclusions

Although the agro-industry has expressed interest in the project and even if the chipper could be used for mix agro-pruning together with urban garden pruning, there are currently deficiencies in knowledge and some difficulties to face in the local market.

2.6. Diagnosis of La Matrecina Soc. Coop.

2.6.1. Company description

Matrecina Soc. Coop. is a cooperative mainly dealing with forestry activities. The headquarter is in Acqualagna, via Garbaldi, 5 (Province of Pesaro Urbino).

The forestry activities it deals with are logging, timber skidding (producing timber, fire wood and wood chips). In partnership with other agro-industrys, it produces a big amount of wood chips, supplying big consumers mainly in Emilia Romagna Region.

The agro-industry has shown a big interest into the project, because it aims to optimize the residues utilization and also because it works in partnership with some herbaceous residues producers. They know and understand the possibilities of setting up a virtuous chain of reuse of the agricultural residues and they also can make investments if there is an economical feedback.

2.6.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

Even if the agro-industry mainly works in forestry activities and it currently hasn't any pelletiser or dryer, it is supposed to be very interesting for the project because they have a good knowledge of the bio-energy sector, there is a strong partnership with other industry of the same field and it has shown, during the interview, a good managing capacity and a good technical-economical knowledge, needed to carry on this kind of activity.

B. Type of biomass resources available

In the area where the cooperative works, it would be find herbaceous residues, mainly during the summer, from farmers and agro-industries both partners or not, within a radius of 35-50 km. This resource was generally sold as animal feed to farms located mainly in Emilia Romagna, but at the moment they are decreasing their request in a relevant way, so that the agro-industry can have access to a big amount of herbaceous resources.

Moreover, olive tree pruning residues are produced in October and November and olive pomace between October and January.

Even these residues are produced in a radius of 50 km, from producers linked or not with the agro-industry.

It is highlighted that, for the moment, there isn't any logistic chain to supply these raw materials to the agro-industry. This chain should be completely built, but the logistic concerning the storage of the material is not a problem.

Vice versa, in the area there are some logistic chains for producing different types of forestry wood, in where even the agro-industry is working, that can be useful to support the new logistic chain for the production of solid biomass from agricultural residues.

Moreover, it is highlighted that, concerning typical utilisation of the herbaceous products, their request from Emilia Romagna is decreasing, so that this resource is more and more available also in big quantities.

Olive tree pruning are used as fertiliser for the soil (burnt), the olive pomace is given to the pomace industries.

Finally, the agro-industry affirms that they can have access to forestry resources and also biomass from energy crops (populus and robinia).

C. Existing equipment in the agro-industry and availability

The agro-industry has no equipment useful for the project, but anyway it usually works in partnership with other industries producing big quantities of wood chips of different size and moisture content.

Moreover, asking about the possibility of investments to purchase devices useful for the project, the cooperative answers positively.

In the table below are reported the periods of production of the residues:

RESOURCES	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Herbaceous						X	X	X	X			
Olive tree pruning										X	X	
Olive pomace	X									X	X	X

The activity for producing solid biomass could be settled up in several different months.

D. Knowledge on the bioenergy sector

The cooperative is not a biomass consumer but it has a strong knowledge in the biomass production, because it produces a big amount of solid biomass from forestry activities during the whole year.

This activity enables the agro-industry to know very well which are the main properties and qualities to be evaluated when producing biomass for energy purposes, such as the origin of the material, the ash content, the moisture content, the heating value, etc.

E. Biomass market in the region

Currently, in the area of the agro-industry, the solid biomass market is not so developed: there are just few households consuming wood pellets and some intensive energy demanding industries consuming forestry wood pellets and wood chips.

Concerning the periods of the year when the biomass is requested, the intensive energy demanding industries request is ongoing during the year, while the households request is mainly in winter time.

The price of pellets for end users amounts to 375 €/t.

The agro-industry says that some public local entities are beginning to be interested in the energy and heat production from solid biomass, so it could be interesting to implement an assessment, deepening the knowledge of the local potential market, concerning costs and quantity/quality of the requested product.

Anyway, the agro-industry highlights that the product that can be produced, low-medium quality agro-pellets from herbaceous residues and olive tree pruning, even if mixed with a quantity of forestry wood chips and olive pomace, cannot fulfil the needs of the current market in terms of quality.

So that, producing and selling the biomass at a significantly lower price than consumers are paying to purchase the forestry wood pellets is essential.

Moreover, a virtuous cycle of knowledge and advertisement to the potential consumers should be settled up, because the agro-industry complains in the considered area an important gap of knowledge about the use of solid biomass that, at the moment, stops any new enterprise.

Finally, the agro-industry complains about a lack of information and business capacity in many local actors, who in recent years bought biomass heating plants/boilers without a preliminary feasibility study, especially concerning the possibilities for biomass supply.

2.6.3. Conclusions

Matrecina Soc. Coop. has primary forestry activities and, at the moment, it has not the needed equipment for the project. On the other hand, we have to consider the big interest shown by the agro-industry in the project, their deep knowledge in logistic and economical aspects concerning biomass residues utilization and, especially, a business capacity valuated relevant to participate at this kind of project.

It´s important to take into account also its opportunity to work in partnership with other local operators, as agricultural residues producers with adequate equipment needed for the project.

2.7. Diagnosis of Cooperativa Soc. A.r.l. L'Agricola Latianese

2.7.1. Company description

L’Agricola Latianese is a cooperative that produces olive oil and wine located in Latiano, Brindisi Province.

It transforms grapes and olives of its members, small and medium grape and/or olive growers in the area.

In the plant of the olive oil production they also produce olive pits, partly for self-consumption in the boiler to heat water for the production of oil.

They are mainly interested in a different way to use the olive dry pomace instead of selling it to the oil pomace industry and in a way to use the stalk residues from grape processing.

2.7.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

The cooperative has two different seasonal activities: the winery and the oil mill. It has not adequate equipment for the production of solid biomass but it has a large amount of agricultural residues from processing olives (olive pits and olive dry pomace) and grapes (stalks, grape pomace and seeds), residues from the olive and grapes harvesting of its members (olive tree and vineyard pruning) and several months of inactivity due to the seasonal production of the oil from October to January and of the wine in August and September.

B. Type of biomass resources available

The cooperative produces olive pits, partly for their own consumption and partly sold to its members or to private with no specific connection to the agro-industry. The olive dry pomace is sold to oil pomace industry, but since last years there are some problems because the oil pomace industry isn't able to extract enough pomace oil. For this reason, they no longer want to buy the dry residue and this happens in the whole Region.

During the scrape separation of the grapes, the winery produces many stalk residues, which are generally burned, and grape pomace sold to distilleries.

The olive tree and vineyard pruning produced by the members of the agro-industry are chopped to fertilize fields in most of the cases. In some other cases they are used for energy purposes as chips or firewood by the same members or sold to households in the area. The farmers associated to the cooperative are in a radio of 35 km from the agro-industry and this could be an opportunity to became logistic centre since the transport could be carried out by the own farmers. At the moment there is not a logistic chain to harvest or gather these agricultural residues.

In the area there is not much availability of forest wood.

C. Existing equipment in the agro-industry and availability

The existing equipment is not so relevant actually, the cooperative has only an extractor of olive pits and they are not so interested in purchases of equipment for the production of agricultural solid biomass.

The idle periods of the agro-industry is large, as is shown in the following graphs:

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Extractor of olive pits		x	x	x	x	x	x	x	x			
Eventual new equipment	x	x	x	x	x	x	x	x	x	x	x	x
RESOURCES												
Olive pruning	x	x	x	x	x							x
Olive pomace	x	x								x	x	x
Vineyard pruning	x	x										x

D. Knowledge on the bioenergy sector

The cooperative is a solid biomass producer and consumer but, as they consume olive pits self-produced, their knowledge is limited to that single product. They are aware of the importance of drying the olive pits (which is dried naturally under a roof) to reduce the moisture content, therefore, they show a gap in know-how about calorific value, ash content, ecc...

E. Biomass market in the region

There is no a much extended biomass market in the area. The agro-industry consumes around 250 t/year of its own biomass (olive pits) and sells the remaining part of it (150 €/t) to its members and some households within a radio of 35 km. Other agro-industries in the area, included some members of the cooperative, chip olive pruning for auto-consumption for energy purposes.

The agro-industry is aware of a wood pellet market in the area.

The actual olive pits and chips of low quality demand is during winter time.

Furthermore, in the area there is a heated swimming pool that potentially could become a consumer of solid biomass.

To expand the actual market among households or agro-industries in the area there should be awareness to the use of biomass boilers.

2.7.3. Conclusions

The interest of Agricola Latianese Soc. Coop. in the project is high, especially due to the problem, widespread all over Puglia, of disposal of the olive dry pomace.

Despite the agro industry already produces agricultural solid biomass, it is devoid of the minimum equipment necessary for the development of the project, so their possible involvement would still be dependent on any investments in this direction or the creation of a partnership with other local operators. Although the agro-industry can have chance to take on such an investment, it is not attracted by the opportunity to start this new business in first person.

2.8. Diagnosis of A.T.S. MonteMaggiore Soc. Coop. Agr. For.

2.8.1. Company description

A.T.S. Montemaggiore Soc. Coop. Agr. For. is an agro-industry dealing with agro-forestry activities (logging and forest maintenance, resulting in the marketing of products, particularly firewood and wood chips for energy use); natural engineering; services for prevention and extinguishing forest fires; urban trees and design; energy crops; landscape enhancement.

The cooperative is in Orsara di Puglia (FG), via Giuseppe di Vittorio 21.

Currently they produce a big amount of woody biomass, resulting largely from forestry (firewood and wood chips of quality from low to high) and secondarily from energy crops (wood chips of medium quality) and maintenance of urban green spaces (low-quality wood chips).

They are interested in evaluating the possibility of diversifying their production, using the residues they produce or in partnership with other local operators.

2.8.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

For the project, this is a quite interesting agro-forestry industry, because over time it has consolidated several partnerships with others working biomass in the area and extra-Region and, in particular, with a company (Biolegnami Vecera Soc. Coop. Ltd.) which has all the equipment required for the project, which are at the moment under-used.

B. Type of biomass resources available

In addition to agro-forestry residues derived from its business activities, the cooperative may have access to herbaceous resources, still in the area and produced especially during spring and summer (cereal straw), for which currently there is no market and which are generally intended to become animal feed.

Similarly, in the area there is availability of residues as olive tree and vineyard pruning, which at the moment are mainly burned on site in winter.

Moreover, olive growing is highly developed in the area, so it is significant in the winter time the production of olive pomace, which is currently destined for almost exclusively to pomace industry.

Finally, the company reports that there is production of grape pomace potentially usable in the area, mainly in the months of September and October, currently transferred to the distilleries.

All these resources are either from agro-industries and farmers linked to the agro-industry, either from not linked operators: they are all in a radio of 35-50 km from the cooperative.

It is highlighted that, for the moment, there is not any logistic chain to supply these raw materials to the agro-industry. This chain should be completely built, but the logistic concerning the storage of the material is not a problem.

On the other hand, in the area there are some logistic chains to produce different types of forestry wood, in which even the agro-industry is working, that can be useful to support the new logistic chain for the production of the biomass from the agricultural residues.

In addition, the agro-industry is pioneering the use of energy crops in short rotation, especially with the locust-tree, so that has access to wood from short rotation forestry.

C. Existing equipment in the agro-industry and availability

In partnership with Biolegnami Vecera Soc. Coop., the agro-industry can use the following equipment:

- ✓ Pelletizer,
- ✓ Rotary dryer,
- ✓ Mill,
- ✓ Wood chipper,
- ✓ Screening.

Moreover, the agro-industry declares that they can make investments to purchase some devices.

About the idle period and its correspondence with the production of the residues, it looks positive both as it is reported in the table below, where it can be observed that there are several months in which the biomass production can begin.

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pellettiser	X	X	X	X	X	X	X	X	X	X	X	X
Dryer			X	X	X	X	X	X	X	X		
Mill	X	X	X	X	X	X	X	X	X	X	X	X
Wood Chipper					X	X	X	X	X			
Screener	X	X	X	X	X	X	X	X	X	X	X	X
RESOURCES	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Herbaceous					X	X						
Woody	X										X	X
Agro-Industrial R.										X	X	X
Other									X	X		

D. Knowledge on the bioenergy sector

The cooperative is a consumer of solid biomass and consumes about 20 t / year of wood chips. Additionally, it has a strong knowledge in the biomass production, because

it produces solid biomass from forestry activities, agricultural and urban pruning and energy crops.

This activity enables the agro-industry to know very well which are the main properties and qualities to be evaluated when producing biomass for energy purposes, such as the origin of the material, the heat value and the moisture content.

E. Biomass market in the region

Currently, in the area of the agro-industry, the solid biomass market is not so developed. Except for the use of wood chips by the agro-industry, there are just few households that currently consume forest wood pellets within a radius of 35 km from the cooperative. Moreover, a certain quantity of olive pomace (pulverized) and olive pits are used in the area.

The demand for solid biomass is mostly in winter period. The cooperative did not provide data on the characteristics of these products.

The agro-industry says that some public local entities are beginning to be interested in the heat production from solid biomass, so it could be interesting to implement an assessment, deepening the knowledge of the local potential market, concerning costs and quantity/quality of the requested product.

The agro-industry is completely inside the biomass market, as it has been inside the forest-wood-energy chain for many years. It is certainly interested in exploring the possibility of producing a solid biomass derived from agricultural residues, but it recognizes some difficulties that are currently related to the limited knowledge on the subject, to the lack of political willingness and to general economic difficulties which are derived from the crisis.

Furthermore, we must consider that the market demand is a high quality pellets, so that, at the moment, the hypothesis of production of a low-middle quality agro-pellet could be supported and justified only by a purchase price significantly lower.

2.8.3. Conclusions

A.T.S. Montemaggiore Soc. Coop. Agr. For. has immediately shown an interest in the project, understanding its innovative capacity and foreseeing the possibility of diversifying its production, improving at the same time the processes to reuse the agricultural residues.

Currently, the agro-industry already produces solid agro-biomass and has a good know-how. At the same time, some critical issues of its framework are highlighted, mainly related to the lack of knowledge in the biomass market from the local operators and potential consumers.

Moreover, the agro-industry is mainly engaged in forestry activities but on the other hand, although in partnership with another actor in the area, they can use the equipment required by the project, also under-used for much part of the year.

2.9. Diagnosis of Coop. Agr. La Pugliese s.r.l.

2.9.1. Company description

Coop. Agr. La Pugliese s.r.l.is an oil mill agro-industry located in Contrada Pagliarulo, Carovigno (BR).

The Cooperative transforms the olives of its members, small and medium olive growers in the area.

They are mainly interested in a different way to use the olive pomace instead of sailing it to the oil pomace industry and, above all, to use olive pruning residues.

2.9.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

This is an oil mill agro-industry which has not adequate equipment for the production of solid biomass, but it has a large amount of agricultural residues from processing olives (olive pomace), residues from the olive harvesting of its members (olive tree pruning) and several months of inactivity due to the seasonal production from September to January.

B. Type of biomass resources available

The cooperative may have access to herbaceous resources in a radius of a few kilometers, for which currently there is no market and which are generally intended to become animal feed. Who answered the questions has not been able to indicate the annual production period of this biomass resource.

Similarly, in the area there is availability of residues as olive tree pruning, which at the moment are mainly burned on site from September to April.

Moreover, the olive oil production is highly developed in the area, so it is significant in the winter time the production of olive pomace, which is currently destined for almost exclusively to pomace industry.

All these resources are either from agro-industries and farmers linked to the agro-industry, either from not linked operators: they are all within a radio of 35 km from the cooperative.

It is highlighted that, for the moment, there isn't any logistic chain to supply these raw materials to the agro-industry. This chain should be completely built, but the logistic concerning the storage of the material is not a problem. Furthermore, concerning raw

materials from members of the cooperative, it could be an opportunity to became logistic centre since the transport could be carried out by the own farmers.

Currently the agro-industry has no access to any types of wood.

C. Existing equipment in the agro-industry and availability

The cooperative has not equipment useful for the project but they could be interested in purchases of equipment for the production of agricultural solid biomass, if the new production is feasible and convenient.

RESOURCES	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Herbaceous												
Olive tree pruning	X	X	X	X					X	X	X	X
Olive pomace	X	X									X	X

D. Knowledge on the bioenergy sector

The cooperative is not a biomass consumer and it doesn't produce solid biomass for energy purposes. It complains for this reason a knowledge gap related to qualitative properties and quantitative characteristics related to solid biomass.

E. Biomass market in the region

Currently, in the area of the agro-industry, the solid biomass market is not developed: some public local entities are beginning to be interested in the energy and heat production from solid biomass in winter time but no one has started yet.

2.9.3. Conclusions

Coop. Agr. La Pugliese has shown certainly interest in the project but currently has neither the equipment nor the knowledge to be considered compatible for the audit.

Otherwise, the agro-industry can afford investments, together with bridging the knowledge gap, and it can have access to large quantities of agricultural resources for solid biomass.

2.10. Diagnosis of Oleifico Cooperativo Produttori Agricoli di Molfetta

2.10.1. Company description

Oleificio Cooperativo Produttori Agricoli di Molfetta is an oil mill cooperative located in Molfetta, Bari, included in a Producers Organization.

It transforms the olives of its 500 members, small and medium olive growers in the area. They also produce olive pits, mainly for self-consumption, in three boilers to heat water for the production of oil.

They are mainly interested in a different way to use the olive dry pomace instead of selling it to the oil pomace industry and in a way to use olive leaves residue from defoliation.

2.10.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

This is an oil mill industry, for this reason it has not adequate equipment for the production of solid biomass but it has a large amount of agricultural residues from processing olives (olive leaves, olive pits and olive dry pomace), residues from the olive harvesting of its members (olive tree pruning) and several months of inactivity due to the seasonal production from October to January.

B. Type of biomass resources available

The agroindustry produces olive pits, partly for their own consumption and partly sold to some greenhouses in the area. The olive dry pomace is sold to an oil pomace industry, but since last years there are some problems because the oil pomace industry is not able to extract enough pomace oil. For this reason, they do not longer want to buy the dry residue.

During the defoliation of the olives, the oil mill produces many leaves residues, which normally are burned or are given to the only farmer in the area as animal feedstuff.

In the area there are other oil mill cooperatives, linked to the agro-industry in the Producers Organization, which produce the same residues.

The olive tree pruning produced by the members of the agro-industry are burned or chopped to fertilize fields in most of the cases. The farmers associated to the cooperative are in a radio of 35 km from the agro-industry and this could be an opportunity to became logistic centre since the transport could be carried out by the own farmers. At the moment there is not a logistic chain to harvest or gather these agricultural residues, but since they come from the members to the cooperative, to organize or develop a new logistic chain, it would not be an obstacle.

Apart from these, in the area they can have access to vineyard pruning, grape pomace and stalks. Only grape pomace has a marginal use because wineries could sell it to distilleries. The vineyard pruning are generally chopped to fertilize fields and the stalks are burned in most of the cases.

These resources come from farmers or agro-industries with any link with the cooperative and actually there isn’t a logistic chain to harvest or gather the agricultural residues and that could supply the agro-industry with this raw material.

In the area there is not much availability of forest wood.

C. Existing equipment in the agro-industry and availability

The existing equipment is not so relevant actually, the cooperative has an extractor of olive pits and they are thinking to buy another one more performant.

On the other hand, they have no relevant problems of space for the storage of raw material and they could be interested in purchasing equipment for the production of agricultural solid biomass, if the new production is feasible and convenient. The idle period of the agro-industry is large, as is shown in the following graphs:

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Extractor of olive pits	x	x	x	x	x	x	x	x	x	x	x	x
Eventual new equipment	x	x	x	x	x	x	x	x	x	x	x	x
RESOURCES												
Olive and vineyard pruning	x	x	x	x								
Olive pomace and leaves	x									x	x	x
Stalks								x	x	x	x	

It can be observed that there are many periods in which put in place the production of solid biomass.

D. Knowledge on the bioenergy sector

The cooperative is a solid biomass producer and consumer but, as they consume olive pits self-produced, their knowledge is limited to that single product. They are aware of the importance of drying the olive pits (which is dried naturally in the boiler room) to reduce the moisture content, therefore, they are aware of the characteristics of calorific value that a solid biomass must have.

E. Biomass market in the region

There is no a very extended biomass market in the area of the cooperative, except the same agro-industry, which consumes 16 t/year of its own biomass, and the greenhouses, in a radio of 25 km of the oil mill, that buy the olive pits (calorific value 5,000 kcal/kg) from the cooperative at 130 €/t.

The actual olive pits demand is produced during the olive processing, from October to January.

However the other oil mills in the area, inside and outside the OP, could be potential consumers of solid biomass, as well as households in the area. This fact is not obvious because these agro-industries may not have biomass boilers.

The increase in production of quality olive pits at a first glance seems to be profitable. Otherwise the production of chips or pellets from pruning, which requires the purchase of equipment (chipper and/or pelletizer), must be studied in more detail in order to avoid risks.

2.10.3. Conclusions

The interest of Oleificio Cooperativo Produttori Agricoli di Molfetta in the project is high, especially due to the problem, widespread all over Puglia, of disposal of the olive dry

pomace. They also saw the innovative spirit of the project, the possibility of creating a business complementary to the main activities of production of olive oil and the opportunity to collaborate with their partners or other agro-industries nearby to give a further use to all agricultural biomass resources of the area, avoiding the problem of disposal.

Despite the agro industry already produces agricultural solid biomass, it is devoid of the minimum equipment necessary for the development of the project, so their possible involvement would still be dependent on any investments in this direction or the creation of a partnership with other local operators.

On the other hand, being already producers of olive pits, there is also the possibility of increasing this existing production, gathering, and also working the olive pomace from the other oil mills in the area for extracting greater amounts of olive pits.

Moreover, this fact makes the agro-industry aware enough on the biomass market, also in terms of product quality demanded by the market.

2.11. Diagnosis of O.P. Terra di Bari Soc. Coop.

2.11.1. Company description

O.P. Terra di Bari Soc. Coop. is a fruit and vegetable agro-industry that deals with the production of table grapes and cherries.

The Cooperative is located in Casamassima, Noicattaro (BA).

They are mainly interested in a different way to use agricultural residues from their members, conferring grapes and cherries to them for processing.

2.11.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

The main product processed and marketed by the aro-industry is table grapes, with an output of about 7,000 tons of grapes a year, with a variety of black and white grapes, with or without seeds. In the last few years, the production of organic grapes is growing steadily. The harvest and conditioning of grapes take place from June to December.

Recently, the agro-industry is increasing the production of cherries: currently they produce about 100 tons a year of organic cherries.

The agro-industry has shown quite interested in the issues of the project but does not own any equipment valuable.

B. Type of biomass resources available

The cooperative may have access to herbaceous resources, still in the area and produced especially during spring and summer (cereal straw), for which currently there is no market and which are generally intended to become animal feed.

Similarly, in the area there is availability of residues as olive tree and vineyard pruning, which at the moment are mainly burned on site in winter.

Moreover, olive oil production is highly developed in the area, so it is significant in the winter time the production of olive pomace, which is currently destined for almost exclusively to pomace industry.

Finally, the agro-industry reports that there is production of grape pomace potentially usable in the area, mainly in the months from September to December, currently transferred to the distilleries.

All these resources are either from agro-industries and farmers linked to the agro-industry, either from not linked operators: they are all in a radio of 35 km from the cooperative.

It is highlighted that, for the moment, there isn't any logistic chain to supply these raw materials to the agro-industry. This chain should be completely built, but the logistic concerning the storage of the material is not a problem. Furthermore, concerning raw materials from members of the cooperative, it could be an opportunity to became logistic centre since the transport could be carried out by the own farmers.

Currently the agro-industry has no access to any type of wood different from pruning.

C. Existing equipment in the agro-industry and availability

The cooperative has not pelletisers or dryers but they could be interested in purchases of equipment for the production of agricultural solid biomass, if the new production is feasible and convenient.

RESOURCES	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Olive tree pruning	X	X										
Vineyard pruning	X	X										
Olive pomace	X	X										X
Grape marc									X	X	X	X

D. Knowledge on the bioenergy sector

The cooperative is not a biomass consumer and it does not produce solid biomass for energy purposes. It complains for this reason a knowledge gap related to qualitative properties and quantitative characteristics related to solid biomass.

E. Biomass market in the region

Currently, in the area of the agro-industry, the solid biomass market is not so developed: there are just few households consuming wood pellets in a radius of 35 km from the cooperative.

The biomass is mainly request in winter time by households. The owner didn't provide data on the characteristics of these materials.

2.11.3. Conclusions

O.P. Bari area Soc. Coop. has shown certainly interest in the project but currently has neither the equipment nor the knowledge to be considered completely compatible for the audit.

Otherwise, the agro-industry can afford investments, together with bridging the knowledge gap, and it can have access to large quantities of agricultural resources for solid biomass.

2.12. Diagnosis of Ortofrutticola Alberobellese Soc. Coop. a r.l.

2.12.1. Company description

Ortofrutticola Alberobellese Soc. Coop. a r.l. is an oil mill and fruit agro-industry that deals with the production of oil and candied cherries.

The Cooperative is located in Contrada Popoleto, Alberobello (BA). For the purposes of this project, it is interesting to consider their activity as producers of oil.

The Cooperative transforms the olives of its members, small and medium olive growers in the area.

They are mainly interested in a different way to use the olive pomace instead of selling it to the oil pomace industry and, above all, to use olive pruning residues.

2.12.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

This is an oil mill agro-industry which has not adequate equipment for the production of solid biomass, but it has a large amount of agricultural residues from processing olives (olive pomace), residues from the olive harvesting of its members (olive tree pruning) and several months of inactivity due to the seasonal production from September to January.

B. Type of biomass resources available

The cooperative may have access to olive tree pruning, which at the moment are mainly burned on site from March to May.

Moreover, olive oil production is highly developed in the area, so it is significant in the winter time, from September to January, the production of olive pomace, which is currently destined for almost exclusively to pomace industry.

All these resources are either from agro-industries and farmers linked to the agro-industry, either from not linked operators: they are all in a radio of 10 km from the cooperative.

It is highlighted that, for the moment, there is not any logistic chain to supply these raw materials to the agro-industry. This chain should be completely built, but the logistic concerning the storage of the material is not a problem. Furthermore, concerning raw materials from members of the cooperative, it could be an opportunity to became logistic centre since the transport could be carried out by the own farmers.

Currently the agro-industry has no access to any types of wood apart from pruning.

C. Existing equipment in the agro-industry and availability

The cooperative has not pelletisers or dryers but they could be interested in purchases of equipment for the production of agricultural solid biomass, if the new production is feasible and convenient.

RESOURCES	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Olive tree pruning			X	X	X							
Olive pomace	X								X	X	X	X

D. Knowledge on the bioenergy sector

The cooperative is not a biomass consumer and it doesn't produce solid biomass for energy purposes. It complains for this reason a knowledge gap related to qualitative properties and quantitative characteristics related to solid biomass.

E. Biomass market in the region

The knowledge gap is also about lack of information on current biomass consumers in the area, for which they have not been given some information about it.

2.12.3. Conclusions

The agro-industry has shown certainly interest in the project but currently has neither the equipment nor the knowledge to be considered compatible for the audit.

Otherwise, the agro-industry can afford investments, together with bridging the knowledge gap, and it can have access to large quantities of agricultural resources for solid biomass.

2.13. Diagnosis of Profenda S.r.l.

2.13.1. Company description

The Profenda S.r.l. is an animal feed factory located in Bortigali, Nuoro.

It is identified as a company target for the diagnosis phase of the project, especially thanks of the equipment it has. On the other hand in the area around the agro-industry there's not much availability of biomass resources.

2.13.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

The agro-industry is an animal feed factory, for this reason it has adequate equipment for the production of solid biomass but in the area there's no available raw material. The agro-industry itself reuse most of all its residues or minimize their production.

Furthermore the biomass market in the area around the agro-industry is not so developed.

B. Type of biomass resources available

The agro-industry produces dust that recovers with a recycling system to the plant entrance. Moreover they generate approximately 2-3 tons of waste per year, on the bottom of the silo, which they sell to a company for the production of biogas.

In the area, within a radio of 35 km, there are some olive groves and vineyards, producing pruning. Otherwise the agro-industry affirms that farmers use pruning for their own boiler.

There are few agro-industries (oil mills, wineries or cereal mills) around the factory but with any link with Profenda and actually there isn't a logistic chain to harvest or gather the agricultural residues and that could supply the agro-industry with this raw material.

Finally in the area there is not much availability of forest wood.

C. Existing equipment in the agro-industry and availability

The agro-industry has pelletisers, screen and mills unused in July and August and underused in the whole year during the day: they produce animal feed during the night. Otherwise they focus on needed maintenance of the plant during the day.

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pelletisers							x	x				
Screen							x	x				
Mill							x	x				
RESOURCES												
Olive and vineyard pruning	x	x	x	x								

The idle period of the main equipment does not match with the production of the possible residues and also with the solid biomass demand, even if it could be studied the feasibility of a production of solid biomass during daylight hours.

D. Knowledge on the bioenergy sector

The cooperative is not a biomass consumer and it doesn't produce solid biomass for energy purposes.

They need to fill a gap in the knowledge on bioenergy. Regarding the solid biomass, they only have awareness about the heating value in the evaluation of the quality of the solid biomass.

E. Biomass market in the region

Currently, within a radio of 35 km from the agro-industry, the solid biomass market is not so developed: there are just few households consuming forestry wood pellets, sold at 400 €/t, and some farmers consuming their own pruning, especially in winter time.

2.13.3. Conclusions

Although the agro-industry has the equipment required by the project and its availability could be set in place several days a year, they do not want to risk in diversifying their activities, considering the insufficient availability of agricultural biomass resources in the area and almost the lack of a local biomass market in the region around the agro-industry.

2.14. Diagnosis of Cooperativa Agricola Rinascita Oliena

2.14.1. Company description

The Cooperativa Agricola Rinascita Oliena is a cheese factory located in Oliena, Nuoro. It transforms the goat and sheep milk of its 100 members, shepherds in the area.

They are interested in assessing the possibility of becoming a biomass logistic centre with the purpose of diversifying its activities and partly for self-consumption, replacing their own diesel boiler. Moreover they are interested in evaluating the opportunity to produce electricity by cogeneration in their plant.

In particular, they are neighbours with an oil mill, producing olive pits for self-consumption, interested in the disposal of the pitted olive pomace residue. Otherwise they have a good network of contacts in the area with other agro-industries (as wineries and oil mills) and farmers.

2.14.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

The agro-industry is a cheese factory, for this reason it has not adequate equipment for the production of solid biomass but it has access to a large amount of agricultural residues in the area from other agro-industries or farmers (especially vineyards and olive tree pruning, as well as olive pits and olive pomace).

B. Type of biomass resources available

The agroindustry can have access to pitted olive pomace of the oil mill nearby, with which they have a good links and which is really interested in finding a pitted olive pomace reuse.

In the area, within a radio of 35 km, they also can have access to olive tree and vineyard pruning, grape pomace and stalks. Only grape pomace has a marginal use because wineries could sell it to distilleries. The olive tree and the vineyard pruning are generally burned in fields in order to fertilize the soil.

These resources come from farmers or agro-industries with any link with the cooperative and actually there isn't a logistic chain to harvest or gather the agricultural residues and that could supply the agro-industry with this raw material. As for the pitted olive pomace of the neighbouring oil mill, the logistics organization is extremely simple and conducive to the realization of the logistics centre for agro-biomass production.

In the area there is not much availability of forest wood.

C. Existing equipment in the agro-industry and availability

The cooperative has not pelletisers or dryers but they could be interested in purchasing equipment for the production of agricultural solid biomass, if the new production is feasible and convenient.

Moreover they have big spaces for the storage of raw material.

In the table below are reported the periods of production of the residues:

RESOURCES	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Vineyard pruning		x	x	x								
Olive tree pruning		x	x	x								
Olive pomace	x	x								x	x	x

The activity for producing solid biomass could be settled up in several different months.

D. Knowledge on the bioenergy sector

The cooperative is not a biomass consumer and it doesn't produce solid biomass for energy purposes.

They need to fill a gap in the knowledge on bioenergy. Regarding the solid biomass, they have awareness about the moisture content in the evaluation of the quality of the solid biomass.

E. Biomass market in the region

Currently, within a radio of 10 km from the agro-industry, the solid biomass market is not so developed: there are just few households consuming forestry wood pellets or firewood and some agro-industries (as the oil mill nearby) consuming olive pits or forestry wood pellets.

The agro-industries identifies 12% as a limit value for the moisture content of forestry wood pellets, firewood and olive pits, sold respectively at 300 €/t, 170-180 €/t and 160 €/t, especially in winter time.

The purchasing cost of pitted olive pomace, with a good chance at 0 €/t, encourages the interest of the cooperative in exploring the feasibility and profitability of a new business for the agro-biomass production.

The agro-industry intends to replace the diesel boiler with a biomass boiler, even it is considering to build a cogeneration plant burning solid biomass.

2.14.3. Conclusions

The interest of Cooperativa Agricola Rinascita Oliena in the project is high, they saw the innovative spirit of the project, the possibility of creating a business complementary to the main activities of production of cheese and the opportunity to collaborate with agro-industries nearby to give a further use to all agricultural biomass resources of the area, avoiding the problem of disposal.

On the other hand the agro-industry is devoid of the minimum equipment necessary for the development of the project, so their involvement would still be dependent on any investments in this direction or the creation of a partnership with other local operators.

2.15. Diagnosis of Santa Maria La Palma S.c.a.a.

2.15.1. Company description

Santa Maria La Palma is a cooperative located in Alghero, Sassari.

It produces wine, transforming grapes of its members, small and medium grape growers in the area.

They are mainly interested in a different way to use the stems and the grape pomace residues from grape processing.

2.15.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

The cooperative has not adequate equipment for the production of solid biomass but it has a large amount of own agricultural residues from processing grapes (stems, grape pomace and seeds) and other residues in the area from grapes harvesting of its members (vineyard pruning).

Thanks to the seasonal production of the wine from August to October, they also have several months of inactivity.

B. Type of biomass resources available

During the scrape separation of the grapes, the winery produces many stems residues, which are generally burned, and grape pomace sold to distilleries.

The vineyard pruning produced by the members of the agro-industry are left in field for fertilization, in most of the cases. This also happens to olive and fruit trees growers in the area, without any link with the cooperative. A marginal use of pruning in the area is the production of compost in a farm about 30 km from the winery.

All the agro-pruning to which the winery can have access, are within a radio of 35 km from the agro-industry.

At the moment there is not a logistic chain to harvest or gather these agricultural residues, but concerning at least vineyard pruning the transport could be carried out by the own farmers associated to the agro-industry.

In the area there is not much availability of forest wood.

C. Existing equipment in the agro-industry and availability

The existing equipment is not so relevant actually, the cooperative has only a destamming machine, aspiring and chopping stems, and they are not so interested in purchases of equipment for the production of agricultural solid biomass, even if, in the past, they evaluated the purchase of a chipper.

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Destamming machine	x	x	x	x	x	x	x				x	x
RESOURCES												
Stems and grape pomace									x	x		
Olive and fruit tree pruning									x	x	x	
Vineyard pruning	x						x					

D. Knowledge on the bioenergy sector

The cooperative is not a biomass consumer and it doesn't produce solid biomass for energy purposes.

They need to fill a gap in the knowledge on bioenergy. Regarding the solid biomass, they only have awareness about the heating value in the evaluation of the quality of the solid biomass.

E. Biomass market in the region

Currently, within a radio of 10 km from the agro-industry, the solid biomass market is not so developed: there are just few households consuming olive pits or forestry wood pellet in winter and two cogeneration plants for the production of electric energy consuming chips from energy crops all over the year.

2.15.3. Conclusions

The interest of Santa Maria La Palma in the project is high, due to the problem of disposal of the stems and grape pomace too.

On the other hand the agro-industry is devoid of the minimum equipment necessary for the development of the project, so their involvement would still be dependent on any investments in this direction or on the creation of a partnership with other local operators. Although the agro-industry can have chance to take on such an investment, it is not attracted by the opportunity to start now this new business in first person.

2.16. Diagnosis of Agriambiente Mugello cooperativa agricola multifunzionale

2.16.1. Company description

Agriambiente Mugello cooperativa agricola multifunzionale is an agro-industry dealing with activities related to agriculture, livestock, forestry, management of public and private green and production of forest biomass. The company manages a farmhouse too.

It is located in Mugello region, Via di Galliano 15/A Barberino di Mugello (FI)

They could be interested in evaluating the possibility of diversifying their production, using the residues produced in the area, if there is an economic advantage.

2.16.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

Agriambiente Mugello is a multi-purpose cooperative that carries out various activities: interventions of forestation, hydraulic works, environmental engineering interventions, construction and maintenance of large green spaces.

In the agricultural field, they produce biological farming, working on about 1.600 ha, especially cereal crops that are used to support their livestock activities. The agro-industry produces about 1.4 million litres of biological milk a year.

They manage also a farmhouse with restaurant.

Finally, in recent years the agro-industry had specialized in forestry wood biomass production and it supplies some heating plants in Tuscany with wood chips.

B. Type of biomass resources available

As agro-industry which manages crop fields, the cooperative produces large quantities of cereal straw and corn stalks, but these residues are directly re-used for livestock activities.

In the area, within a radius of 20 km, there are other farmers or agro-industries, also linked to Agriambiente Mugello, producing the same residues, but also in this case, they are used for livestock activities.

Cereal straw is produced mainly in July, while corn stalks are produced in June and between September and October.

In the area they can have access to small amounts of residues from urban vegetation, olive tree pruning and vineyard pruning, usually left or burned in field.

The cooperative itself and other agro-industries with any link with Agriambiente Mugello produce residues from forestry wood.

Actually, there isn't a logistic chain for these raw materials while there is for forestry wood. Indeed, the agro-industry has access to big amounts of forestry wood, as it produces about 4.000 tons of wooden posts, firewood and wood chips.

C. Existing equipment in the agro-industry and availability

Agriambiente Mugello has a vertical dryer with layers, powered by diesel, for cereals drying.

It also has a small mill, for the treatment of cereals, and a small chipper, operated from the tractor, that is used for the chipping of the urban green pruning and riverside vegetation.

They would have enough space for the potential storage of raw materials and they could afford the necessary investments related to this project.

With regard to the match of the seasonal production of the biomass resources with the idle periods of the agro-industry, as it is shown in the following graphs, it is interesting, especially considering a production of residues of forestry origin variable but continued throughout the year:

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dryer	X	X	X	X	X	X	X	X	X	X	X	X
Mill*	X	X	X	X	X	X	X	X	X	X	X	X
Chipper						variable						
RESOURCES												
Cereal straw							X					
Corn stalks						X			X	X		
Wood	variable											

*the mill is used for only two days a week throughout the year.

D. Knowledge on the bioenergy sector

The farm is a solid biomass producer, although not a consumer, but they sell it to supply facilities located in the area. For these reasons, they have a clear idea of what are the most important properties of quality to be obtained from a biomass supplier when you want to compare different biofuels.

E. Biomass market in the region

Within a radio of 35 km from the agro-industry, there are some households who consume wood chips and pellet but they report that the main consumers are some public buildings, which consume forestry wood chips in districts heating. This chip is typically paid 30 €/t (chip is from coniferous wood left from vegetation cut along rivers in the area) and prompted especially in winter for heating and, marginally, in the summer for hot water.

2.16.3. Conclusions

The interest of Agriambiente Mugello in the project is high, especially because they saw the possibility of creating a business complementary to the main agricultural, livestock and forestry activities.

Moreover, they are exploring for some months the possibility to build a plant for the production of forestry wood pellets, so that they are more interested in the possibility to manage also a production of pellets from agricultural residues.

The major obstacle at the moment is the shortage of raw material with any other use, but it is equally true that in the area it would be possible to create a partnership with other farmers, which could supply Agriambiente Mugello with the necessary amount of residues. This depends on how the logistic chain is created.

In addition, the agro-industry is aware on the limits and possibilities of the project and available to invest.

2.17. Diagnosis of Azienda Agricola Forestale Paolo Macchia

2.17.1. Company description

The Azienda Agricola Forestale Paolo Macchia is an agro-industry dealing with agro-forestry activities (logging and forest maintenance, resulting in the marketing of products, particularly firewood and wood chips for energy use); olive growing, natural engineering; services of shovelling snow.

The farm is located in Pistoia and produce a big amount of forestry wood biomass as firewood and wood chips.

They could be interested in evaluating the possibility of diversifying their production, using the residues produced in the area, if there is an economic advantage.

2.17.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

The agro-industry actually has not adequate equipment for the production of solid biomass, even if they provide district heating with biomass, because they use to rent chippers or to collaborate with forestry firms owning suitable equipment.

They may have access to a large amount of agricultural residues from farmers or agro-industries in the area, but with any link with the agro-industry.

B. Type of biomass resources available

In the area there are oil mills, wineries, farmers, vineyard and olive tree growers, etc. but with any link with the agro-industry.

However, within a radius of 35 km there may be availability of olive tree pruning, olive pomace, vineyard pruning, grape pomace, fruit tree pruning, ... none of these raw materials from the agro-industry diagnosed, except a bit of olive tree pruning.

The pruning are generally burned to fertilize fields or left as it is in field in most of the cases. Only olive pomace can have an alternative use if it is sold to oil pomace industries or subjected to extraction of olive pits directly in the oil mills.

There isn’t any logistic chain to harvest or gather the resources just mentioned.

In the area there is much availability of forest wood and the agro-industry itself produce peels of wooden poles and sawdust.

C. Existing equipment in the agro-industry and availability

The agro-industry has not any equipment useful for the project, but anyway it usually works in partnership with other industries supplying them with forestry wood for wood chips. On the other hand, they have large spaces for the storage of raw materials.

Moreover, asking about the possibility of investments to purchase devices useful for the project, the agro-industry answers positively, if there will be evidence of an economic convenience.

In the table below are reported the periods of production of the residues:

RESOURCES	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Olive tree pruning	x	x	x									
Olive pomace	x									x	x	x
Vineyards pruning											x	x

D. Knowledge on the bioenergy sector

The company is a solid biomass producer, as they supply all over the year, other agro-industrys with wood forest in order to produce wood chips with.

The agro-industry is aware of the main qualitative characteristics of solid biomass, as calorific value, moisture and ash content, size dimension, in addition of the cleanliness and absence of foreign matter that biomass should have.

E. Biomass market in the region

Consumers supplied in the area, in a radius of 35 km, with the chip produced are above all district heating plants and greenhouses. The wood chip has a 10% of moisture content and it is sold at 70 to 85 €/t with 10 % moisture content and 50 €/t for higher moisture content.

In addition, within the same distance, there are households and agro-industries or farmers who respectively consume wood pellets and olive pits.

2.17.3. Conclusions

Azienda Agricola Forestale Paolo Macchia has shown an interest in the project, foreseeing the possibility of diversifying its production, improving at the same time the processes to reuse the residues in the area.

Currently, the agro-industry already produces solid biomass and has a good know-how. At the same time, some critical issues of its framework are highlighted, mainly related to the lack of any logistic chain and links with potential suppliers of agricultural residues and also because of lack of knowledge in the biomass market from the local operators and potential consumers.

2.18. Diagnosis of Azienda Agricola Il Bello

2.18.1. Company description

The Azienda Agricola Il Bello, located in Pistoia, is an agro-industry dealing with agro-forestry activities (logging and forest maintenance, resulting in the marketing of products, particularly wood for works, firewood and wood chips for energy use); natural engineering; olive growing, viticulture and wine production.

They are interested in evaluating the possibility to produce a different type of solid biomass, or in general to increase this type of production, and to reuse their own residues or residues produced in the area, if there is an economic advantage.

2.18.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

The farm actually produces solid biomass and has also residues from its agricultural activities.

They start woody chip production since few months thanks to the cut of 60 ha of forest for the mainly production of wood for works and partially of firewood. 600 t/yr of woody chip are expected, although they would need to establish a reliable customer base.

In the agricultural field, they own 14 ha of olive trees and 4 ha of vineyards and they produce wine too.

For that reason, they have a certain amount of their own residues and they may have access to agricultural residues from farmers or agro-industries in the area, even if with any link with the agro-industry.

B. Type of biomass resources available

The farm itself produces olive tree pruning, vineyard pruning, grape pomace and stems.

In the area there are oil mills, other wineries, farmers, vineyard and olive tree growers even if with any link with the agro-industry.

However, within a radius of 35 km there may be availability of olive pomace and other olive tree pruning and vineyard pruning.

The pruning, produced mainly from January to April, are generally burned to fertilize fields or left as it is or chopped and left in field. Only olive pomace, available mainly in October and November, can have an alternative use if it is sold to oil pomace industries or subjected to extraction of olive pits directly in the oil mills.

There isn’t any logistic chain to harvest or gather the resources just mentioned.

In the area there is much availability of forest wood and the farm itself produces 200t/yr of wood for works and, as a result, peels of wooden poles and sawdust.

C. Existing equipment in the agro-industry and availability

The agro-industry has a small chipper, its use is variable because the material is collected and stored until reaching the useful amount for chipping. However, the equipment is less used from May to August. For the rest of the year, the use of the equipment is flexible and can be scheduled based on the availability of gathered residues. In fact, they would have enough space for the potential storage of raw materials.

With regard to the match of the seasonal production of the biomass resources with the idle periods of the agro-industry, as it is shown in the following graphs, the activity for producing solid biomass could be settled up in some months:

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chipper*					X	X	X	X				
RESOURCES												
Olive tree and vineyards pruning	X	X	X	X								
Grape pomace and stems										X		
Olive pomace										X	X	

*the use of the chipper is flexible and can be scheduled based on the availability of gathered residues

D. Knowledge on the bioenergy sector

The farm is a solid biomass producer, as they start few months ago, to produce wood chip. Both firewood and wood chips are generally produced from September to May.

Il Bello is also a biomass consumer itself, consuming about 30 t/yr of firewood to heat the place.

The farm is not so aware on the main qualitative characteristics of solid biomass, except for calorific value.

E. Biomass market in the region

Since they are now beginning to produce wood chips, they need to build a network of consumers. They are interested in supplying some of the existing district heating and greenhouses in a radius of 35 km, fuelled by chips almost all the year.

Actually, they sell their wood chip at 60 €/t, including transport.

In addition, within the same distance, there are families consuming wood pellets.

2.18.3. Conclusions

Azienda Agricola Il Bello has shown an interest in the project, foreseeing the possibility of improving and diversifying its production, reusing at the same time their own residues or residues in the area.

Currently, the agro-industry already produces solid biomass. At the same time, some critical issues of its framework are highlighted, mainly related to the lack of knowledge on the bioenergy sector and of any logistic chain and also because of lack of contact in the biomass market, especially as potential consumers.

2.19. Diagnosis of Consorzio Agrario del Tirreno Soc. Coop.

2.19.1. Company description

Consorzio Agrario del Tirreno Soc. Coop., located in Grosseto, mainly deals with animal feed production and secondary collects and commercializes arable crops from other agro-industries.

The Cooperative has adequate equipment for agro-pellet production and they are interested in a different way to use their own residues and eventually the agricultural residues in the area. On the other hand, they do not trust fully in the solid biomass production for energy purpose, mainly due to the risk of contamination of their own pelletizers and to the legislative ambiguity that exists around the subject of agricultural residues, which may be regarded as waste.

2.19.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

The agro-industry has two activities: production of animal feed and commercialization of arable crops. For the second activity they pick up arable crops from the farms in the area and distribute them on the market.

Therefore, the Cooperative would have adequate equipment for the production of solid biomass and also the availability of a certain amount of byproducts and residues to be used. However, the production plant of animal feed works the whole year always using pelletisers, screens and mills.

B. Type of biomass resources available

The agro-industry produces residues, mainly as silo waste. Furthermore, they can have access to herbaceous resources in the area, within a radio of 50 km, as cereal straw, maize stalks, sunflower straw, etc…

Even if there isn't a logistic chain to harvest and supply the agro-industry with this raw material, these agricultural residues are produced by farmers linked with the

Cooperative due to the service of collecting and commercializing arable crops that it offers to them.

Within a radius of 50 km, there are also oil mills, wineries, vineyard and olive tree growers but with any link with the agro-industry.

However, in the area there may be availability of olive tree pruning, olive pomace, vineyard pruning, grape pomace, fruit tree pruning. These agro-pruning are generally burned to fertilize fields or left as it is in field in most of the cases. Only olive pomace can have an alternative use if it is sold to oil pomace industries or subjected to extraction of olive pits directly in the oil mills.

C. Existing equipment in the agro-industry and availability

The cooperative has pelletisers, screens and mills underused in August.

For this reason and in order to avoid risk of contamination they should invest in other pelletisers, mills or screens to use them only for solid biomass production. At the contrary they seem to have no problems for storage the raw materials.

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pelletisers								x				
Screen								x				
Mill								x				
RESOURCES												
Herbaceous resources						x	x	x	x	x		
Silo waste	x	x	x	x	x	x	x	x	x	x	x	x
Olive pomace										x	x	x
Mixed agro-pruning	x	x	x	x								

The activity for producing solid biomass could be settled up just in one month if the agro-industry doesn't invest in new equipment.

D. Knowledge on the bioenergy sector

The cooperative is not a biomass consumer and it doesn't produce solid biomass for energy purposes. At the same time, they have awareness about solid biomass properties in order to reach a good quality: heating value, moisture content, ash content, particle size, etc…

Although the agro-industry has the problem of disposing of its byproducts and is interested in offering additional services for the use of residues of farmers linked with itself, they are not so convinced about the success of solid biomass for energy purposes, as future business strategy.

E. Biomass market in the region

Currently, within a radio of 50 km from the agro-industry, the solid biomass market consists in few families consuming forestry wood pellets and some farmers or agro-industries consuming forestry wood pellets or olive pits, especially during winter.

2.19.3. Conclusions

Although the Cooperative has the equipment required by the project and the availability of a large amount of agricultural residues in the area, they wouldn't create this new business line, considering the risk of contamination of its basic products and the lack of trust in the solid biomass market for energy purpose, in terms of legislative ambiguity among residues and waste concept.

2.20. Diagnosis of Leo Verde Società Agricola

2.20.1. Company description

Leo Verde Società Agricola is a farm of olive, ryegrass crops growing and it also deals with the production of electricity from biogas. It is located in Roccastrada, Grosseto.

They purchase olive pomace, corn, triticale and ryegrass for biogas production in a cogeneration plant that they run. They also produce olive pits, which mainly sell to the oil mills from which they buy olive pomace.

They are interested in evaluating the possibility of diversifying their production offering a solid biomass fuel for specific users in the area and offering the possibility to other nearby farmers to find a way to use their agro pruning, if there is an economic advantage.

2.20.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

The farming company actually has not adequate equipment for the production of solid biomass but it can have a large amount of agricultural residues from farmers or agro-industries in the area from which already buy energy crops and olive pomace, or others with any link with the farm.

Leo Verde has also some knowledge in the field of bioenergy and is interested in finding a way to use the excess heat resulting from the production of biogas.

B. Type of biomass resources available

For biogas production the farm produces ryegrass itself and then purchases olive pomace, corn, triticale and ryegrass from farmers or agro-industries in the area, within a radio of 50 km from Leo Verde. They feed a 1 MW biogas cogeneration plant.

Actually there is a logistic chain for these raw materials just mentioned, in particular the company buy:

- ✓ olive pomace at 25 €/t;

- ✓ corn at 45 €/t;
- ✓ triticale at 38 €/t;
- ✓ ryegrass at 36 €/t.

The farm produces also olive pits, mainly sold to the oil mills from which they buy olive pomace, partly consumed to heat an owned swimming pool.

Moreover Leo Verde is an olive grower and for this reason it has olive tree pruning, in addition to the mixed pruning of a few fruit trees they own.

Furthermore in the area they can have access to vineyard pruning, grape pomace and stems, olive leaves from the defoliation phase in the oil mills, olive tree pruning, corn cobs, sunflower stalks, cereal straw, rape straw, sunflower straw, ...

The olive tree pruning and the vineyard pruning produced by Leo Verde itself and by other farmers in the area (within a radio of 50 km from the farm) are generally burned or left on the field. Grape stems from agro-industries around are also burned in most of the cases. Instead the grape pomace has a marginal use because wineries could sell it to distilleries.

During the defoliation of the olives, the oil mills produce many leaves residue, which normally burn or give to farmers in the area as animal feedstaff.

The straw has a marginal use for fertilization of fields.

Finally, sunflowers stalks have no particular uses but give difficulties in gathering.

There isn't a logistic chain to harvest or gather the resources just mentioned but these raw materials come partly from farmers or agro-industries which actually supply the farm with agricultural resources for the production of biogas.

In the area there is availability of forest wood, wood from energy crops plantations and residual wood, with no particular uses actually.

C. Existing equipment in the agro-industry and availability

The existing equipment is not so relevant actually, the farm has got two extractors of olive pits and they affirm to produce a lot of excess heat as a result of the biogas production. They are interested in evaluating the possibility to find a way to use this heated air, for example for drying solid biomass.

Moreover they have large spaces for the storage of raw materials and they could be interested in purchases of equipment for the production of agricultural solid biomass, if the new production is feasible and convenient.

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Extractor of olive pits	x	x	x	x	x	x	x	x	x	x	x	x
Heated air					x	x	x	x	x			
RESOURCES												

Olive tree pruning			x	x	x	x	x	x				
Olive pomace and leaves	x									x	x	x
Vineyards pruning	x	x										x
Grape stems								x	x	x	x	
Straws						x	x	x				
Corn cobs									x	x		

It can be observed that there are many periods in which put in place the production of solid biomass.

D. Knowledge on the bioenergy sector

The farm is a solid biomass producer and consumer, as they consume olive pits self-produced. Moreover they are biogas producer, so they are aware of the characteristics of calorific value and moisture content that a solid biomass must have, in addition of the cleanliness and absence of foreign matter in the biomass resources.

For the cogeneration plant they produce 11.000 m^3/day of biogas burning around 17.000 -18.000 t/yr of biomass divided as follows:

- ✓ 4.300 t/yr of ryegrass;
- ✓ 5.000 t/yr of olive pomace;
- ✓ 5.300 t/yr of corn;
- ✓ 2.200 t/yr of triticale.

E. Biomass market in the region

Within a radio of 35 km from the farm there are agro-industries, farmers and households consuming mostly the olive pits produced by the company itself (with a moisture content < 20 %, at a market price of 150-170 €/t), especially in winter.

Also Leo Verde consumes its own olive pits to heat the swimming pool few days in summer time.

Potential consumers of solid biomass could be public buildings and more households of those already consuming.

2.20.3. Conclusions

The interest of Leo Verde in the project is high, especially because they saw the possibility of creating a business complementary to the main activities of biogas production and electricity cogeneration, olive trees growing. They consider highly the opportunity to collaborate with their partners or other agro-industries and farmers nearby to give a further use to all agricultural biomass resources of the area (included their ones), avoiding the problem of disposal. They have large spaces to storage raw materials and logistic chains already exist or could be created complementing existing.

Despite the farm already produces agro biomass, it is devoid of the minimum equipment necessary for the development of the project, so their possible involvement

would still be dependent on any investments in this direction. It could be interesting evaluate the possibility of using the excess heated air produced as a result of biogas production.

The biomass market could be the most significant weakness, to avoid by raising awareness of public and private entities to the use of solid biomass boilers.

2.21. Diagnosis of Cooperativa Agricola Il Forteto

2.21.1. Company description

Cooperativa Agricola Il Forteto, located in Vicchio, Florence, mainly deals with activities about cereal crops, forestry, livestock for slaughter, dairy sector, olive and fruit tree growing.

It has some equipment for the agricultural biomass production, a good knowledge about bioenergy and it uses woody biomass, but it uses almost all of its agricultural residues. So it would be interested in the opportunity given by SUCELLOG Project if the change of the current intended use of its own residues for agro-biomass production could represent an economic advantage.

2.21.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

Il Forteto manages 200 ha of forest, from which it produces woody chips and firewood, for self-consumption and for selling, 1 ha of olive grove and 1,5 ha of orchard. It grows forage, barley and field bean for its own animals, which it breeds for dairy and meat production.

Moreover, it grows wheat and barley for beer production, it makes wood baked bread and it sells food products, greenhouse plants and solid biomass for energetic purpose.

The cooperative manages a stable too.

B. Type of biomass resources available

As an arable manager agro-industry, the cooperative produces big amounts of cereal straw, available from June to August, but these residues are directly reused as livestock bedding.

There are not many olive and fruit tree pruning, available from March to August, and they are usually chopped in the fields.

The other farms within a 35 km radius reused on their own or sell for the same purpose their agricultural biomass resources too.

In the area, rich of big woody areas, there is a great woody biomass availability. The cooperative itself produces for self-consumption and for selling forest wood chips and fire wood, of which it sells 150 t/year.

C. Existing equipment in the agro-industry and availability

Il Forteto has a chipper operated by the tractor and a mill for cereal processing.

The farm would have enough space for the potential storage of raw materials.

With regard to the match of the seasonal production of the biomass resources with the idle periods of the agro-industry, as it is shown in the following table, there are several months in which the starting of the new business is possible:

EQUIPMENTS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mill	X	X	X	X	X					X	X	X
Chipper			variable									
RESOURCES												
Straw						X	X	X				
Olive tree and vineyards pruning			X	X	X	X	X	X				

D. Knowledge on the bioenergy sector

The agro-industry is a solid biomass producer and consumer for energetic purpose. It has a 25 kW boiler and an oven for the bread production, both wood powered, and two forest wood chips feeded boilers, which use about 180 t/year of wood chips for the heating of some buildings, mainly during the winter.

For these reasons, the cooperative has a good knowledge about the main properties for the requested quality characteristics from a biomass producer while compared with many biofuels, such as the moisture content, the ash content, the particle size and the heating value.

E. Biomass market in the region

Within a 50 km radius from the farm, some families use forest wood chips and fire wood during the winter.

Since the agro-industry uses a great amount of wood biomass for self-consumption, and it sells just a small amount of it, it doesn't have a deep knowledge of the solid biomass for energetic purpose market.

2.21.3. Conclusions

Although Il Forteto owns part of the necessary equipment for the project and has adequate knowledge for the development of an agricultural biomass business, it has a low availability of agricultural residues (at least for what concerns the one without any other use) and it has greater advantages in expand the forest wood biomass production rather than use the agricultural biomass residues for the energy production.

For these reasons the farm will not go on with the audit activity.

2.22. Diagnosis of Azienda Agricola Rapaccio

2.22.1. Company description

The agro-industry Rapaccio, located in Montemurlo, Prato, deals with olive growing floriculture, forestry activities, forestry wood chips production, naturalistic engineer and garden management.

They are interested in considering a different solid biomass production, for self-consumption, or in general to increase this kind of production, and in reusing their own residues, if this activity can lead to an economical advantage.

2.22.2. General overview of the diagnosis

A. General information about their regular activity as agro-industry

The agro-industry has residues from its own agricultural activities and produces fire wood and forest wood chips too for self-consumption and a small amount for selling to families and farms of the area. Anyway it has just a little amount of customers.

The farm has three tractor activated chippers.

In the area there would be residues from olive groves and vineyards availability.

B. Type of biomass resources available

The agro-industry itself produces residues from olive pruning.

Within a 35 km radius there are other farms, vineyards and olive groves which produces residues from pruning activities, without any link with the agro-industry.

Pruning residues are mainly produced from January to March and are usually burned to be used as fertilizer, or left as they are or chopped and left directly in the fields.

There isn't any logistic chain for the gathering of the mentioned resources.

In the area there is a great availability of forest wood, cutting and working residues, which the farm owns too.

C. Existing equipment in the agro-industry and availability

The farm has three tractor activated chippers, and their use changes according to the amount of the gathered material, which is stored until the achievement of a proper amount for chipping. In any case, the equipment is less used during the months of July and August. For the rest of the year the equipment use is flexible and it can be settled up according to the availability of the collected residues. The farm has enough space, covered with a roof, for the storage of the raw material.

About the compatibility between the biomass seasonal production and the agro-industry inactivity period, the solid biomass production should be planned during the summer, as showed in the following table:

EQUIPMENTS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chippers*							X	X				
RESOURCES												
Olive tree and vineyard pruning	X	X	X									

* chipper use is flexible and could be settled up according to the gathered residues availability.

D. Knowledge on the bioenergy sector

The farm is a solid biomass producer, in particular of fire wood and wood chips.

Rapaccio is a biomass consumer too, and use about 10 t/year of fire wood and 10 t/year of forest wood chips for the heating of his own places.

For these reasons, the farm has a good knowledge on the solid biomass main qualitative properties, as heating value, moisture content, ash content and particle size.

E. Biomass market in the region

The industry is not well involved in the solid biomass for energy production market, since at the moment it supplies just a few families and farms within a 10 km radius. Currently it sells his own wood chips with a moisture content lower than 20%, mainly during the winter, for 90-100 €/t to farms and for 120 €/t for domestic use.

Within a 35 km radius, they are interested in supplying some greenhouses, wood chips powered for the almost whole year.

The main farm interest is the solid biomass refuelling for self-consumption.

2.22.3. Conclusions

The agro-industry Rapaccio showed his interest towards the project, foreseeing the possibility to develop and expand his production, with the reuse at the same time of his own residues with a higher use of the chippers.

At the moment the agro-industry already produces solid biomass, although high-lightening some critical issues in the market, highly competitive and with high quality standards. The farm believes that the biomass boilers' properties, both domestic and industrial, are not technically adequate for a mid-quality chips use, as the one from agricultural pruning could be, for problems linked with the feeding systems, with the ash disposal and the chlorine content.

Despite that, after the discussion with the company, it is established to carry out the audit phase for the feasibility evaluation of the new production.

3. Companies audited in Italy

3.1. Summary of the audit study to Ambiente e Territorio Soc. Coop.

3.1.1. Company description

The Ambiente e Territorio Cooperative, located in Osimo, Via Manzoni 65, Ancona, is dealing with urban garden maintenance and agro-forestry activities (logging and forest maintenance, resulting in the marketing of products firewood and wood chips for energy use).

The cooperative already use urban pruning to produce solid biomass but are interested in evaluating the possibility to produce a different type of solid biomass based on agrarian resources, especially in order to reuse their own residues or residues produced in the area. In particular, 2 products have been analysed within SUCELLOG project:

- Pellet made of olive tree, vineyards and urban pruning;
- Briquettes made of olive tree, vineyards and urban pruning.

Figure 1: Location of Ambiente e Territorio Soc. Coop. (Source: Google Earth)

3.1.2. Synergies to become an agro-industry logistic centre

3.1.2.1. Biomass resources availability:

The cooperative itself produces urban tree pruning. In the area, there are farmers owning vineyards and olive tree plantations even if with no current link with the agro-industry.

Within a radius of 30 km there may be availability of maize stalk, cereal straw, olive tree, urban garden and vineyard pruning. Urban tree prunings are generally brought for free to facilities producing fertilizer, avoiding their expensive disposal. Cereal straw is generally sold as animal bedding. The agro-pruning, produced mainly from November to March, are generally burned or chopped and left to the ground as organic amendment.

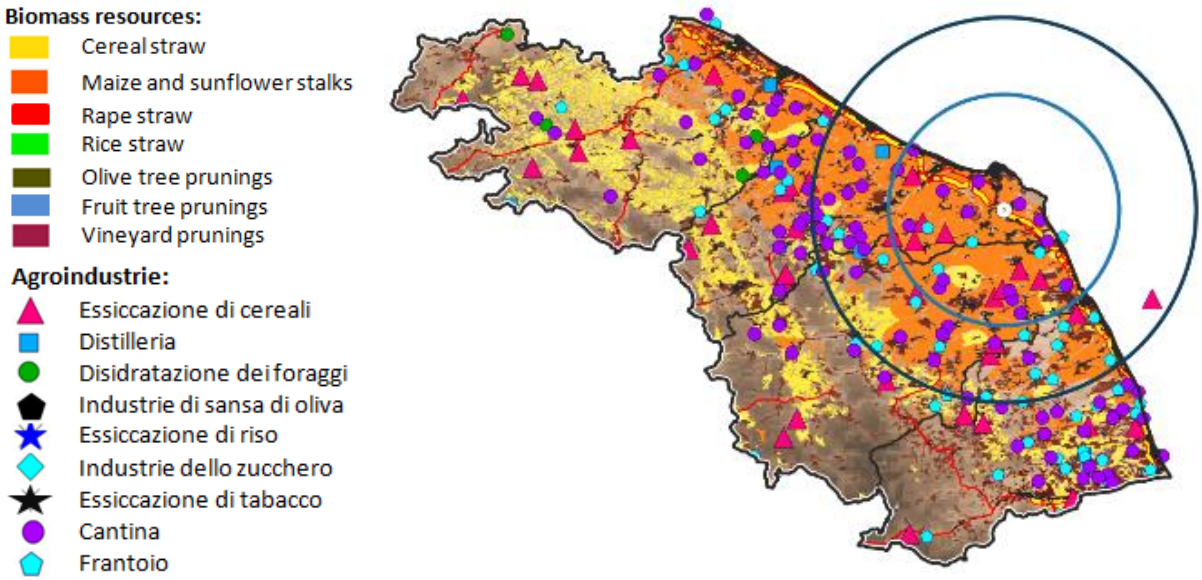


Figure 2: Location of resources and types of agro-industries around the company.

From the analysis of the figure and the interviews held with the stakeholders, it can be concluded that:

- Maize stalk is considered an undesired raw material and would not be taken into account for the production of solid biomass. The reason is the high amount of sand and stones that it contains, due to the fact that it is harvested in September-November during the rainy season.
- Straw is not considered a raw material for the production of solid biomass, since it is used for animal bedding.
- Regarding olive tree pruning, as it can be seen in the Figure, there is a significant amount that could be used in the logistic centre. However, currently there are no initiatives which promote the harvesting of pruning in large scale in the area. The usual practice is to burn them or to shred them and leave them on the soil. Farmers would be interested in selling the product to a logistic

operator delivering it directly to the logistics platform, thus saving work to the farmers and giving an added value to the available residue.

- Similarly, vineyards pruning are available and could be used in the logistic centre, even if currently, also in this case, there are no existing logistic chain developed.

Therefore, the agricultural residues available for the production of solid biomass are olive tree and vineyards pruning. It has been considered to be purchased to farmers at 15 €/t plus 5 €/t for transport. Strong effort should be placed then on engaging stakeholders to develop a logistic chain. It is expected that, at that price, pruning suppliers harvest and deliver the biomass resources to the logistics centre themselves.

Since the company has a significant amount of biomass residues from the activity of garden maintenance, which are brought to their facilities for free, urban pruning have been also taken into account.

Table 2: Data on the available agricultural residues in a 30 km distance.

Type of residue	Quantity available t/yr	Moisture content w-% ar	Months of harvest	Purchasing price €/t	Transport cost €/t
Olive tree pruning	655	45	Nov-Mar	15	5
Vineyards pruning	360	50	Nov-Mar	15	5
Urban tree pruning	655	45	Mar-Set	0	0

3.1.2.2. Equipment and facilities available

The cooperative has a rotatory dryer and a biomass boiler, purchased specifically to start the new business. They have also a chipper, used to chip urban garden pruning generally from April to November, which is available to be used for olive tree and vineyard pruning.

They generally outsource pelletizing and briquetting operation for the urban pruning to another company. They could do the same for the agrarian pruning.

The time where the existing equipment is used along the year is flexible and can be scheduled based on the availability of gathered residues. In fact, they would have enough space for the potential storage of raw materials.

With regard to the match of the seasonal production of the biomass resources with the idle periods of the cooperative, as it is shown in the following graphs, the activity for producing solid biomass could be settled up from November to March:

Table 3: Seasonal availability of the biomass resources and the equipment.

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dryer	X	X	X	X	X	X	X	X	X	X	X	X
Chipper				X	X	X	X	X	X	X	X	
RESOURCES	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**

Pruning	X	X	X								X	X

3.1.2.3. Bioenergy potential market

In a radius of 30 km, the cooperative already supply with their pellet from urban pruning few households, during the winter, and mainly some greenhouses, during all the year, demanding wood pellet. Generally, they require a good quality biomass with a standard moisture content and they are increasingly demanding a certificate product.

In the area, pellets are frequently bought in big distribution chains or supermarkets but also in small shops. It should be highlighted that in Italy it is very difficult to sell non-certified solid biomass (DINplus or ENplus). Using non-certified pellets in a boiler may cause the loss of the boiler guarantee. All these issues should be taken into consideration when marketing a product based on pruning.

The types of solid biomass used in the area and considered as competitors for Ambiente e Territorio are shown in Table 4 with the relative prices (VAT excluded). As it can be observed not agrarian fuels are currently present.

Table 4: Different types of solid biomass consumed in the area.

Type of biomass	Price		Ash content w-% db
	€/t	€/kWh	
Wood pellets bulk	180	0,0390	< 1
Wood pellets in bags (15-25 kg)	220	0,0467	< 1

3.1.3. Feasibility of the new business line as agro-industry logistic centre

Ambiente e Territorio Cooperative is interested in evaluating the following two products:

- Pellet made of olive tree, vineyards and urban pruning: pelletizing will be provided by another company;
- Briquettes made of olive tree, vineyards and urban pruning: briquetting will be provided by another company.

Table 5: Solid biomass types and quantities to be produced

Type of solid biomass	Produced amounts t/yr
Pellet made of olive tree (40%), vineyards (20%) and urban (40%) pruning	1.000
Briquettes made of olive tree (40%), vineyards (20%) and urban (40%) pruning	1.000

The expected boiler use is of about 8 h/d for 220 d/y. The yearly energy requirement of the boiler will be of 2.200 electric MWh, equal to 814 thermal MWh. Both the briquettes and the pellet have the same lower heating value of 4,22 kWh/kg, since they have the same material mixture. So, 190 tons of pellet or briquettes are necessary to satisfy the thermal energy demand.

The share of the different resources have been calculated theoretically considering the characteristics of the raw materials (obtained in bibliography) and the quality limits stated in ISO 17225-6 and ISO 17225-7 standards.

For the production of pellets, pre-treatments are:

- Particle size reduction of pruning harvested with the chipper of the cooperative. The moisture content should decrease at least from 45%-50% to 40%-45%.
- Forced drying of the chips made of mixed pruning for a moisture content reduction up to 14%.
- Milling and pelletizing of the dried biomass assigned to a third party, with a reduction of the moisture content up to 10%
- Pellet storage, mainly in the shed of the company, either on asphalted area with tarps to cover the final product. No long storage is foreseen since the production period corresponds to the consumption period.

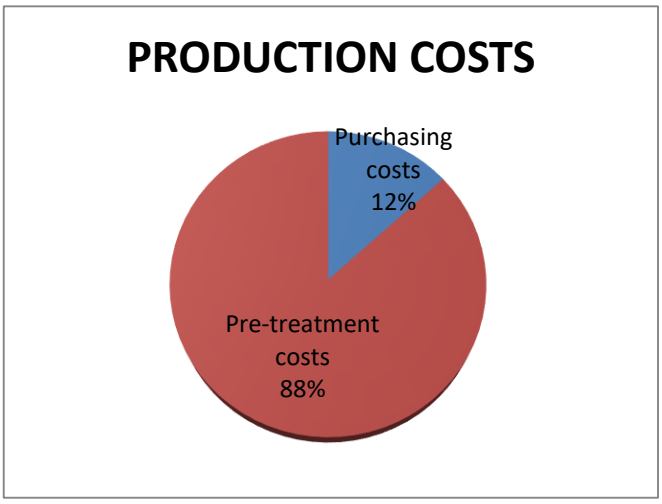


Figure 3: Allocation of production costs for mixed pellets.

For the production of briquettes, pre-treatments are:

- Particle size reduction of pruning harvested with the chipper of the cooperative. The moisture content should decrease at least from 45%-50% to 40%-45%.
- Forced drying of the chips made of mixed pruning for a moisture content reduction up to 14%.
- Milling and briquetting of the dried biomass assigned to a third party, with a reduction of the moisture content up to 10%
- Briquettes storage, mainly in the shed of the company, either on asphalted area with tarps to cover the final product. No long storage is foreseen since the production period corresponds to the consumption period.

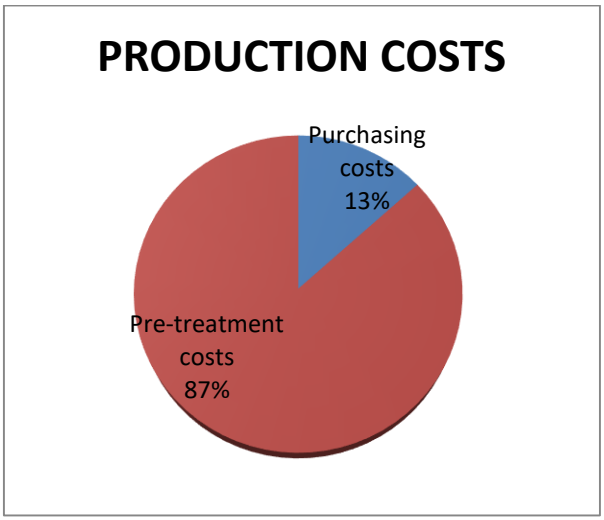


Figure 4: Allocation of production costs for mixed briquettes.

The minimum selling price calculated in the study can be observed in Table 6

Table 6: Minimum selling price of different products.

Scenario	Quantity produced	Production cost	Transport cost	Investment cost quota	Min profit	Min acceptable selling price
	t/yr	€/t	€/t	€/t	€/t	€/t
Pellet made of olive tree, vineyards and urban pruning	1.000	**163,24**	15	0	**10**	188,24
Briquettes made of olive tree, vineyards and urban pruning	1.000	**152,83**	15	0	**10**	177,83

In the tables below it can be observed the comparison with biomass products in the market:

Table 7: Competing products main quality characteristics and prices

	Quality characteristics			Prices
	LHV (kWh/kg ar)	Bulk density (kg/m^3)	Ash content (w-% db)	€/kWh
Forest wood pellets bulk	4,6	650	< 1	0,0390
Forest wood pellets bag	4,6	650	< 1	0,0467

Table 8: Products to be generated in the new business line (theoretical quality characteristics and calculated prices)

	Quality characteristics			Prices
	LHV (kWh/kg ar)	Bulk density (kg/m^3)	Ash content (w-% db)	€/kWh
Pellet made of olive tree, vineyards and urban pruning	4,22	630	3,60	0,0445
Briquettes made of olive tree, vineyards and urban pruning	4,22	550	3,60	0,0421

Both the pellet and the briquettes, in the analyzed composition of the raw materials, obtained in bibliography, they would have the quality characteristics to be comparable to the Class A of agro-pellets and of no-woody briquettes respectively, according to ISO 17225-6 and 17225-7. In terms of cost (€/kWh), the results are encouraging compared to wood pellets.

A possible risk that the agro-industry may be faced when selling potential biomass produced, is related to the quality of agro-pruning biomass, which are suggested to be controlled to ensure its comparability to the forest-based products. The main constraint appears to be the ash content, which is mainly present in the bark: for this reason, pruning branches should be avoided and up-rooted trees should be a priority.

The briquettes are products less common than pellets, but the economic analysis results indicate they are expected to be sold at a competitive price, both compared to the forestry wood pellets and to agro-pellets produced by the cooperative.

3.1.4. Conclusions

The current biomass market is not as varied as in other countries, being the solid biomass products offered mainly from forest origin (in chip and pellet format). The potential consumers of the proposed logistic centre are families and greenhouses.

Regarding the possibilities as logistic centre, 2 scenarios have been considered, corresponding to 2 different products (pellets and briquettes) based on olive tree (40%), vineyards (20%) and urban (40%) pruning.

The study has shown that all possible products are feasible from the techno-economic point of view and a competitive market price can be reached.

Having already bought a dryer and a boiler, and in order to minimize the risk for the new activity, the company prefers not to consider other investments, foreseeing the possibility to schedule the use of its own equipment to collect agricultural residues and to contract the pelletizing and briquetting operations to a third party.

While pellet already has a market in the region, even if based on forest resources, the case of the briquettes represents a less common product. For that reason, it is important to stress the fact that a previous quality analysis (mainly determination of moisture content, calorific value, ash content and Chlorine percentage) of a representative sample of the raw material is strongly advisable before starting the new business activity. Intensive product quality evaluation will avoid unexpected dissatisfaction from consumers. Initial combustion tests with some target boilers are also highly recommended to test the viability of the product during conversion and to evaluate the maintenance requirements.

3.1.5. Additional support activities

Within the project, the agro-industry has received actions of support in addition to the audit activity, as summarized below:

- Visit to Costruzioni Nazzareno, an agro-pellettizing producer and equipment manufacturer, in order to take information about their productivity, pretreatment costs, product prices, equipment costs, biomass quality, type of consumers ecc...; The data and information obtained has been provided to the cooperative Ambiente e Territorio.
- Create synergies with other projects or experiences on similar initiatives on agriculture biomass, i.e. D.R.E.Am. adhered to the EU UP_Running project, participating to the online channel of the project although not being partners, in order to exchange experiences, information and contacts on the agro-biomass topic related to prunings. All the knowledge gained served to better support the cooperative.

3.2. Summary of the audit study to Azienda Agricola Forestale Paolo Macchia

3.2.1. Company description

The Azienda Agricola Forestale Paolo Macchia, located in Pistoia, is dealing with olive growing, agro-forestry activities and natural engineering. The agro-industry already produces 2 types of solid biomass from forest sources: firewood and chips.

They are interested in evaluating the possibility to increase their production with agrarian sources in order to generate another product to be sold in the local market and take advantage of the pruning residues of their plantations. Moreover, they want to evaluate the techno-economic feasibility of producing:

- Olive tree pruning chips;
- Olive tree pruning and forestry wood chips.

Figure 5: Location of Azienda Agricola Forestale Paolo Macchia (Source: Google Earth).

3.2.2. Synergies to become an agro-industry logistic centre

3.2.2.1. Biomass resources availability:

The agro-industry itself produces olive tree pruning. Within a radius of 30 km the existing residues are olive pomace, olive tree pruning, vineyard pruning and grape pomace. Olive pomace, available mainly in October and November, has an alternative use if it is sold to oil pomace industries or subjected to extraction of olive pits directly in the oil mills. The pruning, produced mainly from January to April, are generally burned or chopped and left to the ground.

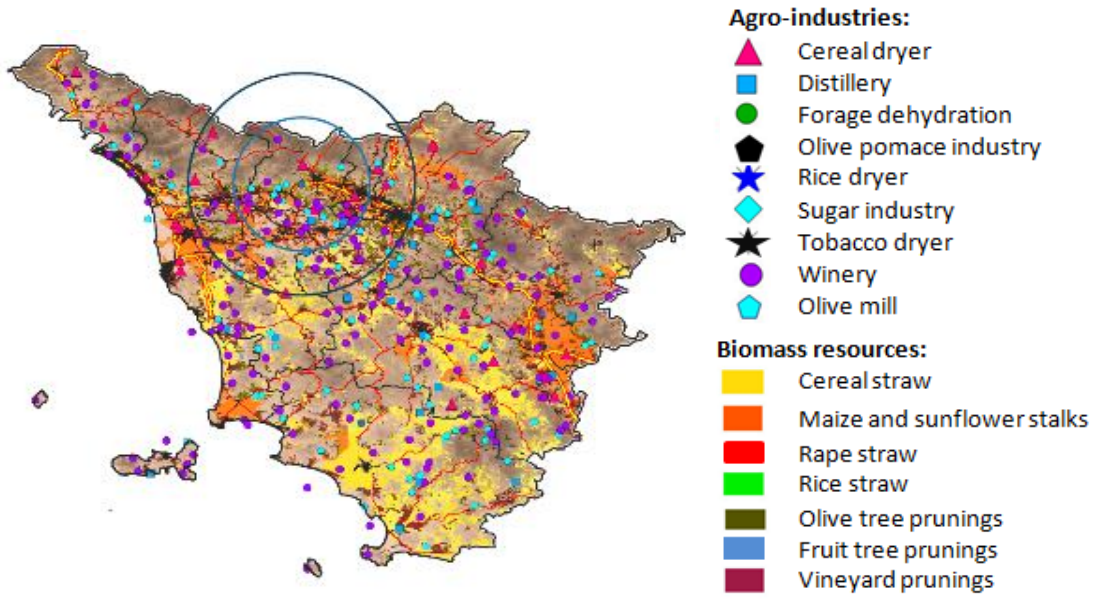


Figure 6: Location of resources and types of agro-industries around the company.

From the analysis of the figure and the interviews held with the stakeholders, it can be concluded that:

- Regarding olive tree pruning, as it can be seen in the Figure, there is a significant amount that could be used in the logistic centre. Moreover, the agro-industry itself has that kind of residue. However, no logistic chain is existing in the area and efforts should be done in that sense with the local stakeholders. The savings to farmers, that would not have to chop it to leave in on the soil, should be highlighted.
- The vineyards pruning are not taken into consideration, due to their lower availability in terms of quantity and because of the higher difficulty in their harvesting, compared to the olive tree pruning.

Therefore, the agricultural residues preferred by the agro-industry for the production of solid biomass are olive tree pruning. The pruning harvesting will take place directly in the fields of the raw material suppliers and will be carried out by the agro-industry Paolo Macchia. In particular, suppliers collect pruning in heaps and the company collects them in trucks with trailers and agricultural pliers. Suppliers thus solve the problem of pruning disposal saving money and time. For these reasons and for the fact that, in the area, pruning are not yet considered a marketable product, their purchase cost is considered as quite low.

At the same time, the company must take into account a transport cost of raw materials from suppliers' fields to yards where pruning will be chopped, of 12 €/t.

Table 9: Data on the available agricultural residues in a 30 km distance.

Type of residue	Quantity available t/y	Moisture content w-% ar	Months of harvest	Purchasing price €/t	Transport cost €/t
Olive tree pruning	541	45	Jan.-Mar.	1	12

In order to improve the quality of the final product, the company has an interest in mixing the chips from olive tree pruning with the chips from forestry wood, which they produce from one year, with a moisture content of 40% as received.

3.2.2.2. Equipment and facilities available

The agro-industry does not own any chipping equipment, contracting the service to an external company when needed, especially from September to April.

The material is collected and stored until reaching the useful amount for chipping. The use of the equipment is flexible and can be scheduled based on the availability of gathered residues. Enough space is available in the agro-industry for storing.

With regard to the match of the seasonal production of the biomass resources with the idle periods of the agro-industry, as it is shown in the following graphs, the activity for producing solid biomass could be settled up in May-August, when the chipper is more available.

Table 10: Seasonal availability of the biomass resources and the equipment.

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chipper[1]					X	X	X	X				
RESOURCES												
Olive tree pruning	X	X	X	X								

3.2.2.3. *Bioenergy market potential*

Paolo Macchia supplies wood chips to few households or farms, during the winter, and mainly some districts heating plants, greenhouses and cogeneration plants in a radius of 30 km, during all the year.

The current biomass market in the area is not as varied as in other countries and generally, they require good quality wood chips with a moisture content of 20 % and a standard size of the particles and they are increasingly demanding a certificate product.

Currently, the agro-industry sells its wood chips at a price from 50 €/t to 85 €/t, (including transport) depending on the moisture content (from 20 to 40 %) and generally on the quality of the chips. Districts heating plants, greenhouses and cogeneration plants will be targeted to supply them also with olive tree pruning chips or olive tree pruning and forestry wood chips, aiming for a quality and a price equivalent to forestry wood chips already conferred to those consumers.

In addition, within the same distance, there are families and agro-industries or farms who respectively consume wood pellets and olive pits. Due to the type of boilers that they own, not compatible with chips, they are not considered as the target market.

The types of solid biomass used in the area and considered competitive for Paolo Macchia are in **Table 11** with the relative prices (VAT excluded).

Table 11: Different types of solid biomass consumed in the area.

Type of biomass	Price		Ash content w-% db
	€/t	€/kWh	
Wood chips cat A1	95	0,0250	< 1
Wood chips cat A2	80	0,0209	< 2
Wood chips cat B	60	0,0200	< 3

3.2.3. Feasibility of the new business line as agro-industry logistic centre

The agro-industry wants to evaluate the following two products:

[1] the chipping operation is assigned to a third party.

- Chips from olive tree pruning.
- Mixed chips from olive tree pruning and forestry wood.

In both cases, chipping would be provided by an external company.

Table 12: Solid biomass types and quantities produced

Type of solid biomass	Quantity produced t/yr
Olive tree pruning chips	350
Mixed olive tree pruning (70%) and forestry wood (30%) chips	500

For the production of olive tree pruning chips, pretreatments are:

- Particle size reduction of pruning harvested. The moisture content would decrease at least from 45% to 40%.
- Chips storage in yards, under a roof or canvas. The material is manually moved to facilitate the natural drying, in this way the moisture content would decrease from 40% to 15%.

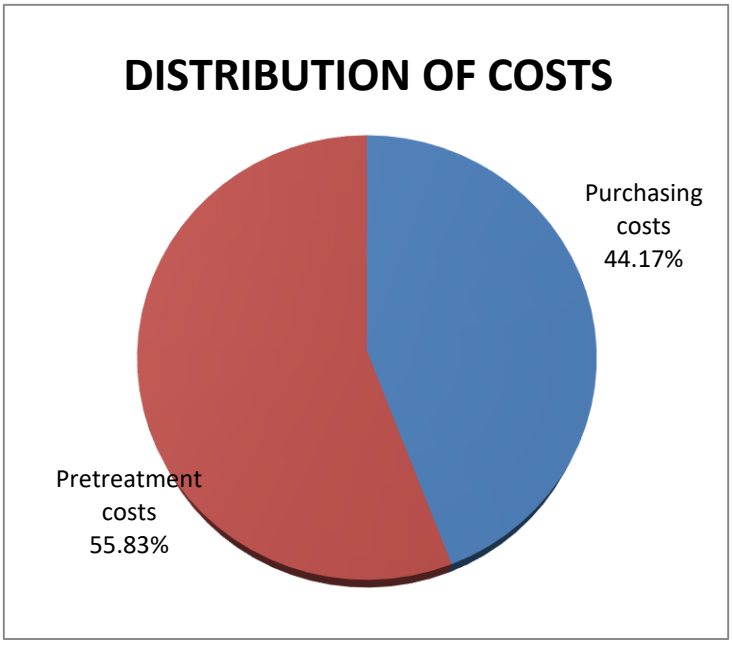


Figure 7: Allocation of production costs of olive pruning chips.

For the production of mixed olive tree pruning (70%) and forestry wood (30%) chips, pre-treatments are:

- Particle size reduction of pruning harvested. The moisture content would decrease at least from 45% to 40%.
- Particle size reduction of forestry wood, mainly pruning and wood residues. The moisture content would decrease at least from 40% to 35%.

- Chips storage in yards, under a roof or canvas. The material is moved manually obtaining the final product mixture and in order to facilitate the natural drying, down to 15% of moisture content.

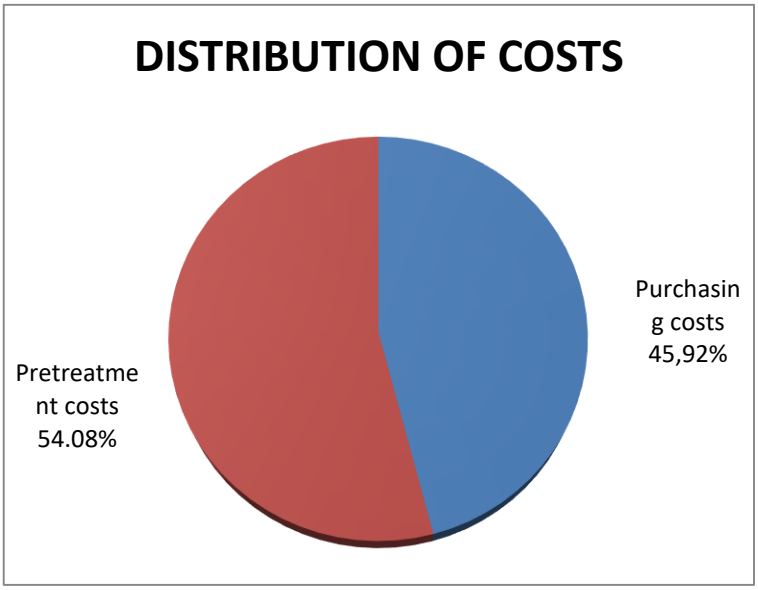


Figure 8: Allocation of production costs of mixed chips.

Table 13: Minimum selling price of different products.

Type of scenario	Quantity produced	Production cost	Transport cost[2]	Investment cost quota	Min profit	Min acceptable selling price
	t/yr	€/t	€/t	€/t	€/t	€/t
Olive tree pruning chips	350	**45,44**	0	0	**5**	50,44
Mixed chips of olive tree pruning and forestry wood	500	**41,71**	0	0	**10**	51,71

In the tables below it can be observed the comparison with biomass products in the market:

Table 14: Competing products main quality characteristics and prices

	Quality characteristics			Prices
	LHV (kWh/kg ar)	Bulk density (kg/m^3)	Ash content (w-% db)	€/kWh
Wood chips cat A1	4,25	250	< 1	0,0250
Wood chips cat A2	2,65	270	< 2	0,0209
Wood chips cat B	2,65	300	< 3	0,0200

Table 15: Products to be generated in the new business line (theoretical quality characteristics and prices)

[2] The transport cost is included in the chipping ones, carried out by third parties (pre-treatment costs)

	Quality characteristics			Prices
	LHV (kWh/kg ar)	Bulk density (kg/m^3)	Ash content (w-% db)	€/kWh
Olive tree pruning chips	3,95	300	4,50	0,0128
Mixed chips of olive tree pruning and forestry wood	4,09	300	4,05	0,0126

By bibliographic data (from European projects like EuroPruning, http://www.europruning.eu/), the chips of future production would not fall completely into the equivalent category B of forest wood chips, according to ISO 17225-4, mainly because of the ash content. On the other hand, the price per kWh of the new chips is competitive compared to forest wood chips category B. Because of this, pruning branches should be avoided, preferring up-rooted trees, and the quality of agro-pruning chips is suggested to be deeply investigated to ensure its comparability to that of forest products.

3.2.4. Conclusions

SUCELLOG study on the possibilities for Paolo Macchia to develop a logistic centre has considered 2 scenarios: the production of chips from pruning and the production of mixed chips (olive pruning+forest wood).

The potential consumers of the proposed logistic centre are small-medium energy consumers (schools, greenhouses, district heating plants).

In order to minimize the risk for the new activity, the company prefers not to consider investments, foreseeing the possibility to schedule the use of its own equipment (truck with trailer) to collect agricultural residues and to schedule the assignment of chipping operation to a third party.

The cost analysis has shown that both products can be competitive in the market but only if the purchasing price of the raw material remains at 1€/t. Strategies to develop a supply chain that ensure this price is therefore strongly needed.

However, quality analysis of the products should be performed (mainly determination of moisture content, calorific value, ash content and Chlorine percentage) as well as combustion tests in the equipment.

3.2.5. Additional support activities

Within the project, the agro-industry has received actions of support in addition to the audit activity, as summarized below:

- Introduce personally to contacts with one potential supplier of raw materials;
- Introduce personally to contacts with one potential consumer of the final product;

- Accompanying actions in events where interesting stakeholders for the new business line are met, i.e. deepening the subject of solid biofuels from agro pruning with two researchers from CNR met at the EIMA fair;
- Introduce to other agro-industries or other stakeholders thinking on starting similar initiatives on agriculture biomass, participating in the conference organized by AIEL (Italian Association agroforestry Energy) on "Efficiency improvement and biomass heating for greenhouses".
- Create synergies with other projects or experiences on similar initiatives on agriculture biomass, ie DREAM adhered to the EU UP_Running project, participating to the online channel of the projects although not being partners, in order to exchange experiences, information and contacts on the agro-biomass topic related to prunings. All the knowledge gained served to better support the cooperative.

3.3. Summary of the audit study to Azienda Agricola Il Bello

3.3.1. Company description

The Azienda Agricola Il Bello, located in Pistoia, is dealing with agro-forestry activities (logging and forest maintenance, producing wood for works, firewood and wood chips for energy use); natural engineering; snowplow service; olive growing, corn growing, viticulture and wine production.

The company is interested in evaluating the possibility to produce a different type of solid biomass taking advantage of their own agrarian residues or residues produced in the area. In particular, 3 products have been analysed by SUCELLOG project:

- Olive tree pruning chips;
- Olive tree pruning and forestry wood chips;
- Corn cob grits.

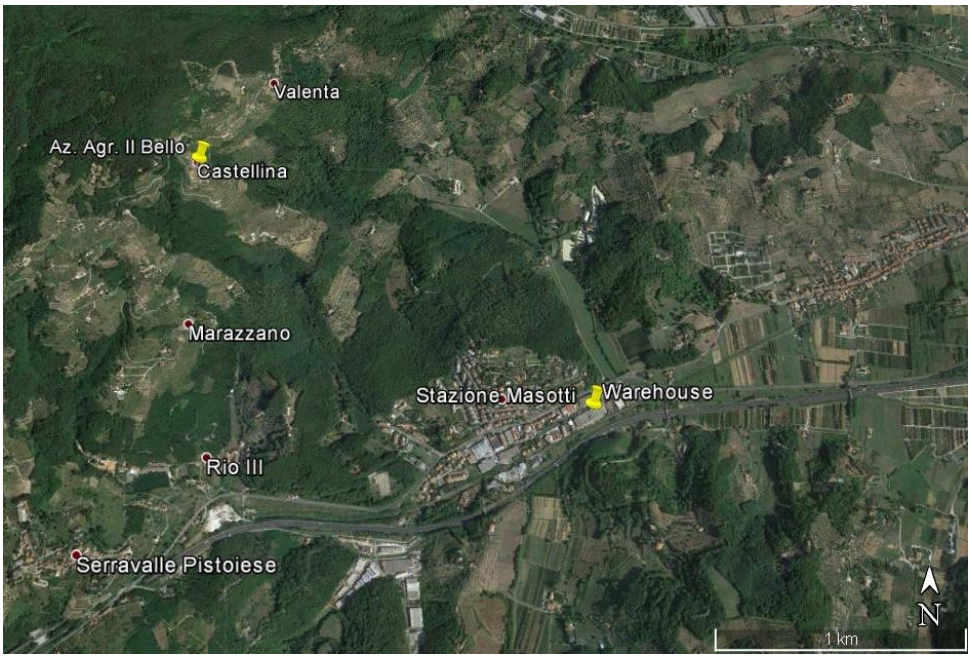


Figure 9: Location of Azienda Agricola Il Bello (Source: Google Earth).

3.3.2. Synergies to become an agro-industry logistic centre

3.3.2.1. Biomass resources availability:

The agro-industry itself produces olive tree pruning, vineyard pruning and corn cobs. In the area there are oil mills, other wineries, vineyard and olive tree plantations.

Within a radius of 30 km there may be availability of olive pomace, olive tree pruning and vineyard pruning. From those, only olive pomace, available mainly in October and November, can have an alternative use if it is sold to oil pomace industries or subjected to extraction of olive pits directly in the oil mills. The pruning, produced mainly from January to April, are generally burned or chopped and left to the ground as natural fertilizers.

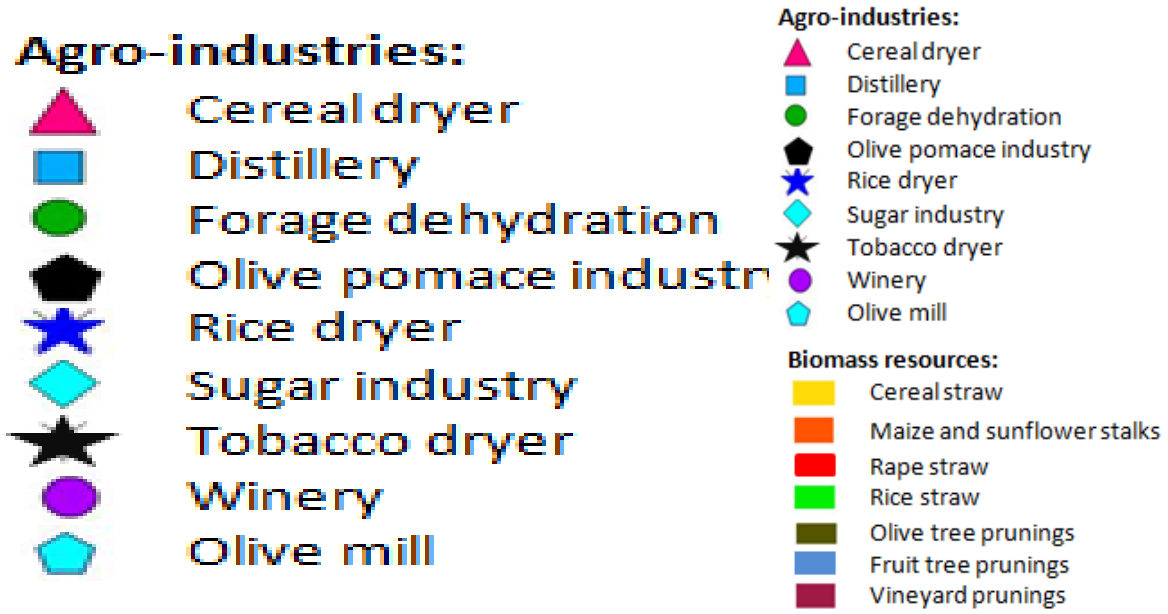


Figure 10: Location of resources and types of agro-industries around the company.

From the analysis of the figure and the interviews held with the stakeholders, it can be concluded that:

- Maize stalk is considered an undesired raw material because of the high amount of sand and stones that it contains, due to the fact that it is harvested in September-November during the rainy season.
- However, the cobs, which are usually left on the soil together with the stalks by the farm, can be considered as raw material for the logistic centre. In order to harvest the corn cobs, the regular machinery used for harvesting the corn grain should be adapted (approximate cost of 15,000 €).
- Regarding olive tree pruning, there is a significant amount that could be used in the logistic centre. The farm itself has a lot of that kind of residue. However, currently there are no initiatives which promote the harvesting of pruning in large scale in the area. The usual practice is to burn them or to shred them and leave them on the soil. Farmers would be interested in selling (even at a price that only covers the harvesting cost) the product to a logistic operator that brings his own machinery for harvesting, thus saving work and giving an added value to the available residue. For this purpose, the company is considering the possibility of buying a pruning chipper to chip the biomass arranged in windrows, directly in the field (approximate cost 30,000 €).
- The vineyards pruning are not taken into consideration, due to their lower availability in terms of quantity and because of the greater difficulty in their harvesting, compared to the olive tree pruning.

Therefore, the agricultural residues available for the production of solid biomass that have been considered are corn cobs and olive tree pruning. The purchasing prices together with quantities available are shown in Table 16.

Table 16: Data on the available agricultural residues in a 30 km distance.

Type of residue	Quantity available t/yr	Moisture content w-% ar	Months of harvest	Purchasing price €/t
Corn cobs	65	35	Sept.-Nov.	38
Olive tree pruning	541	45	Jan.-Apr.	1

The pruning harvesting will take place directly in the fields of the raw material suppliers and will be carried out by the agro-industry Il Bello with the harvester+chipper machinery to be purchased. Suppliers thus solve the problem of pruning disposal saving money and time. For these reasons and for the fact that, in the area, pruning are not yet considered a marketable product, their purchase cost is quite low.

In order to improve the quality of the final product, the company has an interest in mixing the chips from olive tree pruning with the chips from forestry wood produced by them and with a moisture content of 30%.

3.3.2.2. Equipment and facilities available

The harvest of the corn fields belonging to Il Bello is carried out normally by an external company. However, it will be necessary make changes in the existing machinery for the simultaneous harvesting of corn cobs. The agro-industry has a small chipper, which is used along the year but with highly variable workload and that could be used to reduce the particle size of the corn cobs into grits. Moreover, the equipment is less used from May to August. For the rest of the year, the use of the equipment is flexible and can be scheduled based on the availability of gathered residues.

For the chipping of forestry wood, mainly from September to April, the agro-industry normally contracts another company. However, this machinery is not adequate for processing agrarian pruning (the consumption will be too high). The agro-industry would like to consider the possibility to acquire a harvester+chipper machinery to work on-field. Therefore, olive tree pruning would be chopped by the new equipment (harvester+chipper) when the raw material is naturally dried.

The following graph matches the seasonal production of the biomass resources with the idle periods of the agro-industry. Although the chipper is not fully available, the proposed production periods are from September to November for corn cobs grits. The production of chips form olive tree pruning is schedule from February to April.

Table 17: Seasonal availability of the biomass resources and the equipment.

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hammer chipper[3]					X	X	X	X				
RESOURCES												
Olive tree pruning	X	X	X	X								
Corn cobs									X	X	X	

3.3.2.3. Bioenergy market potential

Since the company has recently started to produce wood chips, they are still on the process of building a network of consumers. They are interested in supplying some of the existing districts heating and greenhouses in a radius of 20 km, fueled by chips almost all the year. Currently, the audited agro-industry is selling its wood chip at 60 €/t, including transport, to a district heating in the area. This type of consumer will be targeted to supply them with the chips from olive pruning. Generally, they require a good quality wood chips with a standard moisture content and a standard size of the particles and they are increasingly demanding a certificate product.

Wood pellet consumers in the area (mainly households) are considered the target consumer segment for the corn cob grits since the format is compatible with the existing pellet equipment.

[3] the use of the chipper is flexible and can be scheduled based on the availability of gathered residues.

The types of solid biomass used in the area and considered competitive for Il Bello are in **Table 18** with the relative prices (VAT excluded).

Table 18: Different types of solid biomass consumed in the area.

Type of biomass	Price		Ash content w-% db
	€/t	**€/kWh**	
Wood chips cat A1	95	0.0250	< 1
Wood chips cat A2	80	0.0209	< 2
Wood chips cat B	60	0.0200	< 3

3.3.3. Feasibility of the new business line as agro-industry logistic centre

The agro-industry is interesting in evaluating the production of the following three solid biomass types:

- Chips from olive tree pruning: in this case a chipper will be purchased to chip pruning directly in the field (about 30,000 €).
- Mixed chips from olive tree pruning and forestry wood: even in this scenario, a chipper will be purchased to chip pruning directly in the field (about 30,000 €); forestry wood is chipped by another company with their own equipment.
- Corn cobs grits: in this case the regular machinery used for harvesting the corn grain should be adapted (approximate cost of 15,000 €). The corn is harvested by another company which could be available to make the investment in exchange for a payment of the collection of cobs per ton (in addition to the usual compensation for corn harvesting).

The company prefers not to consider the chipper investment cost in the economic analysis, in order to maintain chips at a competitive price.

Table 19: Solid biomass types and quantities produced.

Type of solid biomass	Produced amounts t/y
Olive tree pruning chips	350
Mixed olive tree pruning (70%) and forestry wood (30%) chips	500
Corn cobs grits	50

For the production of olive tree pruning chips, pre-treatments are:

- Particle size reduction of pruning arranged in windrows, directly in the field, with the harvesting of chips in breathable big bags. The moisture content is expected to decrease by at least 45% to 40%.
- The breathable big bags are stored outside the warehouse under cover. The moisture content is expected to decrease from 40% to 15% due to natural drying.

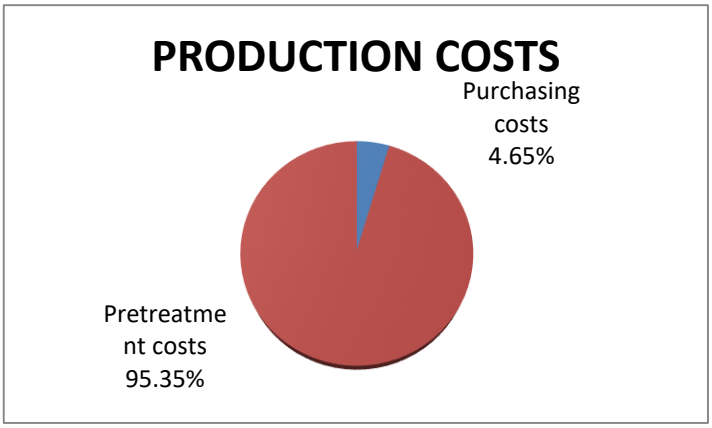


Figure 11: Allocation of production costs for the olive tree chips.

For the production of mixed olive tree pruning (70%) and forestry wood (30%) chips, pre-treatments are:

- Particle size reduction of pruning arranged in windrows, directly in the field, with the harvesting of chips in breathable big bags under cover. The moisture content is expected to decrease at least by 45% to 40%.
- Particle size reduction of forestry wood, mainly pruning and wood residues. The moisture content is expected to decrease at least by 30% to 25%.
- The breathable big bags and the forestry wood chips are stored outside the warehouse. Upon delivery of the product, the chips of olive tree pruning will be mixed with forestry wood chips, the final product is expected to naturally dry to 15% of moisture content.

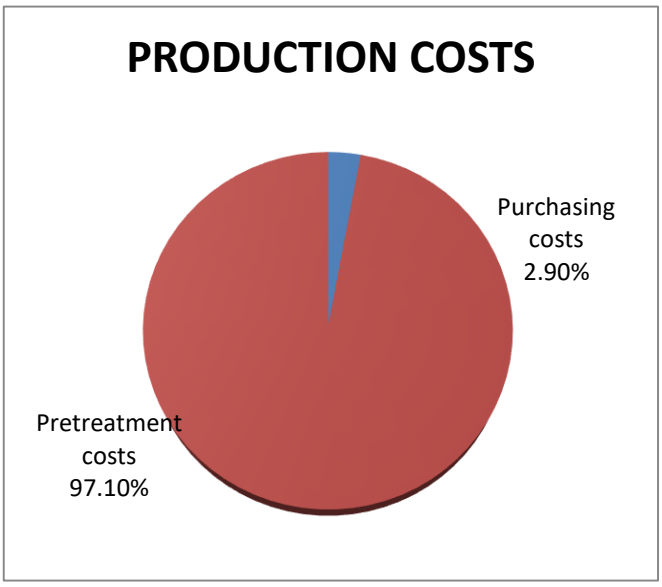


Figure 12: Allocation of production costs for the mixed chips.

For the production of corn cob grits, pre-treatments are:

- Particle size reduction of corn cobs, with the hammer chipper owned by the agro-industry. The moisture content is expected to decrease at least by 35% to 30%.
- The corn cob grits are stored outside the warehouse. The product would be handled to allow natural drying, decreasing the moisture content from 30% to 15%.

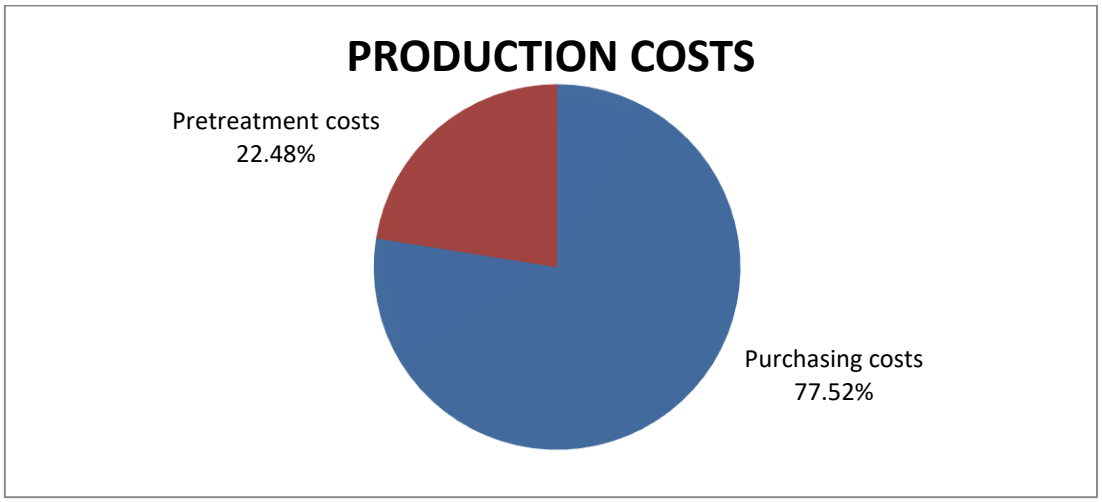


Figure 13: Allocation of production costs for the cob grits

Table 20: Minimum selling price of different products.

Type of scenario	Quantity produced	Production cost	Transport cost	Investment cost quota	Min profit	Min acceptable selling price
	t/yr	€/t	€/t	€/t	€/t	€/t
Olive tree pruning chips	350	**32.03**	15	0	**5**	**52.03**
Mixed chips of olive tree pruning and forestry wood	500	**34.23**	15	0	**5**	**54.23**
Corn cob grits	50	**63.72**	15	0	**10**	**88.72**

In the tables below it can be observed the comparison with biomass products in the market:

Table 21: Competing products main quality characteristics and prices

	Quality characteristics			Prices
	LHV (kWh/kg ar)	Bulk density (kg/m^3)	Ash content (w-% db)	€/kWh
Wood chips cat A1	4,25	250	< 1	0,0250
Wood chips cat A2	2,65	270	< 2	0,0209
Wood chips cat B	2,65	300	< 3	0,0200

Table 22: Products to be generated in the new business line (theoretical quality characteristics and prices)

	Quality characteristics			Prices
	LHV (kWh/kg ar)	Bulk density (kg/m^3)	Ash content (w-% db)	€/kWh
Corn cob grits	3,79	250	2	0,0234
Mixed chips of olive tree pruning and forestry wood	4,70	300	4,05	0,0139

Although the products seem to be competitive in the market (grits against wood pellets and pruning against wood chips), the possible risks that agro-industry may face when selling potential biomass produced, are the following:

- The quality of agro-pruning chips must be controlled to ensure that is comparable to that of forest products. The main constraint appears to be the ash content, which is mainly present in the bark: for this reason, pruning branches should be avoided and up-rooted trees should be a priority. Special care should be taken also when harvesting the branches in order not to collect stones/sand which increases ash content and can generate feeding problems.
- Although the corn cob grits present good quality characteristics (better than the mixed chips proposed), ash content is still double than wood pellets and for that reason more maintenance is expected.

3.3.4. Conclusions

Il Bello agro-industry is interested in starting a new business line producing solid biomass from agrarian sources as a complement to their activity as forest wood chip producer.

Regarding the possibilities as logistic centre, 3 scenarios have been considered, corresponding to 3 different products: olive pruning chips, mixed chips (olive tree pruning + forest wood) and corn cobs.

The company owns a small chipper suitable for the grinding of corn cob. The corn grain is collected by another company, with which it is necessary an agreement to receive a harvesting service of corn cobs too, in exchange for additional compensation, changing their harvesting machines. Chipping of forestry wood is generally relied to third parties.

The current biomass market is not as varied as in other countries, being the solid biomass products offered mainly from forest origin (in chip and pellet format). The potential consumers of the proposed logistic centre are small-medium plants (schools, greenhouses, district heating plants). The study has shown that all possible products are feasible from the techno-economic point of view and competitive with current marketed solid biomass.

In order to minimize the risk for the new activity, the agro-industry chose a conservative scenario for the production of corn cob grits (taking into account only the residue of its own activities) together with mixed chips production, made of olive tree pruning and forestry wood. The company prefers not to consider the chipper investment cost in the economic analysis, in order to maintain a chips competitive price, assuming on the contrary a high risk in the case of chips production.

While chips have already a market in the region, the case of the corn cob grits represents a new product. In both cases, a previous quality analysis (mainly determination of moisture content, calorific value, ash content and Chlorine percentage) of a representative sample of the raw material for the logistic centre is strongly advisable before starting the new business activity. Tests of the products in real operating equipment from potential consumers should be also offered.

3.3.5. Additional support activities

Within the project, the agro-industry has received actions of support in addition to the audit activity, as summarized below:

- Introduce personally to contacts with potential consumers and suppliers of raw materials;
- Introduce the potential suppliers or the agro-industry with manufacturers of resource harvesters and on-field pre-treatment systems, i.e. ONG snc;
- Ask for budget to machinery manufacturers or project developers, i.e. ONG snc;
- Technical support for the adaptation of existing harvester/chippers to gather non-usual resources, gathering information from the Austrian partners on the experience of an Austrian company followed within SUCELLOG project in order to start production of corn cob grits;
- Show successful initiatives of utilization or production of solid biomass from agriculture products, sending by email videos, pictures and information about the modifications that the Austrian company, supported by SUCELLOG project, did to the corn harvester to also collect the cob;
- Accompanying actions in events where interesting stakeholders for the new business line are met, i.e. participating to a conference in EIMA fair about agro-prunings as energy biomass (in particular about standards, quality, European project experiences like EuroPruning and Up Running), accompanying a potential supplier to the conference organized by AIEL on "Efficiency improvement and biomass heating for greenhouses" and to the Boster Fair looking for adequate prunings harvesters and chippers;
- Introduce to other agro-industries or other stakeholders thinking on starting similar initiatives on agriculture biomass, accompanying the agro-industry to the conference on the opportunities provided by the Rural Development Plan for the food industry. In that occasion, the agro-industry met a farm, which carried out a project funded by the RDP 2007-2013 on the Innovative Enhancement of Olive tree Pruning Waste (VISPO project). They built a micro gasifier prototype, powered by olive tree prunings;
- Create synergies with other projects or experiences on similar initiatives on agriculture biomass, ie DREAM adhered to the EU UP_Running project, participating to the online channel of the projects although not being partners, in order to exchange experiences, information and contacts on the agro-biomass topic related to prunings. All the knowledge gained served to better support the cooperative.

Similarly, both a potential supplier and a consumer of the agro-industry evaluated have received actions of support, as summarized below:

- Provide support on the technical aspects (regarding the harvesting, pre-treatment and conversion);
- Provide the links to the supporting documents generated within the project;

- Build-up capacity on biomass field and particularly on solid biomass from agriculture sources;
- Create synergies with other projects or experiences on similar initiatives on agriculture biomass, i.e. DREAM adhering to the EU UP Running project, to exchange experiences, information and contacts on the agro-biomass topic.

3.4. Summary of the audit study to Serragiumenta Agricola SNC

3.4.1. Company description

Serragiumenta Agricola SNC, located at Cosenza, is dealing with agricultural activities (olive growing, corn growing, viticulture and wine production); and with touristic activities (managing a hotel for meetings and ceremonies, a riding school and tourist accommodation).

They are interested in evaluating the possibility to become a biomass producer in order to reuse their own residues or residues produced in the area. In particular, 3 products are analysed by SUCELLOG project:

- Olive tree pruning chips;
- Vineyard pruning chips;
- Orchards pruning chips.

Figure 14: Location of Serragiumenta Agricola SNC (Source: Google Earth)

3.4.2. Synergies to become an agro-industry logistic centre

3.4.2.1. Biomass resources availability:

The agro-industry itself produces olive tree pruning, vineyard pruning and orchards pruning. In the area within a radius of 30 km, there are other vineyard, olive tree and

orchard plantations, whose pruning produced mainly from October to April, are generally burned or chopped and left to the soil as organic amendment.

Calabria is not among the target regions of the project, so as far as the availability of biomass resources and bioenergy area of potential market of reference was made to bibliographic data and interviews with the agro-industry and other local stakeholders. The following data was the result of this research:

- Estimated actual availability of herbaceous crop residues for the Province of Cosenza (source: Enama, 2011): 17,859 t/yr d.b.
- Estimated actual availability of the permanent crops residues for the Province of Cosenza (source: Enama, 2011): 45,134 t/yr d.b.

From the analysis of the figures and the interviews held with the stakeholders, it can be concluded that:

- Herbaceous residues, mainly straw, have not been taken into account, because they are currently sold for animal bedding in format of small bales (size 1.10 X 0.4 m) at 1.50 € each.
- As for the pruning of olive trees, there is a significant amount that could be used in the logistics centre. The same agro-industry has a lot of waste material and can also have access to different material from neighbouring areas. However, currently there are no initiatives which promote the harvesting of pruning in large scale in the area. The usual practice is to burn them or to shred them and leave them on the soil even though it could be used as raw material for solid biomass. For this purpose, the company is considering to become a logistic operator to gather these residues. The possibility of buying a chipper to chip the biomass arranged in windrows, directly in the field (approximate cost € 30,000) has been included in the economic evaluation of this study.
- Vineyard pruning have been taken into account, though the availability of biomass is lower than that of olive groves, and according to conversations with machinery providers there is higher difficulty in collecting vineyard pruning compared to olive tree pruning.
- Finally, the study has considered the pruning derived from orchards, which in the area are present in important quantities.

Therefore, the agricultural residues available for the production of solid biomass that have been considered are olive tree, vineyard and orchard pruning. The purchasing prices together with quantities available are shown in Table 23.

Table 23: Data on the available agricultural residues in a 30 km distance.

Type of residue	Available quantities t/y	Moisture content w-% ar	Months of harvest	Purchasing price €/t	Transport cost €/t
Olive tree pruning	546	32	Oct-Apr	1	15

Vineyard pruning	571	35	Nov-Apr	1	15
Orchard pruning	309	40	All year	1	15

The pruning harvesting will take place directly in the fields of the raw material suppliers and will be carried out by the agro-industry Serragiumenta with the harvester+chipper machinery to be purchased. Farmers will receive 1 €/t for the product apart from the benefits of saving money by avoiding to manage the residue.

3.4.2.2. Equipment and facilities available

Serragiumenta Agricola SNC, at the moment, does not have any machineries useful for the production process, but they could afford investments to buy them and it is their intention to buy a pruning chipper.

In the table below are reported the periods of production of the residues. It can be observed that there are several months in which it would be possible to start the production of solid biomass without large periods of storage.

Table 24: Seasonal availability of the biomass resources and the equipment.

RESOURCES	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Olive tree pruning	x	x	x	x						x	x	x
Vineyard pruning	x	x	x	x							x	x
Orchard pruning	x	x	x	x	x	x	x	x	x	x	x	x

3.4.2.3. Bioenergy potential market

Serragiumenta Agricola SNC has an interest in creating a new production line of chips from agricultural pruning, for two purposes: (1) for self-consumption powering a steam generator which would be eventually built at the service of some owned buildings, (2) to sell them in the local market.

The new product would address mainly small end users and companies who own small boilers fed by chips. It should be highlighted that in Italy it is difficult to sell non-certified solid biomass (A_1, A_2 or B class).

The types of solid biomass used in the area and considered competitive for Serragiumenta Agricola SNC are shown in **Table 25** with the relative prices (VAT excluded).

Table 25: Different types of solid biomass consumed in the area.

Type of biomass	Price		Ash content w-% db
	€/t	€/kWh	
Wood chips cat A1	95	0.0250	< 1
Wood chips cat A2	80	0.0209	< 2

Wood chips cat B	60	0.0200	< 3

3.4.3. Feasibility of the new business line as agro-industry logistic centre

The agro-industry is interested in evaluating the production of the following three solid biomass types:

- Chips from olive tree pruning
- Chips from vineyard pruning
- Chips from orchard pruning

In all these cases, a chipper will be purchased to chip pruning directly in the field (about 30,000 €) and considered in the economic analysis. The scenarios that have been taken into account for SUCELLOG study have been:

Table 26: Solid biomass types and produced amounts.

Type of solid biomass	Produced amounts t/y
Olive tree pruning chips	494
Vineyard pruning chips	494
Orchard pruning chips	247

For the production of chips, in all the cases pre-treatments are:

- Particle size reduction of pruning arranged in windrows, directly in the field, with the chips in breathable big bags. The moisture content is expected to decrease from around 35 % to 27%.
- The breathable big bags are stored outside the warehouse under cover. The moisture content is expected to decrease from 27% to 25% by natural drying.

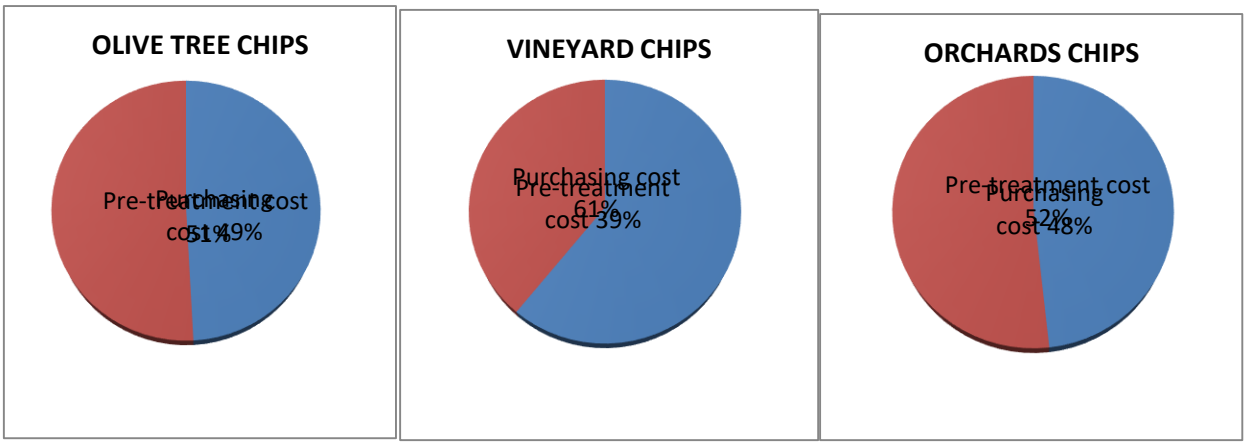


Figure 15: Allocation of production costs for the three chips.

The production cost obtained from the analysis and the minimum acceptable price are shown in the following table:

Table 27: Minimum selling price of different products.

Type of scenario	Quantity produced	Production cost	Transport cost	Investment cost quota	Min profit	Min acceptable selling price
	t/yr	€/t	€/t	€/t	€/t	€/t
Olive tree pruning chips	494	**33,54**	18,00	2,43	**5,00**	**58,97**
Vineyard tree pruning chips	494	**26,48**	18,00	2,43	**5,00**	**51,91**
Orchard tree pruning chips	247	**39,51**	18,00	2,43	**5,00**	**64,94**

In the tables below it can be observed the comparison with biomass products in the market:

Table 28: Competing products main quality characteristics and prices.

	Quality characteristics			Prices
	LHV (kWh/kg ar)	Bulk density (kg/m^3)	Ash content (w-% db)	€/kWh
Wood chips cat A1	4,25	250	< 1	0,0250
Wood chips cat A2	2,65	270	< 2	0,0209
Wood chips cat B	2,65	300	< 3	0,0200

Table 29: Products to be generated in the new business line (theoretical quality characteristics and prices).

	Quality characteristics			Prices
	LHV (kWh/kg ar)	Bulk density (kg/m^3)	Ash content (w-% db)	€/kWh
Olive tree pruning chips	3,41	300	4,50	0,0173
Vineyard pruning chips	3,47	300	3,00	0,0149
Orchard pruning chips	3,41	300	3,00	0,0191

Although all the proposed products seem to be competitive in the market (pruning against forest wood chips), the possible risk that agro-industry may face when selling potential biomass produced is that the quality of agro-pruning chips must be controlled to ensure that is comparable to that of forest products.

The main constraint appears to be the ash content, which can increase consumers' maintenance requirements. For this reason, special care should be taken also when harvesting the branches in order not to collect stones/sand. Up-rooted trees are preferred than pruning to reduce the amount of bark in the wood.

Additionally, particle size distribution should be similar to the one of the forest wood chips offered in the market in order to avoid feeding problems and customers dissatisfaction.

3.4.4. Conclusions

Serragiumenta agro-industry is interested in starting a new business line producing solid biomass from agrarian sources as a complement to their agricoltural activity and to take advantage of their own residues.

Regarding the possibilities as logistic centre, 3 scenarios have been considered, corresponding to 3 different products: olive pruning chips, vineyard pruning chips and orchard pruning chips.

The company do not have machineries compatible for the production but has the intention to buy a pruning harvester and chipper (value of 30,000 €) to start this line of production. The drying process of the wood would be done naturally.

The current biomass market is not as varied as in other countries, being the solid biomass products offered mainly from forest origin (in chip and pellet format). The potential consumers of the proposed logistic centre are small-medium plants (schools, greenhouses, district heating plants, private citizens) consuming chips.

The study has shown that all possible products are feasible from the techno-economic point of view and competitive with the current marketed solid biomass.

The data coming out from the analysis of cost, profit and revenue potential, considering an investment to be amortized fully with the new production line, are currently good enough for the agro-industry.

Nevertheless, a previous quality analysis (mainly determination of moisture content, calorific value, ash content and Chlorine percentage) of a representative sample of the raw material for the logistic centre is strongly advisable before starting the new business activity. Tests of the products in real operating equipment from potential consumers should be also offered as to ensure their satisfaction.

3.4.5. Additional support activities

Within the project, the agro-industry has received actions of support in addition to the audit activity, as summarized below:

- Introduce personally to contacts with potential consumers and suppliers of raw materials;
- Introduce the potential suppliers or the agro-industry with manufacturers of resource harvesters and on-field pre-treatment systems, i.e. Peruzzo and Serrat (during EIMA fair);
- Accompanying actions in events where interesting stakeholders for the new business line are met, i.e. participating to a conference in EIMA fair about agro-prunings as energy biomass (in particular about standards, quality, European project experiences like EuroPruning and Up Running);
- Introduce personally to manufacturers of energy systems, i.e. Uniservizi s.r.l.;
- Technical personal support in combustion tests and chemical-physical analysis carried out by RAGT Energie;
- Ask for budget to machinery manufacturers or project developers, i.e. Uniservizi s.r.l.;
- Show successful initiatives of utilization or production of solid biomass from agriculture products. i.e. Hofer Energy;

- Visit together facilities working (or designed to) with agriculture biomass. i.e. at Hofer Energy place;
- Support on improving the energy efficiency of the whole own facilities incorporating biomass;
- Provide information about public aids/financing for purchase of equipment, i.e. Rural Development Program 2014-2020 and Conto Termico Decree;
- Provide support for marketing activities, suggesting to promote wine, one of their main final products, coming from energy coming from their own residues and by-products;
- Provide information about equipment costs, including installation, i.e. concerning the cogeneration plant;
- Provide knowledge about solid biomass quality issues;
- Create synergies with other projects or experiences on similar initiatives on agriculture biomass, ie DREAM adhered to the EU UP_Running project, participating to the online channel of the projects although not being partners, in order to exchange experiences, information and contacts on the agro-biomass topic related to prunings. All the knowledge gained served to better support the cooperative.

3.5. Summary of the audit study to Azienda Agricola Rapaccio

3.5.1. Company description

The Azienda Agricola Rapaccio, located in Montemurlo (PO), is dealing with olive growing, floriculture, urban garden maintenance, agro-forestry activities and natural engineering. The agro-industry already produces 2 types of solid biomass from forest sources: firewood and chips.

They are interested in evaluating the possibility of increasing their production with agrarian sources in order to generate another product to be used by themselves and to be eventually sold in the local market, taking advantage of the pruning residues of their plantations. Moreover, 2 products have been analysed by SUCELLOG project:

- Olive tree pruning chips;
- Olive tree pruning and forestry wood chips.

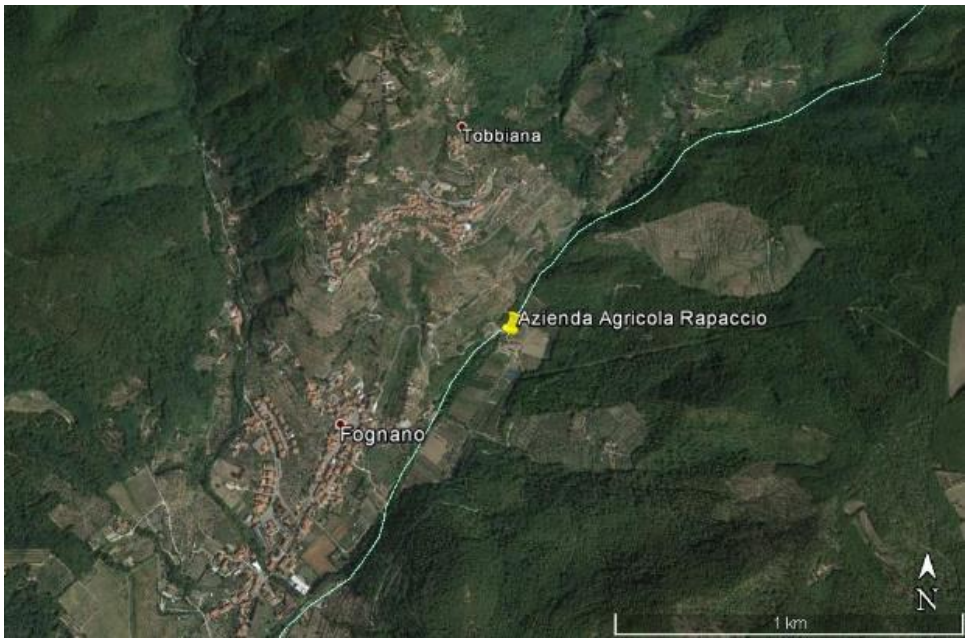


Figure 16: Location of Azienda Agricola Rapaccio (Source: Google Earth).

3.5.2. Synergies to become an agro-industry logistic centre

3.5.2.1. Biomass resources availability:

The agro-industry itself produces olive tree pruning. Within a radius of 30 km, there are farmers owning vineyards and olive tree plantations even if with no current link with the agro-industry. Pruning residues are mainly produced from January to March and are usually burned to be used as fertilizer, left as they are or chopped and left directly in the fields.

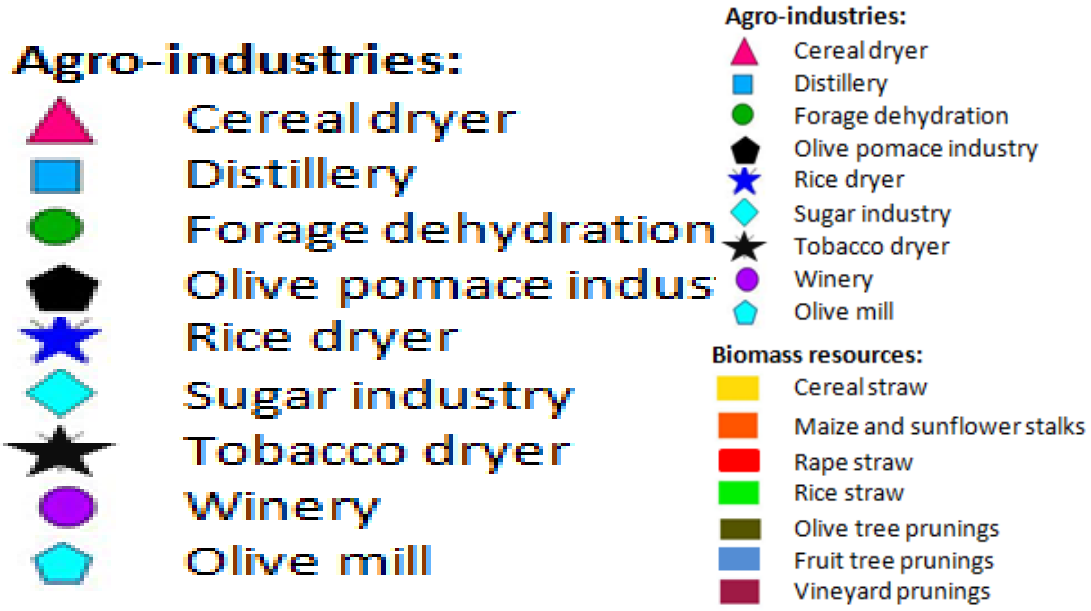


Figure 17: Location of resources and types of agro-industries around the company.

From the analysis of the Figure 17 above and the interviews held with the stakeholders, it can be concluded that:

- Regarding olive tree pruning, as it can be seen in the Figure, there is a significant amount that could be used in the logistic centre. Moreover, the agro-industry itself is a producer of this residue. However, no logistic chain is existing in the area and efforts should be done in that sense with the local stakeholders. Farmers would be interested in selling the product to a logistic operator, avoiding to chop it and to leave in on the soil and therefore giving an added value to the available residue.
- The vineyards pruning are not taken into consideration, due to their lower availability in terms of quantity and because of the higher difficulty in their harvesting, compared to the olive tree pruning.

Therefore, the agricultural residues preferred by the agro-industry for the production of solid biomass are olive tree pruning. The pruning harvesting will take place directly in the fields of the raw material suppliers and will be carried out by the agro-industry Rapaccio. In particular, suppliers would collect pruning branches in heaps and the company would collect them with their tractors. Suppliers thus would solve the problem of pruning disposal saving money and time. For the study, and according to conversations with the agro-industry, it has been considered that olive pruning branches can be purchased to farmers at 5 €/t.

At the same time, the company should take into account a transport cost of raw materials from suppliers' fields to yards where pruning will be chopped, of 15 €/t.

Table 30 shows the resources that would be considered as available for the logistic centre and their characteristics.

Table 30: Data on the available agricultural residues in a 30 km distance.

Type of residue	Available quantity t/y	Moisture content w-% ar	Months of harvest	Purchasing price €/t	Transport cost €/t
Olive tree pruning	618	45	Jan-Mar	5	15
Forestry wood	142	40	Sep-Jun	0	15

In order to improve the quality of the final product, the company is interested in evaluating the possibility of mixing the chips from olive tree pruning with the chips from forestry wood. The wood considered for the study (142 t/y at an initial moisture content of 40 %, w-% ar) are residues coming from their own works (a price of 15 €/t has been considered) that otherwise would not be used.

3.5.2.2. Equipment and facilities available

The agro-industry has three tractor activated chippers. They are normally underused in July and August, but their workload changes importantly depending on the amount

of the gathered material until the achievement of a proper amount for ensure an efficient chipping.

Being the use of the equipment flexible, it can be scheduled based on the availability of gathered residues. Enough space is available in the agro-industry for storing. Therefore, no investment is required to develop the new activity.

With regard to the match of the seasonal production of the biomass resources with the idle periods of the agro-industry, as it is shown in the following graph, the activity for producing solid biomass could be settled up in July and August, when the chipper is more available. The olive pruning branches would be then stored outdoors under roof or under non-permeable textile until that period, been dried naturally.

Table 31: Seasonal availability of the biomass resources and the equipment.

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chipper							X	X				
RESOURCES												
Olive tree pruning	X	X	X									

3.5.2.3. Bioenergy market potential

Currently Rapaccio supplies forest wood chips in a radius of 10 km to few households or farms, during the winter, and few greenhouses, during all the year. They are a biomass consumer too, using firewood and forest wood chips for the heating of their own buildings.

The current biomass market in the area is not as varied as in other countries and generally, they require good quality wood chips and a standard size of the particles.

The company sells wood chips with a variable moisture content from 16 to 22 %, mainly during the winter, at 90-100 €/t to farms and at 120 €/t for domestic use (including transport).

Districts heating plants, greenhouses and cogeneration plants, in a radius of 20 km, would be targeted to supply them also with olive tree pruning chips or mixed olive tree pruning-forestry wood chips, aiming for a quality and a price equivalent to forestry wood chips already purchased by those consumers. Rapaccio would also consume the new chips to heat their own different buildings in winter.

Wood pellet consumers in the area (mainly households) are not considered the target consumer segment due to the type of boilers that they own, not compatible with chips. In a second stage, the company would like to investigate the existence of boilers that have a good combustion of wood chips from agricultural sources in the area. Indeed, within a distance of 10-20 km, there are families and agro-industries or farms who consume wood chips. Moreover, Rapaccio believes that the biomass boilers' properties, both domestic and industrial, are not technically adequate for a mid-quality chips use, as the one from agricultural pruning could be, due to problems linked with

the feeding systems, with the ash disposal and the chlorine content. However, combustion tests should be performed.

The types of solid biomass used in the area and considered competitive for Rapaccio are in **Table 32** with the relative prices (VAT excluded).

Table 32: Different types of solid biomass consumed in the area.

Type of biomass	Price		Ash content w-% db
	€/t	€/kWh	
Wood chips cat A1	120	0,0292	< 1
Wood chips cat A2	90	0,0242	< 2
Wood chips cat B	70	0,0200	< 3

3.5.3. Feasibility of the new business line as agro-industry logistic centre

The agro-industry would like to evaluate a new business line that generates the following two products:

- Chips from olive tree pruning.
- Mixed chips from olive tree pruning and forestry wood.

Table 33: Solid biomass types and quantities produced

Type of solid biomass	Quantity produced t/yr
Olive tree pruning chips	400
Mixed olive tree pruning (80%) and forestry wood (20%) chips	500

For the production of olive tree pruning chips, pre-treatments are:

- Handling of pruning from the company's and suppliers' fields to the storage area, under a roof or outdoors. The moisture content would decrease at least from 45% to 40%.
- Particle size reduction of pruning harvested. The moisture content would decrease at least from 40% to 35%.
- Chips storage in yards, under a roof or outdoors. The material is manually moved to facilitate the natural drying, in this way the moisture content would decrease from 35% to 15%.

For the production of mixed olive tree pruning (80%) and forestry wood (20%) chips, pretreatments are the same but including the chipping of forestry wood. See Figure 18 for distribution of production costs. The distribution of production cost for both scenarios is very similar and can be observed in Figure 18. The minimum selling price is included in Table 34.

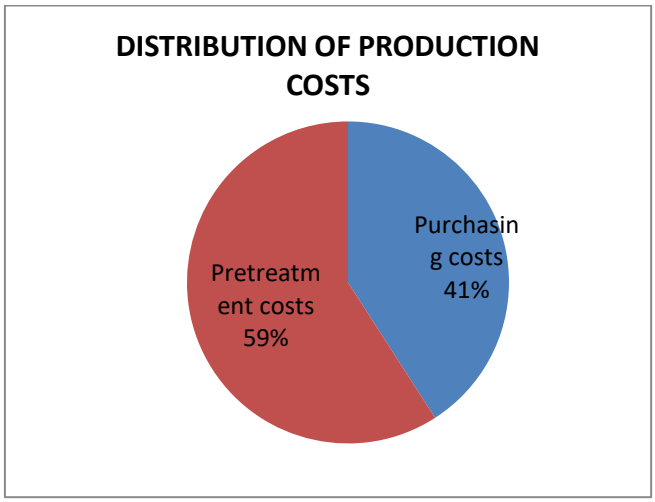


Figure 18: Allocation of production costs of olive pruning chips.

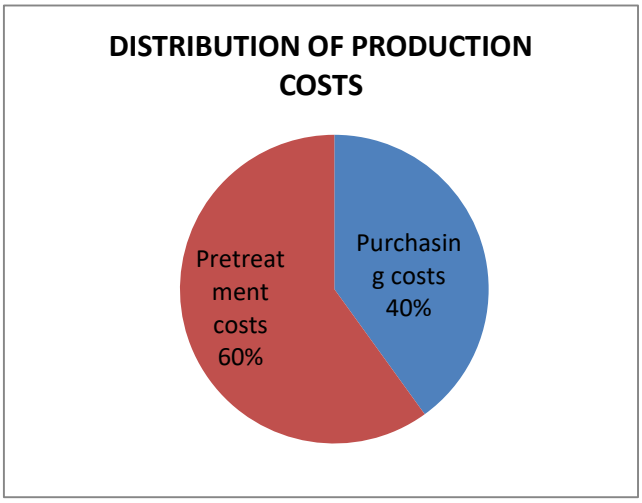


Figure 19: Allocation of production costs of mixed chips.

Table 34: Minimum selling price of different products.

Scenario	Produced amounts	Production cost	Transport cost	Investment cost quota	Minimum profit	Minimum acceptable selling price
	t/y	€/t	€/t	€/t	€/t	€/t
Olive tree pruning chips	400	**74,73**	20	0	**5**	99,73
Mixed chips of olive tree pruning and forestry wood	500	**71,68**	20	0	**5**	96,68

In the tables below it can be observed the comparison with biomass products currently in the local market:

Table 35: Competing products main quality characteristics and prices

	Quality characteristics			Prices
	LHV (kWh/kg ar)	Bulk density (kg/m^3)	Ash content (w-% db)	€/kWh
Wood chips cat A1	4,36	250	< 1	0,0292
Wood chips cat A2	3,77	270	< 2	0,0242
Wood chips cat B	2,65	300	< 3	0,0200

Table 36: Products to be generated in the new business line (theoretical quality characteristics and prices)

	Quality characteristics			Prices
	LHV (kWh/kg ar)	Bulk density (kg/m^3)	Ash content (w-% db)	€/kWh
Olive tree pruning chips	4,77	300	4,50	0,0252
Mixed chips of olive tree pruning and forestry wood	4,84	300	4,05	0,0241

According to bibliographic data (from European projects like EuroPruning, (http://www.europruning.eu/), the chips planned to be produced would not fulfil category B stated in ISO 17225-4, mainly because of the ash content.

In addition, the price per kWh of the new chips is similar to forest wood chips category A, because the company wants to maintain this type of prices to be sure to cover all costs in order to start production. A careful review of production costs should be performed. In this regard and in order to be competitive, the quality should be achieved by implementing all possible precautions. An intense marketing policy highlighted that the use of local residues against imported wood products (commonly used in Italy) should be considered.

3.5.4. Conclusions

SUCELLOG has evaluated the possibilities for Rapaccio to develop a logistic centre considering the production of chips from olive tree pruning and the production of mixed chips (olive tree pruning+forest wood).

The company could use their usual equipment and facility to generate this product with no investment foreseeing the possibility to schedule the use of its own equipment (tractor and trailer) to collect and chip agricultural residues.

Apart from their own facility, additional potential consumers of the proposed logistic centre would be families, small-medium agro-industries, farm and greenhouses.

The study has shown that even with mixing with forest chips, the quality of the product would be inferior to marketed products and the competitiveness is not clear. However, in order to take a decision on the appropriateness of the new business line, SUCELLOG recommends to perform quality analysis of the products (mainly determination of moisture content, calorific value, ash content and Chlorine percentage) as well as combustion tests in the equipment, investigating on brands and models of boilers most indicated.

An amount of 10 t/y of chips from only agrarian residues, therefore olive pruning, should be intended to the self-consumption, with a production of 40,500 kWh of thermal energy.

3.5.5. Additional support activities

Within the project, the agro-industry has received actions of support in addition to the audit activity, as summarized below:

- Introduce personally to contacts with potential suppliers of raw materials and accompanying a potential supplier to Vivere Bio fair in order to make them closer in allocating pruning for energy purposes rather than for composting;
- Introduce the potential suppliers or the agro-industry with manufacturers of resource harvesters and on-field pre-treatment systems, i.e. CAEB;
- Accompanying in demonstrations of resources harvesting/pre-treatment with innovative systems, i.e. field test of a pruning of vines and olive trees baler of the CAEB;
- Introduce personally to manufacturers of energy systems, i.e. Uniservizi s.r.l.;
- Ask for budget to machinery manufacturers or project developers, i.e. ONG snc and CAEB;
- Show successful initiatives of utilization or production of solid biomass from agriculture products; i.e. another farm in the area producing olive tree prunings bales for bakeries and pizzerias;
- Introduce to other agro-industries or other stakeholders thinking on starting similar initiatives on agriculture biomass, as above;
- Provide information about public aids/financing for purchase of equipment, i.e. Rural Development Program 2014-2020;
- Create synergies with other projects or experiences on similar initiatives on agriculture biomass, ie DREAM adhered to the EU UP_Running project, participating to the online channel of the projects although not being partners, in order to exchange experiences, information and contacts on the agro-biomass topic related to prunings. All the knowledge gained served to better support the cooperative.

Similarly, a company's potential supplier has received actions of support, as summarized below:

- Accompanying actions in events where interesting stakeholders for the new business line are met, i.e. Vivere Bio fair;
- Build-up capacity on biomass field and particularly on solid biomass from agriculture sources;
- Create synergies with other projects or experiences on similar initiatives on agriculture biomass, ie DREAM adhered to the EU UP_Running project, participating to the online channel of the projects although not being partners, in order to exchange experiences, information and contacts on the agro-

biomass topic related to prunings. All the knowledge gained served to better support the cooperative.

3.6. Summary of the audit study to Società Agricola Leo Verde

3.6.1. Company description

Società Agricola Leo Verde, located in Roccastrada, via Montelattaia (GR), meanly deals with forage production and olive growing, with 15 ha of olive groves. Furthermore, the company owns a biogas cogeneration plant with a power output of 1 MWe. The company cultivates ryegrass and purchases olive pomace, corn, triticale, sorghum and further ryegrass to feed the biogas plant. In the agroindustry the olive pit is extracted from the olive pomace purchased and then it is sold to the supplier of the olive pomace and some oil mills of the area to cover their heat demands.

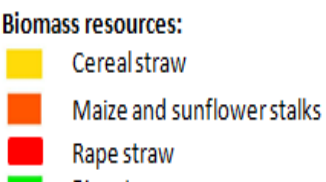
The company is interested in optimising their olive pit production in order to be more competitive in the biomass market offering a better quality product, studying the possibility to be sold in small packages for household consumers. They would also like to evaluate the feasibility of becoming a logistics centre for the production of agro-pellets within SUCELLOG project.

Figure 20: Società Agricola Leo Verde location (source: Google Earth).

3.6.2. Synergies in becoming an agro-industry logistic centre

3.6.2.1. Biomass resources availability

Resources availability analysis revealed that a significant amount of agrarian residues for the solid biomass production is available within a 30 km radius from the society, without market competition or sustainability requirements (Figure 21).



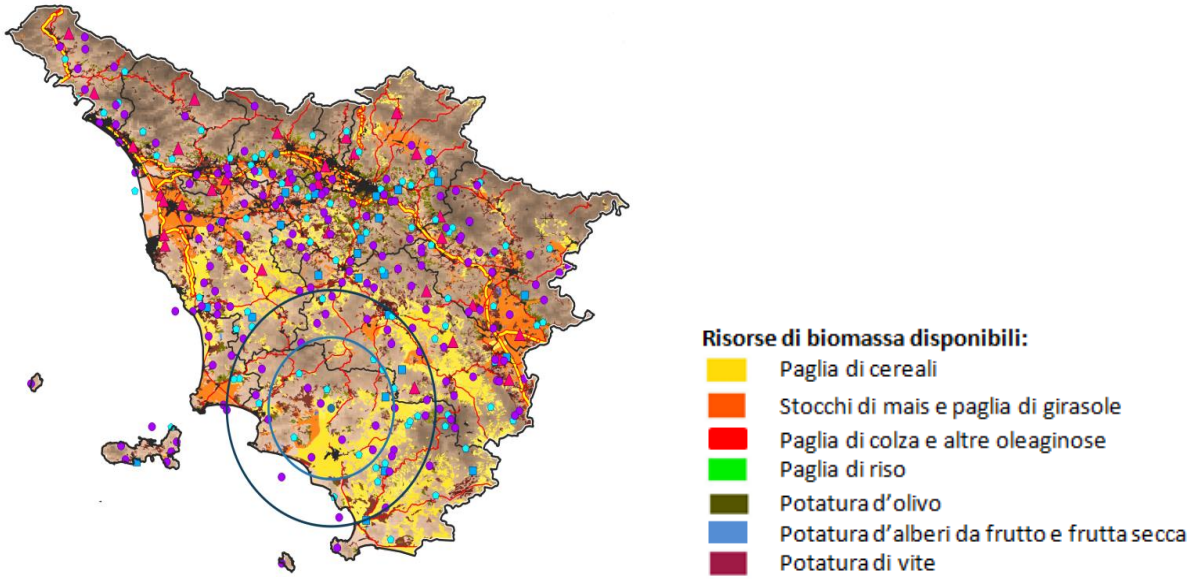


Figure 21: Location of resources and types of agro-industries around the company.

From the picture analysis and the interviews with the local stakeholders it is possible to conclude that:

- Cereal straw is usually sold as animal litter or fodder. Even if a big theoretical amount of it can be available, in this study it will not be considered as raw material due to its alternative preferable usage.
- A considerable amount of olive pruning could be used in the logistic centre: the agro-industry itself has some resulting material, and in the surrounding area there are about 1.500 ha of olive groves. The orchards pruning as well can be considered as raw material for the logistic centre, since in the area there are about 100 ha of orchards and their pruning can be mixed with the olive ones for the agro-pellet production. However, currently there are no initiatives which promote the harvesting of pruning in large scale in the area. The usual practice is to burn them or to shred them and leave them on the soil. Farmers would be interested in selling the product to a logistic operator which harvest the pruning directly in the fields, saving work and given an added value to the available residue. For this aim, the company is interested in purchasing a residual chipper to chip the biomass in windrows in the fields.
- Vineyard pruning are not considered as raw material in this study for the higher difficulty in the harvesting process.
- Maize stalk is considered an undesired raw material and would not be taken into account for the production of solid biomass in this study. The reason is the high amount of sand and stones that it contains, due to the fact that it is harvested in September-November during the rainy season.

Therefore, the agricultural residues available for the production of solid biomass are olive tree and orchards pruning.

Moreover, the company has 1.000 t/year of wet olive pits extracted from the olive pomace that is fed to the cogeneration plant.

Table 37: Data on the available agricultural residues in a 30 km distance.

Residue type	Available amount t/year	Moisture content w-% ar	Harvesting months	Purchasing cost (VAT excluded) €/t
Olive pruning	2.021	45	Mar-Aug	1
Orchard pruning	117	50	Nov-Aug	1
Olive pits	1.006	15	Oct-Jan	0

The pruning harvesting will take place directly in the fields of the raw material suppliers and will be carried out by Leo Verde with the harvester+chipper machinery to be purchased. Suppliers would thus solve the problem of pruning disposal saving money and time. For these reasons and for the fact that, in the area, pruning are not yet considered a marketable product, their purchase cost is quite low.

3.6.2.2. Available equipment and facilities

The company owns some facilities which are compatible with the new business line: it has two olive pit extractors, a considerable space availability under canopies to storage the material, and it has hot exhaust gases from the cogeneration plant, that can be used to reduce biomass moisture content. These components can be used during the whole year for the new production, and the solid biomass handling can be planned on the basis of the agrarian residues availability thanks to the storage available space.

The needed investments for the agro-pellet production are:

- A pruning field chipper for the raw material harvesting and the particle size reduction with a production capacity of 1,14 t/h;
- A pelletizer line for the pruning densification, with a production capacity of 0,3 t/h;
- A rotatory drier both for the prunings and the olive pits moisture content reduction, with a production capacity of 3 t/h, powered by the surplus hot exhaust gases from the cogeneration plant.

Furthermore, Leo Verde is planning to sell the olive pits in bags of 15 kg, but for now doesn't plan to buy equipment for this purpose, carrying out packaging manually.

With regard to the match of the seasonal production of the biomass resources with the idle periods of the cooperative, as it is shown in the following graphs, the activity for producing solid biomass could be settled up in many periods during the year:

Table 38: Seasonal availability of the biomass resources and the equipment.

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Ago	Sep	Opt	Nov	Dec
Olive pit extractors	x	x	x	x	x	x	x	x	x	x	x	x
Hot air[4]	x	x	x	x	x	x	x	x	x	x	x	x
RESOURCES												
Olive tree and orchards prunings			x	x	x	x	x	x				
Olive pomace	x									x	x	x

3.6.2.3. Bioenergy potential market

There are many agro-industries, farmers and families using olive pits within a 50 km radius from the farm. Leo Verde itself produces about 1000 t/yr of olive pits, with a moisture content between 15 and 30%, with a market price of 150-170 €/t, and it uses a small amount of it for self-consumption, to heat the swimming pool during the summer time.

Further potential consumers of olive pits could be public buildings or other households. Householders use pellet and firewood too. Pellet is purchased at big distribution chains or supermarkets, but even at little stores. It should be highlighted that in Italy it is very difficult to sell non-certified solid biomass (DINplus or ENplus), and the usage of non-certified pellets in a boiler may cause the loss of the boiler guarantee.

Solid biomass consumption is seasonal for domestic use, mainly between September and April, while yearly for the industrial users. Middle and big consumers (heating districts, greenhouses, schools, cogeneration plants) are using forestry wood chips, which is carried by trucks, and they ask for a good quality product characterised by standard moisture content and particle size, with an increasing attention to the product certification.

The market competition is characterised by the presence of few big producers and many small producers of wood chips. There are not producers of solid biomass from agrarian residues, neither pellet nor chips.

However, even if the general biomass consumption is slightly increasing within the Country, it remains strictly connected with the oil price, and many people, once biomass consumers, are nowadays using fossil fuels again due to their price decrease.

The table below shows the prices and quality of the different products in the local market.

Table 39: Different types of solid biomass consumed in the area.

Type of biomass	Price	Ash content

[4] Especially from May to September

	€/t	€/kWh	w-% db
Current olive pits	160	0,0500	< 2
Forestry wood pellet-class A1	230	0,0500	< 1

3.6.3. Feasibility of the new business line as agro-industry logistic centre

The company is interested in starting a new activity as logistic centre for the production and the selling of solid biomass according to two possible scenarios:

1. **Pellet from olive and orchard prunings:** Leo Verde owns 15 ha of olive groves, from which it could obtain a small fraction of the prunings (about 20 t/year), the remaining one should be purchased and harvested from orchards and olive groves of the area, then carried to the agro-industry for the processing. Given the raw material amount, the expected produced amount is of 1.300 t, with a mixture of 95 % of olive tree pruning and 5 % of orchard pruning. This scenario implies the harvesting and the chipping of the pruning residuals directly in fields, with the related investments for the pelletizer and the dryer.
2. **Olive pits drying:** the agrarian society Leo Verde already purchases olive pomace from the oil mills in the area, especially from OL.MA. for the cogeneration plant feeding. Leo Verde already extracts 3 t/day of olive pits, which are mainly sold to OL.MA. itself for their energy needs. The extraction process includes the water addition to the olive pomace and a further centrifugation.

Table 40: Solid biomass types and quantities to be produced.

Solid biomass typologies	Produced amounts t/year
Pellet from olive and orchard pruning	1,300
Olive pits	950

After the residuals purchasing, they have to be pre-treated to be sold as solid biomass.

For the mixed pellet from olive tree (95 %) and orchard (5 %) pruning production, pre-treatments are:

- Particle size reduction of the gathered pruning. Moisture content should reduce at least of 5 %, from 45 to 40 % for olive tree prunings and from 50 to 45 % for orchard prunings.
- Drying, with a moisture content reduction to 20 %.
- Milling and pelletizing, with a further moisture content reduction to 10 %.
- Pellet storage in yards, under canopies. Material will be manually handled.

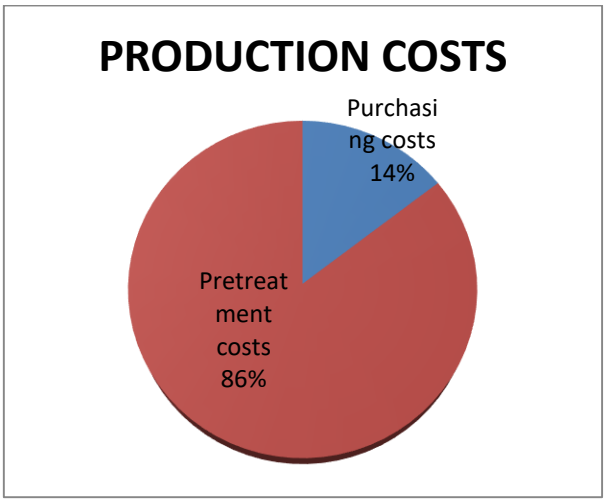


Figure 22: Allocation of production costs for agro-pellet.

For the olive pits production from the olive pomace, additional pre-treatments of the new business line are forced drying (with a moisture content reduction from 15 % to 10 %) and the packaging of final product in bags of 15 kg.

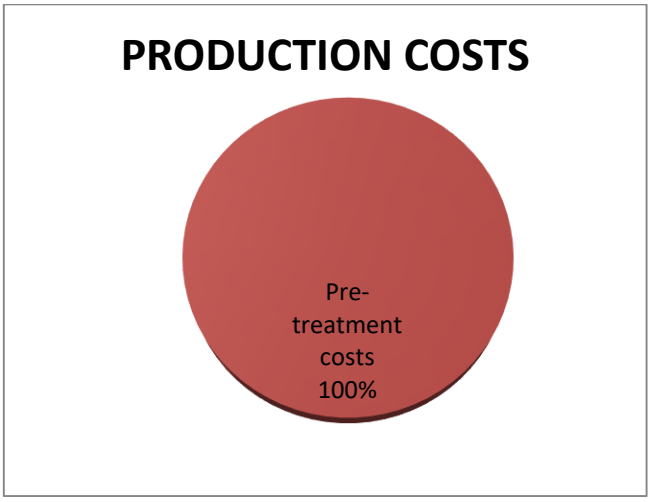


Figure 23: Allocation of production costs for olive pits.

Minimum selling price is reported in the table below.

Table 41: Minimum selling price of different products.

Scenario	Quantity produced	Production cost	Transport cost	Investment cost quota	Min profit	Min acceptable selling price
	t/yr	€/t	€/t	€/t	€/t	€/t
Pellet from olive tree and orchard pruning	1.300	**145,49**	15	30	**15**	**205,49**
Olive pits	950	**13,72**	15	52,63	**15**	**96,35**

In the tables below it can be observed the comparison with biomass products in the market:

Table 42: Competing products main quality characteristics and prices.

Competing products	Quality characteristics			Price		
	LHV (kWh/kg ar)	Bulk density (kg/m^3)	Ash content (w-% db)	€/t	€/kWh	€/m^3
Forestry wood pellet-class A1	4,6	650	0,70	230	0,050	150
Current olive pits	4,25	500	4	160	0,050	80

Table 43: Products to be generated in the new business line (theoretical quality characteristics and calculated prices).

New business line products	Quality characteristics			Price		
	LHV (kWh/kg ar)	Bulk density (kg/m^3)	Ash content (w-% db)	€/t	€/kWh	€/m^3
Pellet from olive tree and orchard pruning	4,23	600	4,43	210	0,049	124
Dried olive pits	4,76	500	2,8	170	0,020	85

Evaluating this data, it can be said that the risks that the agro-industry could face in starting the new business line are the following:

- In terms of heating value and €/m^3, agro-pellet seems to be a competitive product for the forestry wood pellet. However, the ash content is considerably higher, and tests in real consumers' boilers should be carried out to evaluate its competitiveness as solid biomass in terms of operation and maintenance. In any case, in order to reduce the price of the product, the cost of reduction of moisture content should be checked and look for a combined alternative with natural drying. The agronomic benefits from avoid on-field burning should be also taken into account from the environmental and social point of view.

- The analysed investment for the olive pits production is not considered a big risk for the company since the olive pits are a very well-known product in the biomass local market. Moreover, they already have a market created, so for certain consumers it will only be needed to prove that the additional cost compared to the previous ones will mean a less quantity of product to be required.

3.6.4. Conclusions

Leo Verde agrarian society deals with olive tree growing and forage, and it owns a biomass cogeneration plant, for which it purchases olive pomace, ryegrass and triticale. The company is interested in verifying the possible synergies between its facilities capacity and the agrarian raw material of the area.

An evaluation of the boundary conditions has been carried out with the following conclusions:

- The raw material resources for the logistic centre are olive tree and orchard prunings from the farmers of the area and of the own agro-industry's agricultural

activities. They are an interesting resource to be considered for the production of an agro-pellet. A second scenario foresees the optimization in the current olive pits extraction from the olive pomace feeding the cogeneration plant, with the utilization of a residual hot gases and offered in a package format.

- The biomass current market is not very varied and the main offer of solid biomass comes from forestry origin, in chips or pellet format. Families and small and medium plants (school, greenhouses, heating districts) are the potential consumers for the proposed logistic centre.

Two possible production scenarios have been evaluated to analyse the logistic centre potentiality, both of them characterised by different initial investments, with different final products and costs. The agro-industry facilities are already partly compatible with the new scenarios, but the purchasing of a dryer is necessary in both of them, besides the one of a field-chipper and a pelletizer for the production of agro-pellet from the pruning residues.

3.6.5. Additional support activities

Within the project, the agro-industry has received actions of support in addition to the audit activity, as summarized below:

- Introduce personally to contacts with potential consumers and suppliers of raw materials;
- Accompanying actions in events where interesting stakeholders for the new business line are met, i.e. participating to a conference in EIMA fair about agro-prunings as energy biomass (in particular about standards, quality, European project experiences like EuroPruning and Up Running);
- Introduce to other agro-industries or other stakeholders thinking on starting similar initiatives on agriculture biomass, partecipating to the conference on the opportunities provided by the Rural Development Plan for the food industry. In that occasion, we met a farm, which carried out a project funded by the RDP 2007-2013 on the Innovative Enhancement of Olive tree Pruning Waste (VISPO project). They built a micro gasifier prototype, powered by olive tree prunings;
- Technical personal support in combustion tests or adaptation of existing/new facility equipment, i.e. physical-chemical analysis carried out on olive pits newly produced;
- Ask for budget to machinery manufacturers or project developers, i.e. Costruzioni Nazzareno;
- Create synergies with other projects or experiences on similar initiatives on agriculture biomass, ie DREAM adhered to the EU UP_Running project, participating to the online channel of the projects although not being partners, in order to exchange experiences, information and contacts on the agro-biomass topic related to prunings. All the knowledge gained served to better support the cooperative.

Similarly, a company's potential supplier and consumer has received actions of support, as summarized below:

- Build-up capacity on biomass field and particularly on solid biomass from agriculture sources;
- Create synergies with other projects or experiences on similar initiatives on agriculture biomass, ie DREAM adhered to the EU UP_Running project, participating to the online channel of the projects although not being partners, in order to exchange experiences, information and contacts on the agro-biomass topic related to prunings. All the knowledge gained served to better support the cooperative.

3.7. Summary of the audit study to the Cooperative Society La Matrecina

3.7.1. Cooperative description

The cooperative society La Matrecina, located in Mondavio with registered office in Via Frazione S. Michele al Fiume, 115 – 61040 (PU), mainly deals with forestry activities, as wood cutting and management for construction wood, firewood and wood chips. For these activities it manages 30 ha/year of forest land.

Figure 24: Cooperative society La Matrecina location (source: Google Earth).

The cooperative, with other partners, produces of a large amount of forest wood chips, which it yearly sells to final consumers, mainly located in Emilia Romagna.

Next to the company there is another farm, which stores cereal straw under canopies adjacent to the ones of La Matrecina, and then sells it to farms. In the area there are agro-industries producing big amounts of pruning.

They are interested in being supported by SUCELLOG project to explore the possibility to become a biomass logistic centre to sell in the local market biomass products based on available agriculture resources.

3.7.2. Synergies in becoming logistic centre

3.7.2.1. Biomass resources availability

The study of the resources availability revealed that a considerable amount of agrarian residues (without market competition or sustainability requirements) is available for the solid biomass production.

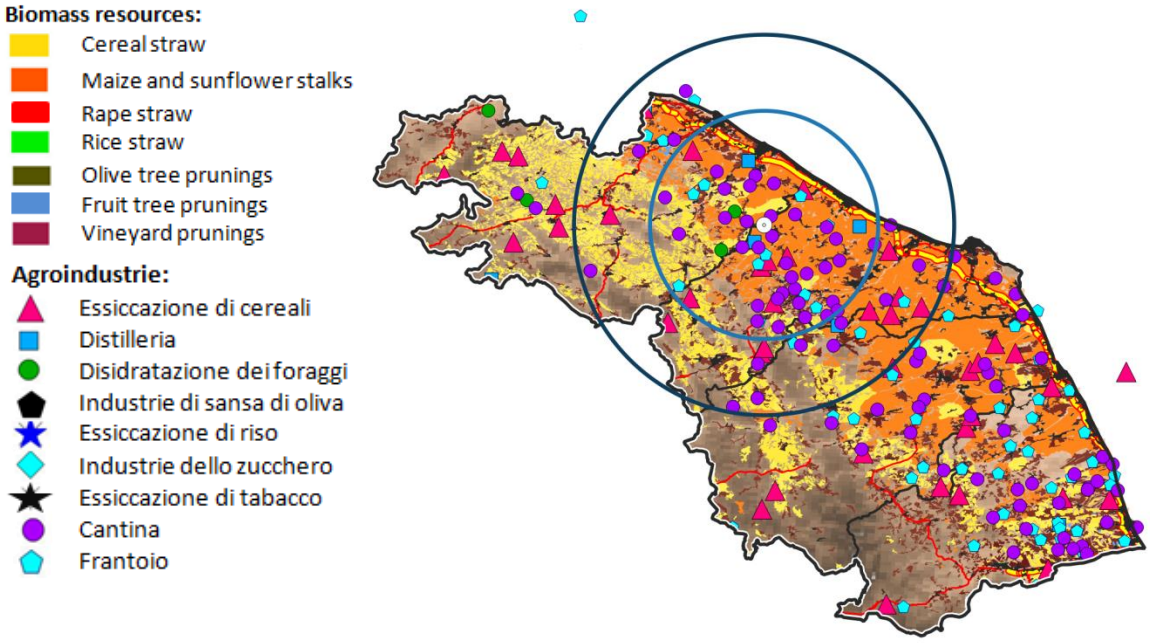


Figure 25: Resources location and agro-industries typologies in the cooperative surrounding area.

From the picture analysis and the interviews with stakeholders, it is possible to assume that:

- Corn stalks cannot be considered as biomass raw material for the elevated sand and gravel amount that they hold, because of the harvesting during the rainy season.
- A agro-industry located next to La Matrecina produces about 10.000 t/year of cereal straw and sells it to farms as litter and fodder, for a price of 0,6-0,7 €/t. The cooperative would pay 1 €/t to mix the straw with forestry residues and agrarian pruning for pellet production.

- There is a considerable amount of olive pruning that could be used in the logistic centre. However, in the area there are not any initiatives which promote the large scale pruning harvesting at the moment. Common practice is to burn or leave them on the ground. The farmers of the zone could be interested in selling the product to the cooperative, after a sensitization process about the valorisation of the agrarian residues through their re-usage for energetic purpose.
- In the area there are enough forestry resources to make their usage desirable for biomass production. The cooperative itself manages 30 ha of wood every year for its own activities, with a yield of about 100 t/ha of timber, corresponding to 600 t/y of branches.

Available agrarian residues for solid biomass production are therefore the forestry activities' waste, cereal straw and olive pruning.

Table 44: Data about available agrarian residues within a 30 km distance.

Residue type	Available amount t/y	Moisture content w-% ar	Harvesting months	Purchasing cost, excluding VAT (€/t)
Forestry branches	600	50	The whole year	0
Cereal straw	10.000	17	Jun-Sept	1
Olive pruning	330	45	Sept-Nov	5

3.7.2.2. Available equipment and facilities

The society owns machineries for the timber harvesting (tractors with winch) and transportation from the wood to the agro-industry yards (trucks with trailers).

The agro-industry is unaware of the required equipment for the pre-treatment operations for the biomass production. For the agro-pellet production the cooperative should invest in the following machineries:

- A small chipper for the particle size reduction of the raw materials (pruning and branches), with a production capacity of 1,14 t/h;
- A pelletiser with a capacity of 0,3 t/h.

The olive pruning harvesting and transportation are considered in charge of the suppliers, for an adequate payment.

Operations for the straw transport are not evaluated because it is currently stored under canopies that are adjacent to the ones of the cooperative La Matrecina itself.

According to the correspondence between the seasonal biomass resources production and the cooperative inactivity period, the solid biomass production can be settled between June and November.

Table 45: Seasonal availability of equipment and biomass.

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Ago	Sep	Opt	Nov	Dec

Tractor with winch	X	X	X	X	X	X	X	X	X	X	X	X
Truck with trailer	X	X	X	X	X	X	X	X	X	X	X	X
RESOURCES												
Forestry branches	X	X	X	X	X	X	X	X	X	X	X	X
Cereal straw						X	X	X	X			
Olive pruning									X	X	X	

3.7.2.3. Potential biomass market

The solid biomass market of the area is underdeveloped at the moment: there are just few families using forestry wood pellet and some industries with high energy consumption which use pellet and chips. The industries demand for solid biomass is continuous during the whole year, while the families one is concentrated in the winter season. A final price of 380 €/t is referred for pellet.

In the area there is an important lack of knowledge on the biomass usage for energetic purpose, so it will be necessary to start a virtuous mechanism of acquaintance and information of potential final consumers, before starting a business activity in this field.

Table 46: Solid biomass typologies that are consumed in the area.

Biomass typology	Price		Ash content w-% db
	€/t	€/kWh	
Forestry wood pellet A1	240	0,070	< 0.7
Forestry wood pellet A2	220	0,061	< 1.5
Agro-pellet A	220	0,055	≤ 6
Agro-pellet B	200	0,050	≤ 10

3.7.3. Feasibility of the new business line as agro-industry logistic centre

The cooperative is interested in the development in a logistic centre which could start a virtuous mechanism of agrarian residues recovery. Two possible production scenarios have been evaluated:

- Mixed pellet from forestry branches (50%) and cereal straw (50%);
- Mixed pellet from forestry branches (50%), cereal straw (20%) and olive pruning (30%).

For the both scenarios investments for the purchasing of the required machineries are foreseen.

Table 47: Solid biomass typologies and amounts.

Solid biomass typologies	Produced amounts t/y
Pellet with forestry branches (50%) and cereal straw (50%)	670

Pellet with forestry branches (50%), olive pruning (30%) and cereal straw (20%)	670

Fractions of the different resources have been calculated in theoretical way on the basis of the raw material characteristics, obtained from bibliography, and from quality characteristics according to the standard ISO 17225-6.

Pre-treatments for the mixed pellet from forestry wood and cereal straw are:

- Cutting and preparation of plants for branches harvesting, with a moisture content of 50%.
- Timber harvesting and transportation to the covered yards. Moisture content should reduce to 45% for a natural drying process.
- Branches chipping, with a moisture content reduction of 5%.
- Pelletising of the blend, with the achievement of a moisture content of 12%.
- Pellet storage in the covered yard. Natural drying processes help the attainment of a final moisture content of 10%.

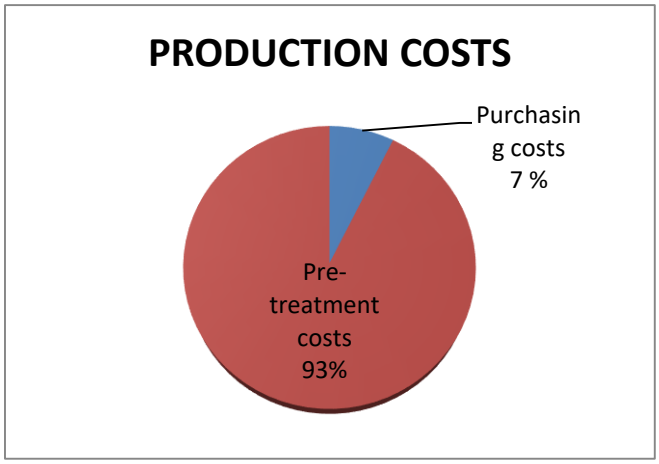


Figure 26: Production costs allocation for the pellet from forestry branches and straw.

Pre-treatments for the mixed pellet from forestry wood, olive pruning and cereal straw are:

- Cutting and preparation of trees for branches harvesting, with a moisture content of 50%.
- Timber harvesting and transportation to the covered yards. Moisture content should reduce to 45% for a natural drying process.
- Branches and olive pruning chipping, with a moisture content reduction of 5%.
- Pelletising of the blend, with the achievement of a moisture content of 12%.

Pellet storage in the covered yard. Natural drying processes help the attainment of a final moisture content of 10%.

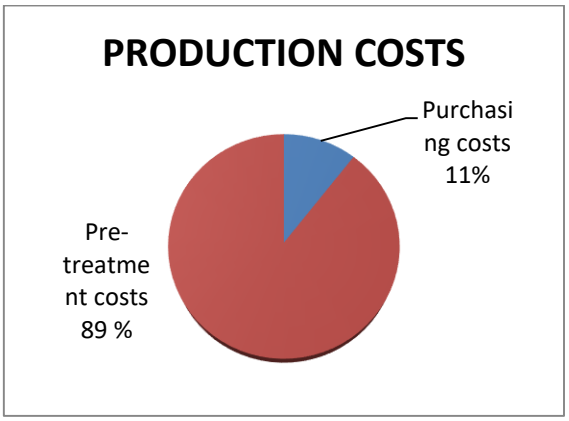


Figure 27: Production costs allocation for the pellet from forestry branches, olive pruning and straw.

Minimum selling prices are shown in Table 48.

Table 48: Minimum selling prices.

Scenario	Produced amounts	Production costs	Transport costs	Depreciation charge	Minimum profit	Minimum selling price
	t/y	€/t	€/t	€/t	€/t	€/t
Pellet with forestry branches (50%) and cereal straw (50%)	670	148,62	12	22,39	5	188,01
Pellet with forestry branches (50%), olive pruning (30%) and cereal straw (20%)	670	173,85	12	22,39	5	213,24

In the tables below it can be observed the comparison with biomass products in the market:

Table 49: Prices and characteristics of main competitive products.

Competitive products	Quality characteristics				Price		
	LHV (kWh/kg ar)	Bulk density (kg/m^3)	Ash content (w-% db)	Chlorine content (w-% db)	€/t	€/MWh	€/m^3
Forestry wood pellet A1	≥ 4	650	< 0,7	≤ 0,02	240	70	182
Forestry wood pellet A2	≥ 4	650	< 1,5	≤ 0,02	220	61	159
Agro-pellet class A	≥ 4	650	≤ 6	≤ 0,1	220	55	143
Agro-pellet class B	≥ 4	650	≤ 10	≤ 0,3	200	50	130

Table 50: New business line products (quality characteristics and prices).

New business line products	Quality characteristics				Price		
	LHV (kWh/kg ar)	Bulk density (kg/m^3)	Ash content (w-% db)	Chlorine content (w-% db)	€/t	€/MWh	€/m^3
Pellet with forestry branches (50%) and cereal straw (50%)	4,53	630	4,00	0,2	200	44	130
Pellet with forestry branches (50%), olive pruning (30%) and cereal straw (20%)	4,49	630	3,85	0,1	220	48	139

From the comparison of qualitative characteristics and prices of the possible production scenarios, conclusions about possible risks that the agro-industry could face are:

- For the high ash content, neither of the products is competitive with the forestry wood pellet.
- Pellet from the first scenario is comparable with the class B agro-pellet, for the chlorine content which does not suit the class A requirements.
- Pellet from second scenario is comparable for heating value to the class A agro-pellet.
- Prices for MWh are competitive with the ones of the available pellet products.

Biomass market, as the agro-industry itself highlighted, could represent the main weakness, to solve with sensitization of public and private authorities to promote the solid biomass boilers use.

Second scenario allows to obtain a better product but it foresees the purchasing of the olive pruning, for which there is no logistic chain at the moment at the local scale. So, this business line implies the creation of a logistic chain for the raw material harvesting, factor which increases the potential risk.

First scenario presents lower risks linked to the raw material finding but the final product has lower quality characteristics.

3.7.4. Conclusions

For the cooperative society La Matrecina, interested in the evaluation of the possible synergies between its own activities and the availability of raw material in the area, an evaluation of the both boundary conditions, biomass resources and their market, has been carried out.

- Raw material resources for the logistic centre are mainly the forestry branches, waste of the current forestry activities, olive pruning from the surrounding agro-industries and cereal straw, available from the adjacent agro-industry. Two business scenarios have been evaluated, for two different blend for the agro-

pellet production, depending on the presence of the olive pruning in the final product.

- Current biomass market is not so wide. Currently, mainly forestry wood solid biomass are consumed, in forms of firewood and wood chips, both supplied by La Matrecina. Potential consumers for the logistic centre are families, agro-industrys and small or medium plants (school, greenhouses and heating districts), in which the use of the solid biomass boilers has to be promoted.

For the evaluation of the potentialities as logistic centre two production scenarios have been evaluated, characterised both by initial investments, with different products and costs. The agro-industry facilities are partly compatible with the new scenarios for what concern the branches harvesting and the storage of the raw material and of the final product. For the both of them the purchasing of a chipper and of a pelletiser would be necessary.

The study revealed that the both products are characterised by technical and economic feasibility, because the production costs are lower than the minimum selling price. Analysis of the final product are strictly recommend to determine the real heating value and the bulk density.

The awareness of the local energetic market is primary for the starting of the new business activity, as the analysis of the used boilers to verify their operation with the products.

3.7.5. Additional support activities

Within the project, the agro-industry has received actions of support in addition to the audit activity, as summarized below:

- Visit to Costruzioni Nazzareno, an agro-pellettizing producer and equipment manufacturer, in order to take information about productivity, pretreatment costs, product prices, equipment costs, biomass quality, type of consumers ecc...; The information gathered was used to provide support to the agro-industry.
- Accompanying actions in events where interesting stakeholders for the new business line are met, i.e. participating to a conference in EIMA fair about agro-prunings as energy biomass (in particular about standards, quality, European project experiences like EuroPruning and UP_Running);
- Introduce to other agro-industries or other stakeholders thinking on starting similar initiatives on agriculture biomass, i.e. Costruzioni Nazzareno;
- Ask for budget to machinery manufacturers or project developers, i.e. Costruzioni Nazzareno;
- Create synergies with other projects or experiences on similar initiatives on agriculture biomass, ie DREAM adhered to the EU UP_Running project, participating to the online channel of the projects although not being partners,

in order to exchange experiences, information and contacts on the agro-biomass topic related to prunings. All the knowledge gained served to better support the cooperative.

3.8. Summary of the audit study to the Cooperative Oil Mill of Molfetta

3.8.1. Company description

The Oleificio Cooperativo Produttori Agricoli di Molfetta deals with the olive oil production of its 500 associates' olives. It also produces olive pits for self-consumption, to feed three boilers for heating of the processing water. They are interested in being supported by SUCELLOG project to explore the possibility of becoming a logistic centre of biomass products based on olive prunings due to the large amount of available resource in the area which has no current market.

The registered office is located in Contrada Mino, 70056, Molfetta, BA.

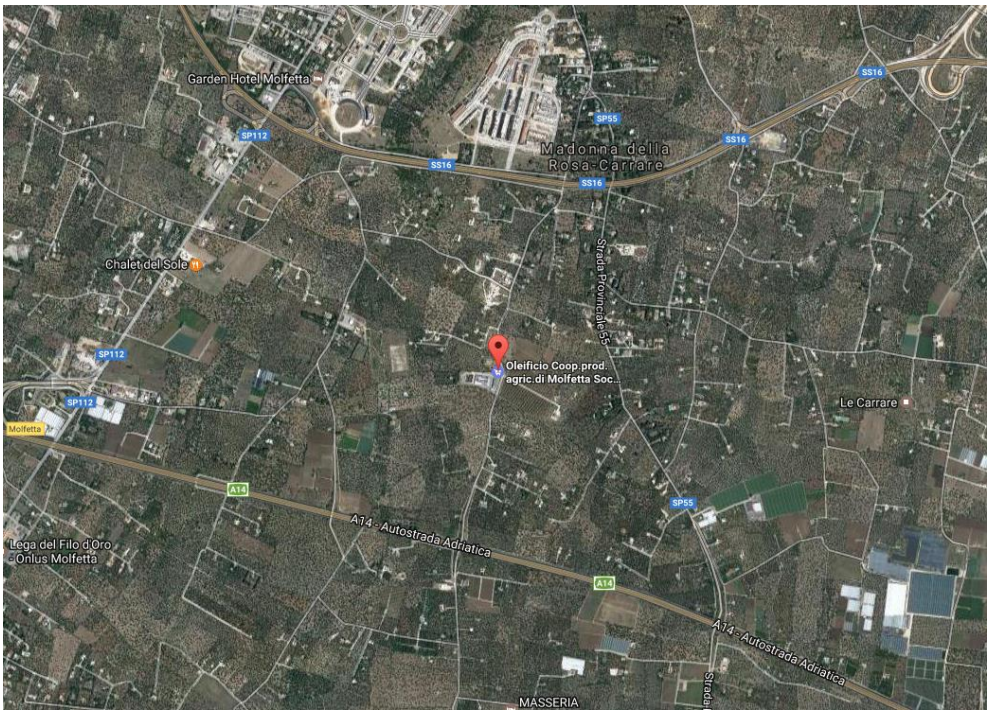


Figure 28: Location of Oleificio Cooperativo Produttori Agricoli di Molfetta (source: Google Earth).

3.8.2. Synergies to become an agro-industry logistic centre

3.8.2.1. Biomass resources availability

Resources availability analysis revealed that a significant amount of agrarian residues for the solid biomass production is available within a 30 km radius from the society, without market competition or sustainability requirements.

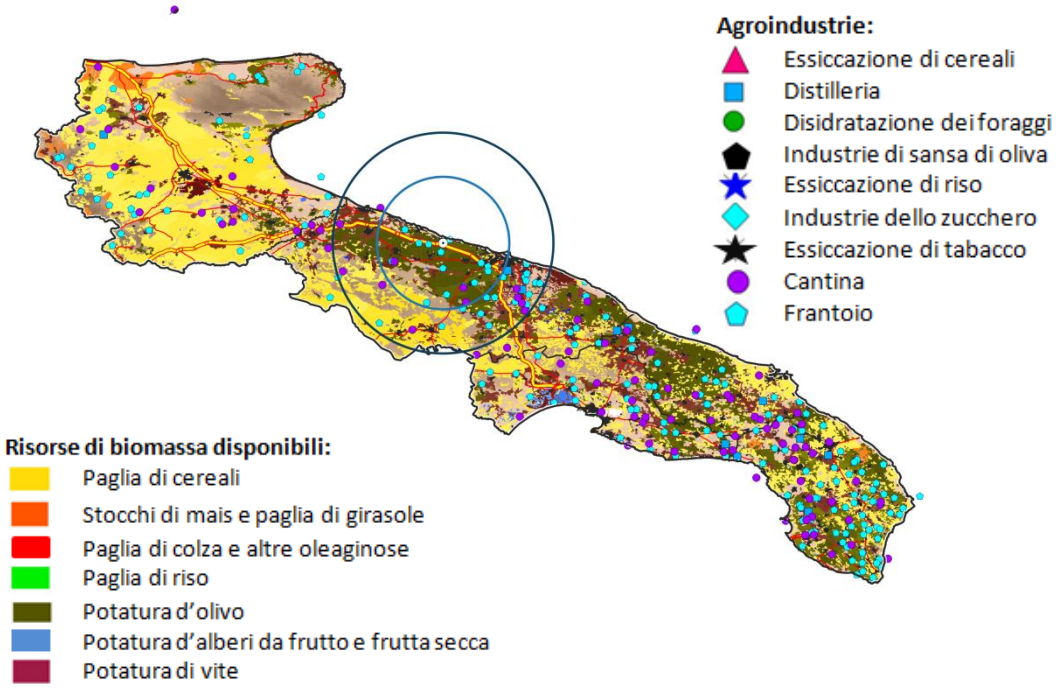


Figure 29: Location of resources and types of agro-industries around the company.

From the resources analysis and the interviews with the local stakeholders it is possible to conclude that:

- There is a significant amount of olive pruning in the area, which comes from the cooperative's associates and could be used by the biomass logistic centre. The usual practice is to burn them or to shred them and leave them on the soil. Their usage for the biomass production would give an added value to the agrarian wastes, and would help in saving time and money for their disposal. The associated farmers, in a 35 km radius, own about 3.400 ha of olive groves, with a yield of 1,32 yearly tons per hectare, for a total of 4.500 t/y of available olive pruning. Currently there are neither logistic chains to organize the pruning harvesting nor initiatives which promote the harvesting of pruning in large scale in the area, but since they come from the cooperative's associates it would be too difficult to develop a new logistic chain for the pruning purchasing, for a symbolic price of 1€/t.
- Pruning from vineyards and other growing of the area are not considered for their low availability and for the greater difficulty of their harvesting.

Therefore, the agricultural residues available for the production of solid biomass are olive tree pruning.

Table 51: Data on the available agricultural residues in a 30 km distance.

Residue type	Available amount t/year	Moisture content w-% ar	Harvesting months	Purchasing cost (VAT excluded) €/t
Olive pruning	4.500	45	Jan-Mar	1

3.8.2.2. Equipment and facilities availability

The cooperative is not equipped for the agrarian residues harvesting and processing for the solid biomass production at the moment. In order to become a logistic centre, the initial investment for a field chipper purchasing is expected, to harvest and chop the associates' pruning directly in their fields.

On the other hand, the agro-industry owns enough space for the raw material and final product storage, outside (about 600 m^2) and under canopy (about 800 m^2).

Figure 30: Available spaces for the olive pruning storage.

In the following chart the idle period of the agro-industry is reported: it is great enough to allow the solid biomass production from agrarian residues in many period of the year.

Table 52: Seasonal availability of the biomass resources and the equipment.

EQUIPMENT	Jan	Feb	Mar	Apr	May	Jun	Jul	Ago	Sep	Opt	Nov	Dec
Pits extractor	x	x	x	x	x	x	x	x	x	x	x	x
RESOURCES												
Olive pruning	x	x	x	x								

3.8.2.3. Bioenergy potential market

Solid biomass consumption for energetic purpose in the area is essentially connected to the olive pit produced from the cooperative (16 t/year) and used by the cooperative itself and some greenhouses located within a 25 km radius, which buy it for 130 €/t.

Potential biomass consumers are the olive oil mills of the area, both the associated and the not associated to the cooperative, but the investigation on the used boiler typologies is fundamental before starting the new business activity.

It is important to remember the emerged will of the cooperative and the other agro-industries of the zone in create a logistic centre to feed a biomass cogeneration plant for the many oil mills energy supply within the area.

Table 53: Solid biomass typologies of the area.

Biomass type	Price		Ash content w-% db
	€/t	€/kWh	
Wood chips cat A1	120	0,0292	< 1
Wood chips cat A2	90	0,0242	< 1.5
Wood chips cat B	70	0,0200	< 3

3.8.3. Feasibility of the new business line as agro-industry logistic centre

The agro-industry is interested in started a new business activity as logistic centre for the production and the selling of solid biomass for energetic purpose, in particular for the production of chips from olive pruning. Raw material would come from the cooperative's associates, for a price of 1 €/t, and the project development foresees the initial investment for a field chipper. The yearly expected production is of 3.500 ton of chips.

Table 54: Solid biomass types and quantities to be produced.

Solid biomass typology	Produced amount t/year
Olive tree pruning chips	3.500

After the residuals purchasing, they have to be pre-treated to be sold as solid biomass. Pre-treatments for the olive pruning chips production are:

- Harvesting and chipping of the associates' prunings in field, transport to the storage areas in the cooperative yards, in the outside or under canopies. The moisture content should reduce from 45 to 35% for the operations of particle size reduction and for the natural drying processes.
- Chips storage in the yards. The material is manually handled to help the natural drying. In this process the moisture content should reduce from 35 to 30%.

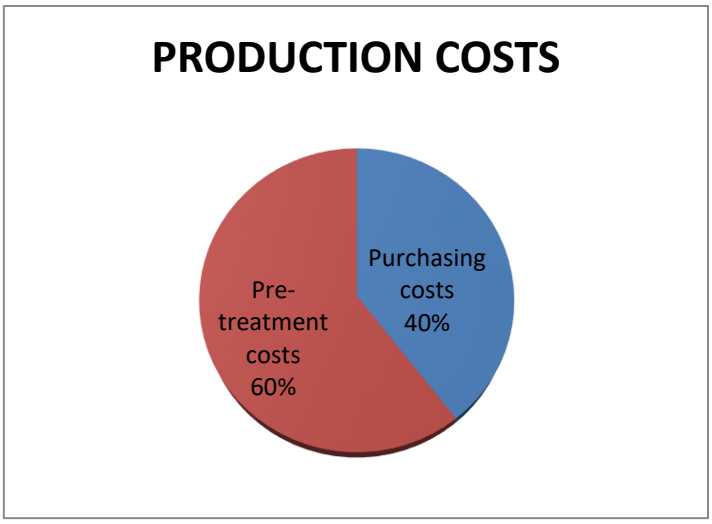


Figure 31: Allocation of production costs for olive pruning chips.

Minimum selling price is reported in the chart below.

Table 55: Minimum selling price of the new product.

Type of scenario	Produced amounts	Production cost	Transport cost	Investment costs	Minimim profit	Min acceptable selling price
	t/y	€/t	€/t	€/t	€/t	€/t
Olive pruning chips	3.500	**41,69**	10,00	4,29	**5,00**	**60,98**

In the tables below it can be observed the comparison with biomass products in the market:

Table 56: Competing products main quality characteristics and prices.

Competing products	Quality characteristics			Price		
	LHV (kWh/kg ar)	Bulk density (kg/m^3)	Ash content (w-% db)	€/t	€/kWh	€/m^3
Wood chips cat A1	4,36	300	< 1	120	0,0292	36,00
Wood chips cat A2	3,77	270	< 1,5	90	0,0242	24,30
Wood chips cat B	2,65	250	< 3	70	0,0200	18,75

Table 57: Product to be generated in the new business line (theoretical quality characteristics and calculated prices).

New business line products	Quality characteristics			Price		
	LHV (kWh/kg ar)	Bulk density (kg/m^3)	Ash content (w-% db	€/t	€/kWh	€/m^3
Olive pruning chips	3,14	300	4,50	62,00	0,0194	19,00

The conclusions above the emerged possible risks that the agro-industry could face in selling the potential produced biomass are essentially linked to the quality level of the chips from the agrarian residues, which has to be carefully checked to ensure that the final product is competitive with the ones from forestry origin. The ash content seems to be the main bound: it is strictly connected with the bark, reason why the usage of the only branches should be avoided.

The agro-industry highlights the importance of a good diffusion of the adequate boiler for the biomass consumption, to evaluate before starting the new business activity.

3.8.4. Conclusions

The cooperative society Oleificio Cooperativo Produttori Agricoli Molfetta works with the olives of its 500 associates and produces olive pits for self-consumption (three boilers for the processing water heating). The farm is interested in verifying the possible synergies between its facilities capacity and the agrarian raw material of the area.

An evaluation of the both boundary conditions has been carried out:

- The raw material resources for the logistic centre are olive pruning, residuals of the associates of the cooperative.

- The biomass current market is not very varied and the main consumers are the olive pits buyers. The other cooperatives of the area are new potential consumers, interested in buying bioenergy for a potential biomass cogeneration plant which could use the olive pruning chips.

The study revealed the technical and economic feasibility of the analysed products, since that their production costs are lower than their minimum selling price. Tests in the final product quality are highly recommend, to evaluate the real heating value and ash content, which assure a usable and competitive product with the other available biomass product on the market. Even the analysis of the used boilers compatibility with the new product is fundamental to guarantee the project success.

3.8.5. Additional support activities

Within the project, the agro-industry has received actions of support in addition to the audit activity, as summarized below:

- Introduce personally to contacts with a potential supplier of raw materials;
- Introduce the potential suppliers or the agro-industry with manufacturers of resource harvesters and on-field pre-treatment systems, i.e. CAEB;
- Introduce personally to companies providing the service of harvesting and supplying the resources, i.e. ATS Montemaggiore;
- Ask for budget to machinery manufacturers or project developers, i.e. ONG s.n.c.;
- Introduce to other agro-industries or other stakeholders thinking on starting similar initiatives on agriculture biomass, i.e. other cooperative oil mills, a logistic operator, the regional association of category and CREA - Research Council and the agrarian economy analysis);
- Facilitate, mediate with other agro-industries thinking on starting together initiatives on agriculture biomass, i.e. other cooperative oil mills in the area;
- Support for the development of a proposal for a request of local funding to start the new logistics centre. They applied for funding on the RDP 2014-2020, for the creation of a working group formed by the agro-industry, three other cooperative oil mills in the area, the Legacoop of Puglia Region, an office of designers and professional agronomists and environmental engineers, ATS Montemaggiore biomass logistics operator and CREA (Research Council and the agrarian economy analysis). This group will build a cogeneration plant fuelled with chips from olive trees pruning for the energy consumption of the four oil mills and their members, studying the plow machine prototype harvesting and chipping pruning and studying how to redeploy the whole plant ash for the fertilization of the fields;

- Support the technical design of a project where SUCELLOG concept is incorporated, in the application for funding on the RDP 2014-2020 briefly explained above;
- Support on improving the energy efficiency of the whole own facilities incorporating biomass;
- Introduce personally to associations promoting innovation actions on agriculture /energy, i.e. regional Association of category;
- Introduce personally to research/technological centres promoting innovation actions on agriculture, i.e. the Research Council and the agrarian economy analysis (CREA);
- Provide information about public aids/financing for purchase of equipment, i.e. Rural Development Program 2014-2020 and Conto Termico Decree;
- Provide support for marketing activities, suggesting to promote oil, their main final product, coming from energy coming from their own residues and by-products;
- Provide information about equipment costs, including installation. i.e. concerning the cogeneration plant;
- Create synergies with other projects or experiences on similar initiatives on agriculture biomass, i.e. DREAM adhered to the EU UP_Running project, participating to the online channel of the projects although not being partners, in order to exchange experiences, information and contacts on the agro-biomass topic related to prunings. All the knowledge gained served to better support the cooperative;
- Accompanying actions in events where interesting stakeholders for the new business line are met, i.e. participating to a conference in EIMA fair about agro-prunings as energy biomass (in particular about standards, quality, European project experiences like EuroPruning and UP_Running);

Similarly, the three cooperative oil mills, the Regional Association of Category Legacoop, the biomass logistics operator and the Research Council and the agrarian economy analysis) have received actions of support by SUCELLOG project, as summarized below:

- Build-up capacity on biomass field and particularly on solid biomass from agriculture sources;
- Create synergies with other projects or experiences on similar initiatives on agriculture biomass, i.e. DREAM adhered to the EU UP_Running project, participating to the online channel of the projects although not being partners, in order to exchange experiences, information and contacts on the agro-biomass topic related to prunings. All the knowledge gained served to better support the cooperative;Support for the development a proposal for a request of local funding to start the new logistics centre;
- Support the technical design of a project where SUCELLOG concept is incorporated;

- Provide information about public aids/financing;
- Provide information about equipment costs, including installation;
- Facilitate, mediate with other (known) agro-industries thinking on starting together initiatives on agriculture biomass;
- Introduce personally to contacts with potential consumers of the final product.

3.9. Summary of the audit study to the Agrarian Cooperative Rinascita Oliena

3.9.1. Cooperative description

The Cooperativa Agricola Rinascita Oliena is located in Oliena (NU), with registered office in via Norgheri, 44.

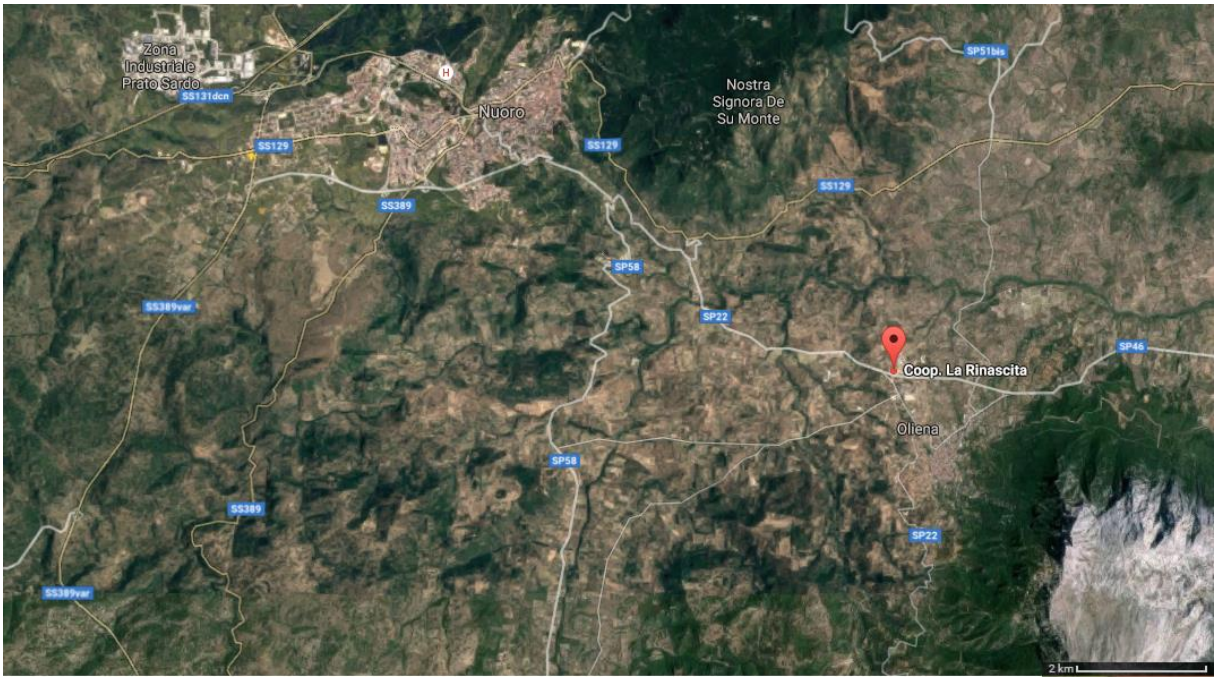


Figure 32: Cooperativa Agricola Rinascita Oliena location (Source: Google Earth).

The Cooperativa Agricola Rinascita Oliena is a dairy company which works with the goat and sheep milk of its 90 associates of the area.

They are interested in evaluating the possibility of become a biomass logistic centre with the purpose of using, mainly for self-consumption, the pruning residuals form their associates, changing their own diesel boiler with a new biomass one. Depending on the biomass availability, even the surrounding companies of the area could benefit of the produced thermal energy though a heating network.

Additionally, they are interested in evaluating the opportunity of electrical energy production from cogeneration, for self-consumption and possibly for the surrounding agro-industriss.

3.9.2. Synergies to become an agro-industry logistic centre

3.9.2.1. Biomass resources availability

An evaluation of the biomass provision and competitiveness within an area of a 30 km radius from the cooperative (Figure 33:) revealed that a considerable amount of agrarian residues (without market competition or sustainability requirements) is available for the solid biomass production.

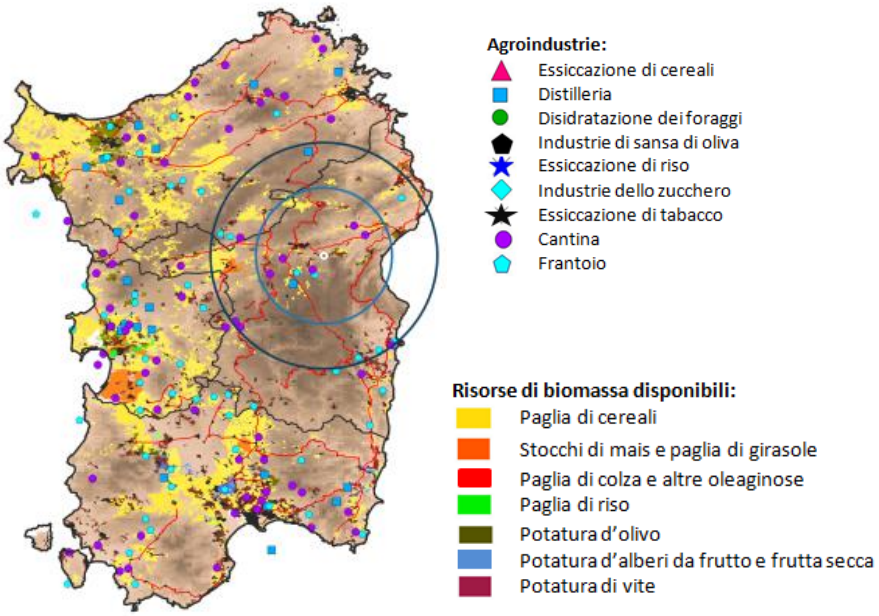


Figure 33: Resources location and agro-industries typologies in the cooperative surrounding area.

From the picture analysis and the stakeholders interviews, it is possible to assume that:

- There is a considerable amount of cereal straw, but the agro-pellet production scenario is not interesting for the cooperative. Furthermore, straw has a highly competitive use as animal litter.
- There is a big amount of olive pruning that could be used in the logistic centre. However, currently in the area there are not any initiatives which promote the large scale pruning harvesting. Common practice is to burn or leave them on the ground. Cooperative members could be interested in selling, even for a low price, their pruning to the dairy plant. They already have a transport logistical chain through the plant facility, because they bring there their milk for the dairy production. Furthermore, some of them already deliver the harvested olives in the area, since there is an olive oil mill just next to the cooperative. So, they should bring the pruning within the same logistical process.
- Vineyard pruning are considered as low fraction for the chips production, due to their low availability.
- Forestry resources are strongly present in the area and, if necessary, they could be used into the agrarian chips production.

Therefore, available agrarian residues for solid biomass production to be considered in this study are olive pruning and, secondly, vine pruning. Yearly available amounts, moisture content (w-%, ar), production months and purchasing cost, transport not included, are indicated in Table 58.

Table 58: Data about available agrarian residues within a 30 km distance.

Residue type	Available amount t/year	Moisture content w-% ar	Harvesting months	Purchasing cost, excluding VAT (€/t)
Olive pruning	3.105	45	Feb-Apr	10
Vine pruning	145	50	Feb-Apr	10

3.9.2.2. Available equipment and facilities

The industry has the possibility of study an efficient storage logistics, since it has some space to be used as warehouse for the residual biomass, even with a possible partnership with the surrounding companies, the olive oil mill or the animal feed factory. It will be necessary to build a canopy to store the raw material, before and after the chipping process. It will be important to carefully evaluate the material storage and the chipping process, because the raw material availability is seasonal, but its usage for the energy production lasts for the whole year.

Due to the low convenience in purchasing a machinery to be used just for a short time period, the cooperative opts for entrust the chipping process to a third part, with a capacity of 15 t/h.

It is important to verify the possibility that the cooperative members themselves will take charge of the pruning transport to the plant, with a congruous payment of 10 €/t. Such logistics would launched a virtuous process of biomass restoration and qualification, that otherwise would be burned, in a context in which members already carry their milk to the dairy plant and their olives to the adjacent olive oil mill.

3.9.2.3. Bioenergy potential market

Currently, within a 10 km radius from the agro-industry, the solid biomass market is not well developed: there are only some householders which consume woody pellet or fir wood and a few agro-industries (like the next olive oil mill) which use olive pit or forestry wood pellet.

Solid biomass consumption in the area is seasonal, between October and April, connected with the heat production and sanitary water.

Householders are the main consumers of pellet and firewood in the area. Pellet is purchased in the big distribution chains or in the supermarkets, but even in small stores. Medium and great consumers (heating districts, greenhouses, schools, cogeneration plants) use forestry wood chips, delivered by trucks. They usually ask for a good quality chips with standard moisture content and particle size, and they are asking more and more for a certified product.

About the competition, in the area there are some small wood chips producers. There are not solid biomass producers which use solid biomass, neither chips nor pellet.

The used solid biomass typologies in the area which can be considered competitive for the industry are shown, with the related prices (excluding VAT and transport), in Table 59:

Table 59: Different biomass typologies that are used in the area.

Biomass typology	Price		Ash content w-% db
	€/t	€/kWh	
Wood chips cat A1	80	0,0250	< 1
Wood chips cat A2	65	0,0209	< 2
Wood chips cat B	45	0,0200	< 3

3.9.3. Feasibility of the new business line as agro-industry logistic centre

The cooperative is interested in starting a new activity as logistic centre for the solid biomass production and self-consumption in the possible scenario that is shown in Table 60.

Table 60: Solid biomass typologies and amounts for the self-consumption scenario.

Solid biomass typology	Produced amounts t/year
Mixed chips from olive pruning (95%) and vine pruning (5%)	300
Mixed pellet from olive (75%) and vine (5%) pruning, grape pomace (10%) and grape stems (10%)	300
Mixed briquette from olive (75%) and vine (5%) pruning, grape pomace (10%) and grape stems (10%)	300

Table 61: Solid biomass typologies and amounts for the selling scenario.

Solid biomass typology	Produced amounts t/year
Mixed chips from olive pruning (95%) and vine pruning (5%)	1500
Mixed pellet from olive (75%) and vine (5%) pruning, grape pomace (10%) and grape stems (10%)	1500
Mixed briquette from olive (75%) and vine (5%) pruning, grape pomace (10%) and grape stems (10%)	1500

About the yearly required amounts, we observe that:

- The reported data refer to chips with a final moisture content of 30% (suitable to be burned in heating or cogeneration plants), and to pellet and briquettes with a final moisture content of 10%.
- The average yearly thermal consumption of the plant is of about 40.000 l of diesel, which correspond to 34.000 kg (specific density of 0,85 kg/l): for a lower

heating value of 40,90 MJ/kg, the yearly thermal consumption is of 386.278 kWht.

- The average yearly electric consumption of the plant is of 40.000 €, corresponding to 250.000 kWhe (for a cost of 0,16 €/kWhe).
- Each one of the 90 associates of the cooperative owns about 15 ha of olive groves, with a yearly average production of 2,3 t/ha, and 1 ha of vineyards, with a yearly average production of 1,6 t/ha, for a total of 3.105 t of olive and 145 t of vine. The yearly availability of grape marc and stems is of 600 tons for each raw material.

Pre-treatments for olive and vine pruning chips production are:

- Pruning storage in the service areas, under a canopy (to be realised, cost not considered in the investment costs) or tarpaulins. During this material handling a modest natural drying takes place: the moisture content should reduce from 45% to 40% for olive and from 50% to 45% for vine, just before the chipping.
- Chipping of the stored pruning: with this process the moisture content should further reduce of 10-15%, moving from 40% to 30% for olive and from 45% to 30% for vine.
- Chips storage in the service areas under canopy or tarpaulins: the moisture content threshold value of 30% could be reached with natural drying in a controlled area.

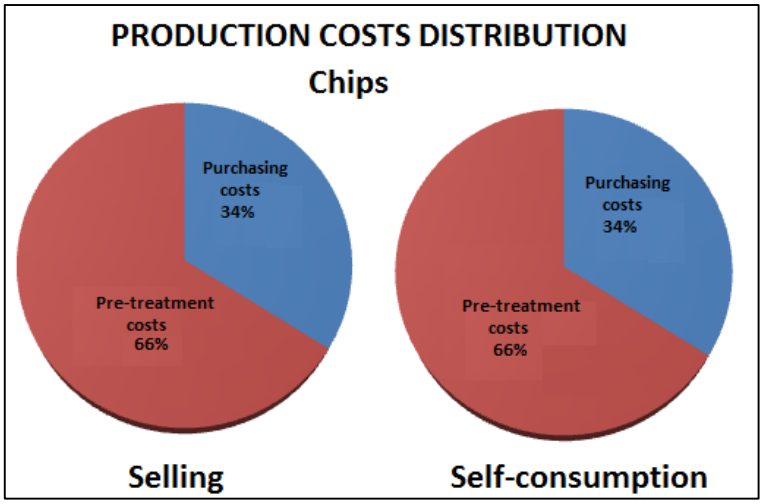


Figure 34: Allocation of the production costs for chips production.

Pre-treatments for mixed agro-pellet are:

- Pruning particle size reduction. Moisture content should reduce from 45%-50% to 40%-45%.
- Natural drying of the raw materials during storage with manual handling.

- Milling and pelletizing of the dried biomass, with a moisture content reduction to 10%.
- Final product storage in the service areas under canopy or tarpaulins.

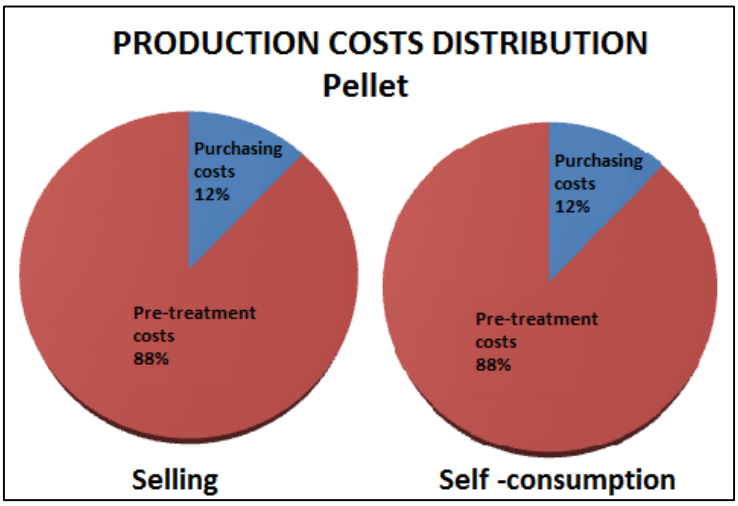


Figure 35: Allocation of the production costs for agro-pellet production.

Pre-treatments for mixed agro-briquettes are:

- Pruning particle size reduction. Moisture content should reduce from 45%-50% to 40%-45%.
- Natural drying of the raw materials during storage with manual handling.
- Milling and briquetting of the dried biomass, with a moisture content reduction to 10%.
- Final product storage in the service areas under canopy or tarpaulins.

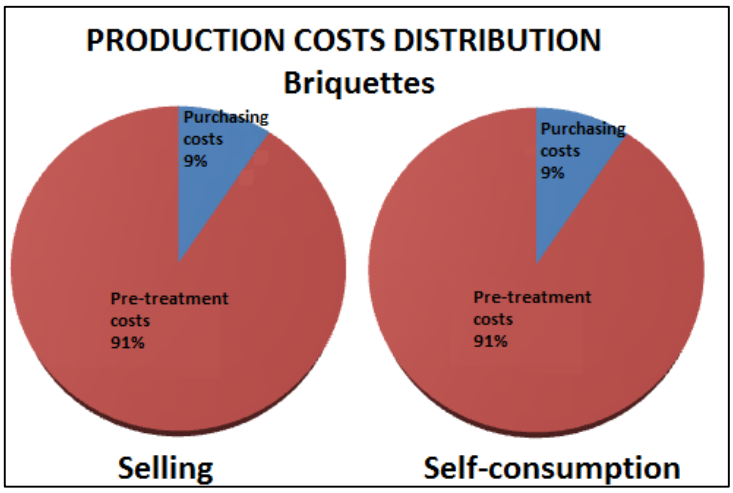


Figure 36: Allocation of the production costs for agro-briquettes production.

Table 62: Minimum selling prince.

Scenario	Produced amount	Production costs	Transport costs	Depreciation charge	Minimum profit	Minimum selling price

	t/y	€/t	€/t	€/t	€/t	€/t
Self-consumption						
Pruning chips	300	**37,63**	0,00	0,00	**5,00**	**42,63**
Agro-Pellet	300	**141,79**	0,00	46,67	**5,00**	**193,46**
Agro-Briquettes	300	**182,86**	0,00	10,00	**5,00**	**197,86**
Selling						
Pruning chips	1.500	**37,61**	0,00	0,00	**15,00**	**52,61**
Agro-Pellet	1.500	**141,72**	0,00	15,56	**15,00**	**172,28**
Agro-Briquettes	1.500	**182,79**	0,00	2,00	**5,00**	**189,79**

In the following charts it is possible to compare the new business line products with the ones already on the market.

Table 63: Prices and characteristics of main competitive products for the chips production.

	Quality characteristics			Prices		
	LHV (kWh/kg ar)	**Bulk density (kg/m³)**	**Ash content (w-% db)**	**€/t**	**€/kWh**	**€/m³**
Wood chips cat A1	4,25	250	< 1	95	04037	23,8
Wood chips cat A2	2,65	270	< 2	80	0,2120	21,6
Wood chips cat B	2,65	300	< 3	60	0,1590	18

Table 64: New business line products (quality characteristics and prices) in the chips production scenario.

	Quality characteristics			Prices		
	LHV (kWh/kg ar)	**Bulk density (kg/m³)**	**Ash content (w-% db)**	**€/t**	**€/kWh**	**€/m³**
Self-consumption scenario						
Olive and vine pruning chips	3,14	300	4,50	**55**	0,1727	16,5
Selling scenario						
Olive and vine pruning chips	3,14	300	4,50	**55**	0,1727	16,5

Table 65: Prices and characteristics of main competitive products for the agro-pellet production.

	Quality characteristics			Prices		
	LHV (kWh/kg ar)	**Bulk density (kg/m³)**	**Ash content (w-% db)**	**€/t**	**€/kWh**	**€/m³**
Agro-pellet cat. A	≥ 4	600	< 6	200	0,8000	120
Agro-pellet cat. B	≥ 4	600	< 10	180	0,7200	108

Table 66: New business line products (quality characteristics and prices) in the agro-pellet production scenario.

	Quality characteristics	Prices

	LHV (kWh/kg ar)	Bulk density (kg/m³)	Ash content (w-% db	Bulk density (kg/m³)	€/kWh	€/m³
Self-consumption scenario						
Agro-pellet	4,33	600	5,93	**195**	0,8443	117
Selling scenario						
Agro-pellet	4,33	600	5,93	**180**	0,7794	108

Table 67: Prices and characteristics of main competitive products for the agro-briquettes production.

	Quality characteristics			Prices		
	LHV (kWh/kg ar)	Bulk density (kg/m³)	Ash content (w-% db	€/t	€/kWh	€/m³
Agro-briquettes cat.A	≥ 4	600	< 6	165	0,6600	99
Agro-briquettes cat.B	≥ 4	600	< 10	155	0,6200	93

Table 68: New business line products (quality characteristics and prices) in the agro-briquettes production scenario.

	Quality characteristics			Prices		
	LHVLHV (kWh/kg ar)	Bulk density (kg/m³)	Ash content (w-% db	Bulk density (kg/m³)	€/kWh	€/m³
Self-consumption scenario						
Agro-briquettes	4,33	600	5,93	**200**	0,8660	120
Selling scenario						
Agro-briquettes	4,33	600	5,93	**195**	0,8443	117

The energy costs of the different scenarios have been calculated on the basis of the current thermal and electric consumptions, respectively 386.278 kWht and 250.000 kWhe. For the yearly expenses estimation, the diesel price have been considered equal to the average cost of 1,1 €/l, the electricity one equal to 0,16 €/kWhe.

Table 69: Thermal and electric consumption expenses in the different scenarios.

Scenario	Thermal consumption €/year	Electric consumption €/year
Current	44.000,00	40.000,00
Chips	6.760,81	9.495,08
Pellet	17.404,98	24.444,06
Briqquettes	17.851,27	25.070,83

3.9.4. Summary and conclusions

The Rinascita Oliena Agrarian Cooperative works in the dairy sector and is interested in verifying the possible synergies between its own facility capacities, its thermal and electric energetic requirements and the agrarian raw material availability of the area.

An evaluation of the both boundary conditions (biomass resources and market) has been carried out:

- Raw material resources for the logistic centre are mainly olive pruning and vine pruning (lower amounts), residues from the cooperative members' activities. They have moderate purchasing costs and a logistic chain that can be easily enforced.
- Potential consumers for the proposed logistic centre are the cooperative itself and possibly the surrounding companies (olive oil mills, feed manufacturers).

Three production scenarios have been evaluated to analyse the logistic centre potentiality: chips production from agrarian prunings, pellet or briquettes production from agrarian prunings, grape marc and stems. The chipping process would be entrusted to third parts, in exchange for an hourly costs.

The study demonstrated that the production of chips and pellet is technical and economic feasible, since that their production costs are lower to the minimum acceptable selling price.

However, the price is more elevated for the agrarian briquettes, due to the low production capacity of the required equipment.

A preliminary qualitative analysis, mainly to determine the moisture content, the LHV, the ash content and the chlorine percentage, of a raw material significant sample is highly recommended before the starting of a new business activity. A product quality evaluation will help avoiding unexpected consumers answers. Even combustion tests in some standardized boilers are strongly suggested to verify the burning suitability of the product (e.g. to evaluate the low-melting ashes presence).

3.9.5. Additional support activities

Within the project, the agro-industry has received actions of support in addition to the audit activity, as summarized below:

- Introduce personally to contacts with a potential consumer and supplier of raw materials;
- Introduce the potential suppliers or the agro-industry with manufacturers of resource harvesters and on-field pre-treatment systems, i.e. CAEB;
- Ask for budget to machinery manufacturers or project developers, i.e. CAEB and New Eng;

- Introduce to other agro-industries or other stakeholders thinking on starting similar initiatives on agriculture biomass, i.e. the cooperative oil mill beside;
- Facilitate, mediate with other agro-industries thinking on starting together initiatives on agriculture biomass, i.e. the cooperative oil mill beside;
- Support for the development a proposal for a request of local funding to start the new logistics centre;
- Support the technical design of a project where SUCELLOG concept is incorporated, in order to build a cogeneration plant fuelled with chips from olive trees pruning of their members for the energy consumption of the dairy and the oil mill;
- Introduce personally to associations promoting innovation actions on agriculture /energy, i.e. local association of category;
- Support on improving the energy efficiency of the whole own facilities incorporating biomass;
- Provide information about public aids/financing for purchase of equipment, i.e. Rural Development Program 2014-2020 and Conto Termico Decree;
- Provide information about equipment costs, including installation;
- Create synergies with other projects or experiences on similar initiatives on agriculture biomass, i.e. DREAM adhered to the EU UP_Running project, participating to the online channel of the projects although not being partners, in order to exchange experiences, information and contacts on the agro-biomass topic related to prunings. All the knowledge gained served to better support the cooperative;
- Accompanying actions in events where interesting stakeholders for the new business line are met, i.e. participating to a conference in EIMA fair about agro-prunings as energy biomass (in particular about standards, quality, European project experiences like EuroPruning and UP_Running);
- Include the agro-industry as beneficiary in other similar project, i.e. the European project SCOOPE.

Similarly, the cooperative oil mill besides has received actions of support by SUCELLOG, as summarized below:

- Build-up capacity on biomass field and particularly on solid biomass from agriculture sources;
- Create synergies with other projects or experiences on similar initiatives on agriculture biomass, i.e. adhering to the EU UP Running project, participating to the online channel of the projects although not being partners, in order to exchange experiences, information and contacts on the agro-biomass topic.
- Support for the development a proposal for a request of local funding to start the new logistics centre;
- Support on improving the energy efficiency of the whole own facilities incorporating biomass;
- Provide information about public aids/financing;

- Provide information about equipment costs, including installation;
- Facilitate, mediate with other (known) agro-industries thinking on starting together initiatives on agriculture biomass;
- Include agro-industries as beneficiary in other similar project, i.e. the European project SCOOPE.