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

SUCELLOG: IEE/13/638/SI2.675535

D4.4c
Summary of Cooperativa Le Rene Business Model

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About SUCELLOG project

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

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About this document

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1. Introduction

Within WP4, SUCELLOG project performs a techno-economic feasibility study to one agro-industry per target country in order to evaluate their possibilities to develop a new business line as a biomass logistic centre. The study presented different possible scenarios of business among which the beneficiary has chosen the most convenient according to his situation and perspectives.

In the case of Cooperativa Le Rene, the Italian agro-industry selected to be support by the project, the scenario chosen was to produce agro-pellets, medium wood chips and hog fuel (more details can be found in document D4.3). The scope of this report is to present a tailor-made Business Model for it.

The Business Model is the set of organizational and strategic solutions through which the Company acquires a competitive advantage: it describes the logic with which an organization creates a value proposition for the customer, performs it and gets a portion of the economic value generated.

The model is organized in conceptual blocks that allow making clear the relevant phenomena to the Company's management and that are explained in **¡Error! No se encuentra el origen de la referencia.**.

Table 1: Basic building blocks of the Business Model.

Block	What does this block defines	What does this block identifies
Customer segments	The different groups of people or organizations that an enterprise aims to reach and serve	Subjects (people, companies) for whom we want to create value, dividing them into segments, and defining characteristic features (specific needs, different channels, types of relationships, different profitability)
Value propositions	The bundle of products and services that create value (benefit) for a specific Customer Segment.	Problems or needs to be solved or satisfied
Channels	How a company communicates with and reaches its Customer Segments to deliver a Value Proposition	Customers' favorite channels and their availability, integration, effectiveness and costs
Customer Relationship	The types of relationships a company establishes with specific Customer Segments	Types of relationships expected by the customer and their costs and integration with other components of the Business Model
Key Resources	This is the most important assets required to make a Business Model work: defines resources required according to the value proposition and the various processes to improve it, producing value and getting a significant part of it.	The human, financial, physical and intellectual resources.
Key Activities	The strategic activities that must be performed to create the Value Propositions, reach customers, maintain relations with them and generate revenues	The most important tasks that a company has to carry out in order to achieve its business objective
Cost structure	All costs incurred to operate a particular Business Model	The major cost areas in the Business Model: resources and fundamental processes costs (fixed costs, variable costs, economies of scale, etc.).
Revenue streams	The cash a company generates from each	Forms of revenue, sale of goods, use of

Block	What does this block defines	What does this block identifies
	Customer Segment (costs must be subtracted from revenues to create earnings).	services, fees, rentals and leasing, brokerage fees, advertising fees
Key Partners/Suppliers	The network of suppliers and partners that make the business model work.	Fundamental partnerships (key partners and suppliers): resources and activities provided; suppliers of resources to optimize the business; risk coverage suppliers; critical resources suppliers
Competitors	Analysis of the competitive environment	Information on similar products available in the market (price, quality, service granted); profiles of competitors, strengths and weaknesses
Market	Optimal strategies for the acquisition of required market share and a good positioning compared to the competition	Ways to reach the customers target and the sales target. Analysis of marketing variables (product, price, place, promotion).
Authorization process and permits required	Main categories of permits and permissions required to start or change the activity	Summary assessment of their procedural complexity; estimated average timing for obtaining authorizations.

2. Agroindustry Cooperativa Le Rene

After the feasibility study performed by SUCELLOG project, the Company has decided that the best scenario for the new business line is to valorise at maximum the sub-products available in the area (residues from the cereal and wood treatment) and to select the agro-prunings in a better way so medium quality products can be generated (not only hog fuel) to produce and sell:

- 529 t/yr of agro-pellets class A (ISO 17225-6), composed by:
  - Residues from cereal cleaning (18.9 % of the pellet);
  - Fine material from agro-prunings coming from the screening of the material resulting from the chipping process (78.8 % of the pellet);
  - Sawdust from wood processing (2.3 % of the pellet).

The agro-pellet is considered the top product of the logistic centre. The following products are therefore secondary products which are generated as sub-products of the main process:

- 292 t/yr of medium quality wood chips, resulting from mixed agro-prunings;
- 1,167 t/yr of hog fuel, resulting from mixed agro-prunings.

This section starts from the collected data in other WP4 tasks in order to make an evaluation of the single production lines, of the market and of the target segment of customers aimed at finding the most competitive advantage of the planning idea.

Due to the fact that the agro-pellet is considered as the main product of the possible logistic centre, the business model is mainly focused on it.

2.1. Customer segments

The most common fuel for heating purposes in Italy is, without doubts, the natural gas. The simplicity and convenience of use is comparable to gasoil or LPG and are much higher than the any type of solid biomass. Moreover, the cost of energy from natural gas is lower than from any fossil fuel and comparable to renewable energies. The mature technology is part of the large success of this type of fuel, above all in highly densified areas where the costs of connection to distribution networks is low since are shared among an important number of consumers.

However, the natural gas access is only possible in population centres (cities or big villages), or in isolated facilities if they are sited along or nearby the gas line (since the connection costs are covered by the consumer). Isolated consumers not fulfilling this requirement use mainly LPG, gasoil or biomass (wood logs, wood pellets and olive pits for small consumers; wood chips for larger consumers). Regarding the use of biomass in these isolated areas, the disposal of the ash produced as a result of its combustion is not a problem since most of this type of consumers has garden or agricultural areas where these ashes can be used due to their mineral compounds.

The most important end users, in terms of numbers, of solid biomasses in the region are the domestic consumers sited in rural areas (without access to the methane network) who use heating products in their houses, and the small service and commercial activities (shops, small workshops, offices, etc.): these consumers, who buy small quantities of product during the cold season, **mainly exclusively use forest wood pellets and, since a few years, also olive pits which are very easy to use in pellet powered boilers**. This type of customer is very careful about the quality of the product and also about aesthetic features: as a fact, it clearly requires certified (ENplus or DINplus) and light coloured pellets (the dark colour is considered as a low quality sign).

A significant part of domestic consumers, especially in rural settings, still uses **wood log powered boilers**. This particular segment of potential customers of the logistic centre already buys the wood from the biomass production platform located in the agro-industry: this is the reason why it is possible to promote a marketing activity on them, suggesting to replace the boiler with new and easy-to-use devices, besides promoting the possibility of using agro-pellets, chips and hog fuel from agro-prunings instead of the actual fuels.

On the other hand, in terms of burned quantity of solid biomasses, the product which is mainly used in the region is represented by **forest wood chips**. The most relevant users of medium-high quality of forestry chips, who may need the product all year round (depending on their location and commercial or productive requirements) are:

- industry or agro-industry activities which use the products to heat their facilities, warehouses, greenhouses, etc.;
- farms, to heat stables and houses;

- commercial and services supplies activities, such as hotels, thermal baths, agritourisms, etc.;
- public and private buildings, such as schools, offices, gyms, small housing units connected to central heating, etc.;

These types of customers include a part of those who buy from the forestry biomass production platform at the logistic centre, so they are easily approachable by promotional activities. As one of the logistic centre proposed product is the medium quality wood chips from agro-prunings, this can be offered to them as an alternative product at lower price.

Lastly, there also is **a segment of end-users which is less interested to wood chips quality** and asks for huge quantities of cheap class B product and hog fuel all year round, especially for fuel supply of large power stations service structures even if located out of the region.

The following table shows potential customer segments approachable by the Cooperative and the product types which are normally used in the heating systems:

Table 2: List of potential target customers and currently used types of solid biomasses

Customer segment	Type of product currently consumed
households in rural areas	wood pellets
	olive pits
public and private offices, shops, small workshops in rural areas	wood pellets
	high quality wood chips
	olive pits
industry or agro-industry	medium quality wood chips
farms	
commercial and services supplies activities	medium-high quality wood chips
public and private buildings	
small housing units	
Large industries	low quality wood chips and hog fuel

2.2 Value Propositions

The business idea, on which the plan of creation of the logistic centre is based, is **the enhancement of agricultural residues and production scraps** of the Cooperative as agro-industry: these have to be esteemed as ***"further" raw materials*** (residues from the management of firstly employed raw materials) which receive added value through processes increasing their final utility.

The target product must as much as possible meet the following requirements:

- satisfaction of technical-financial needs (quality/price ratio) of at least one or more customer segments;

- being in possession of innovating features, aimed at maximum reduction of direct competition with similar products from other suppliers.

At least at the beginning and in order to be able to test the market reaction and the end users of solid biomasses, the Cooperative intends to produce both agro-pellets and wood chips coming from agriculture, as it is already equipped with necessary raw materials and tools to carry out this production, without having to rely on expensive funding.

On a simple observation of the potential customer segments and of the local prices, as summarized in the graphic presented in the market analysis section (Figure 2), it appears that the most interesting commercial area, on which the logistic centre must act, is **that of solid biomasses for households and small consumers owner of pellets powered stoves/boilers**: in this sector, cheap solid biomasses which maintain the main principal features of forestry wood pellets (such as ease of use and fuelling of the boiler, cleaning, energy yield, etc.) are totally absent.

Therefore, **the business idea is based on the objective of penetrating the market of small consumers of forestry wood pellets** by offering products with slightly inferior technical features but at a much lower price.

At an early stage of setting of the scenarios and on expressed choice of the contractor, the objective product was identified in what you call "**cippatino**" of forestry wood. This is a high quality product, deriving from wood chips, screened in order to obtain homogeneous particle size (small cubes of about 1.2 – 2 cm on each side), without dust, dried up to 15% of moisture content and therefore suitable to be used in pellets powered stoves/boilers.

But the development of the scenario for the production of "cippatino" requires very high investment costs (purchase of screener, drier and 1.1 MW biomass boiler); such financial fixed assets, particularly in Italy - due to higher influence of the crisis compared to other European countries - are not currently affordable by small and medium sized companies.

So it was necessary to assume **additional scenarios, characterized by lower or even nil investment costs**.

The first of them provides for corn cob grits as objective product: this maintains many of the positive features of wood pellets, despite having a lower volumetric density; this setting also included a productive line of olive pits and one of mixed agro-pruning chips. Even this solution turned out not to be feasible, because the production chain needs to be totally started up, especially at the initial phase (modification of machines in order to separate the corn cobs from the seeds, collection and storage) and nevertheless requires important investments to be able to process the other expected products.

Therefore, a second scenario was preferred which does not provide for investments and identifies the objective product as agro-pellets mainly produced from agricultural residues.

The new production line will allow the Cooperative to obtain an additional profit besides the current activity of the agro-industry, **by producing and selling agro-pellets as flagship product and agricultural wood chips as a secondary product**.

The logistic centre activity may generate the following **advantages**:

- **For those farmers who provide mixed agro-prunings**: the delivery of the residues at the logistic centre, symbolically valued at 1 €/t, avoids these suppliers the costs of destruction (burning or burial on site) or, as an alternative, the costs of disposal in a landfill. In many Italian councils the law doesn't allow burning of agricultural residues for most part of the year, both in summer due to fire hazard and during the other seasons due to the risk of exceeding particle (PM10) concentration in the atmosphere; moreover, for many kinds of agricultural cultivations, it is not recommendable to grind nor bury the residues, especially if these procedures are carried out regularly during the years, due to phytosanitary reasons in relation to spreading of some diseases.

  Therefore, management of residues may be complex and can generate financial and time loss in the activity of the agricultural companies. This is the reason why the opportunity to deliver the residues at the logistic centre, even though this is carried out for a symbolic price, represents **a secondary benefit for the farmers** that don't have to take on the relatively high costs of disposal.

- **The re-use of the cereal cleaning residuals** resulting from the cooperative activity of farmers using the agro-industry structures that currently do not have any other application: this will avoid the farmers having to carry out their own disposal, allowing the logistic centre to obtain this material for the transformation into pellets **free of charge**.

- **The re-use of manufacturing residues (sawdust)** resulting from wood cutting carried out by the forest contractor which operates on part of the Cooperative area by the facility. Also in this case, these residues will be collected by the logistic centre **free of charge**, to be converted into pellets.

- **The possibility for consumers to use locally produced solid biomasses in existing wood chips or pellets powered stoves/boilers**, without having to carry out any modification.

- **A very convenient price, compared with prices of forestry wood pellets** with regard to the agro-pellets which the logistic centre intends to produce. The other manufactured products (wood chips and hog fuel) will be sold, on the other hand,

at a price which will be at the lowest limit of the variation range of average market prices. The Cooperative will be able to apply these selling prices thanks to the low cost of raw materials and residues used for production.

- **When comparing the agro-pellets to the forest wood pellets, it should be highlighted that their quality decreases proportionally less than their price**: according to the literature and on the basis of the manufacturing blend, the agro-pellets to be produced can be classified as class A agro-pellets of ISO 17225-6, even though it is still necessary to carry out some tests, during production, with regard to content of ashes and chlorine.

- Due to high energetic density of agro-pellets, comparable with that of forestry wood pellets, the consumers will need **less storage space compared to other types of solid biomasses**; for the same reason, it will be possible **to reduce the number of product supplies during the year**, as stated in the following table:

Table 3: Supply frequency or storage volume ratio of agro-pellet

Type of product (depending on boiler)	Bulk density kg/m3	Supply frequency or storage volume ratio of new product vs. current solid biomasses (different bulk density)	
high quality wood chips	250	agro-pellets vs. high quality wood chips	0.4
forestry cippatino	300	agro-pellets vs. cippatino	0.5
olive pits	500	agro-pellets vs. olive pits	0.8
wood pellets	650	agro-pellets vs. wood pellets	1

- **Increase of demand for skilled manpower**, for about 600 hours/year, seasonally employed for the extra activities at the logistic centre.

- Finally, there will also be some **economic benefits for the operators working at the facility**, such as carriers and suppliers of equipment rental with driver.

The possible **disadvantages** we can currently predict are the following:

- **Using products which are not recommended by the boilers producers may cause loss of guarantee**, enabling to use such materials only with old boilers (with expired guarantee) or multi-powered.

- Due to the type of raw materials involved in production, **the agro-pellets will contain a higher quantity of ashes compared to pellets which are produced only from forestry wood**: this may cause problems in management of the boilers, due to the increase of maintenance to keep it clean from ashes and for their disposal. On the other hand, due to the absence of herbaceous material in the blend of agro-pellets, there should not be any problem regarding grid or heat exchanger fouling.

- During production, **some pellet samples will have to be tested** in order to verify not only the contained percentage of ashes and their composition, but also the

content of chlorine and sulphur: this will allow to evaluate the possibility of appearance of corrosive agents which could damage the metal components of the boiler, eventually taking precautionary measures.

- Splitting the logistic centre in two facilities distant one from the other about 3-4 km (one for wood chips production and cereal management and one for pelletisation), will cause **additional charges for the transport** of pellet production materials from one factory to the other.

2.3 Channels

The selection of the communication channels must be made in agreement with the offered products and the customer categories which have to be reached.

Generally, the Cooperative intends to sell its products directly on the spot, using the facilities of the logistic centre as sale points, without going through sales people, distributors nor wholesalers.

The new products may be advertised as follows:

- by **word of mouth** with the local farmers, with whom the Cooperative already has a relationship;
- through the **web site** of the Cooperative, where there already is a promotional section regarding the currently produced goods and which will also allow starting an e-commerce activity;
- through **contacts on the ground**, raising awareness among a group of consolidated customers of the Cooperative, consumers of firewood, with regard to knowledge and the possible use of agro-pellets.
- through the **Borsa Merci Telematica Italiana** S.C.p.A. (Italian Commodity Exchange), which is a negotiation instrument allowing daily and constant deal with the goods from remote workstations. To handle marketing on BTMI would represent an opportunity for product sales expansion, by extending the catchment area from private and domestic use, which still absorbs most part of the pellets produced in Italy, to the industrial operators. The Organization of Biomass Producers is a brokering enabled entity so should allow the Cooperative to pick the ample opportunities this instrument offers.

Another promotional and marketing channel can be achieved by **exploiting the knock on benefits of the forest contractor**, associate member of the Organization of Biomass Producers, who holds a large segment of forestry biomass consumers.

Finally, it will be possible to exploit the promotional and visibility opportunities which are offered by the sector trade fairs.

2.4 Customer Relationship

The relationships the logistic centre can conduct with its customers can be summarised it two main typologies:

- **a simple relationship, based on price policy**, to be carried out**:**
  - towards **new household customers** or small product quantities consumers, reached by advertisement on magazines or through the website ;
  - towards **new consumers or wholesalers of medium-high product quantities**, reachable through the Borsa Merci Telematica Italiana (BMTI)

  by highlighting at the same time, in the advertisement message or in the BMTI product-fiche, the quality/price ratio of the product and the environmental advantages of the short distribution chain on which the manufacturing process is based.

  The BMTI product-fiche allows, for example, to establish the details of the purchase or sale offer of the product and to add further information regarding its qualitative features and the implementing rules of the contract.

- **A better structured relationship, with the subjects which are already directly or indirectly involved with the logistic centre** (raw materials and residues suppliers, service suppliers, established consumers of solid biomasses such as firewood or wood chips, etc.) based on a global consulting activity with regard to the heating requirements of the potential customers. The process must be participated and will allow to point out the assets and the technical and economic advantages of the innovative product. As a fact, the logistic centre will be able to carry out this activity of "**guide to the product**" correctly for the customers by producing different kinds of solid biomasses. In particular the environmental sustainability of the local supply chain, the territoriality of the product, the resulting supplying guarantee and the relative price stability will be the features to rely on.

2.5 Key Resources and key activities

The key resources of the whole process, necessary to create the logistic centre, are:

- raw materials;
- available equipment in the agro-industry.

Raw materials

The principal resource on which the whole process of creation of the logistic centre is based (as proved by the feasibility study) is the raw materials, i.e.:

- mixed agro-prunings;
- residues from cereal cleaning;

- residues from forestry timber processing (sawdust).

These materials will be used for the production of solid biomasses for energetic purposes to be introduced on the market.

The **agro-prunings** is represented by branches, mainly of olive trees and secondly of fruit trees and vines: these will be directly **purchased from the local farmers**. The material is constituted of:

- for about 20 % of wood with dimensions allowing production of **medium quality chips**;
- for about 80 % of small branches and leaves, which only allow production of **hog fuel** (that is in fact a sub-product from the chipping process).

Following to chipping process, the material will be screened for size sorting: the smaller residue (**under-sieve material**) will be used by the logistic centre for the production of agro-pellets.

On the other hand, as a result of cereal cleaning carried out during the normal working process, about **100 t/yr of husk, bran and damaged or broken seeds** are obtained: these will be re-used for the production of agro-pellets.

Finally, as a result of the forestry timber processing carried out at the facility by the Organization of Biomass Producers, it is possible to obtain about **12 t/yr of sawdust**, which can also be used for the production of agro-pellets.

The available equipment

At the main facility , the Cooperative is provided with the necessary equipment for the treatment of cereals and timber processing, whilst the pelletiser is located in another facility, about 3-4 km distant. The processing scheme is reported in the below section of Key Activities.

The equipment which is available in the mentioned facilities and that can be used at the logistic centre for the production of solid biomasses consists of: a cereal cleaner, some wood chippers, a power driven mini skid steer loader, a screener and a pelletiser (details are reported in the feasibility study, see document D4.3) .

The key activities are represented by:

- cereal cleaning, with collection of processing residues;
- chipping of agricultural prunings:
- screening of agricultural pruning chips, with collection of under-sieve residues;
- handling of under-sieve materials, with a power driven mini skid steer loader, in order to facilitate dehydration;
- pelletising of the blend of forestry timber sawdust and fine residues from cereals and agro-chips.

The manufacturing processes carried out by the logistic centre are summarised in the following flow diagram (Figure 1):

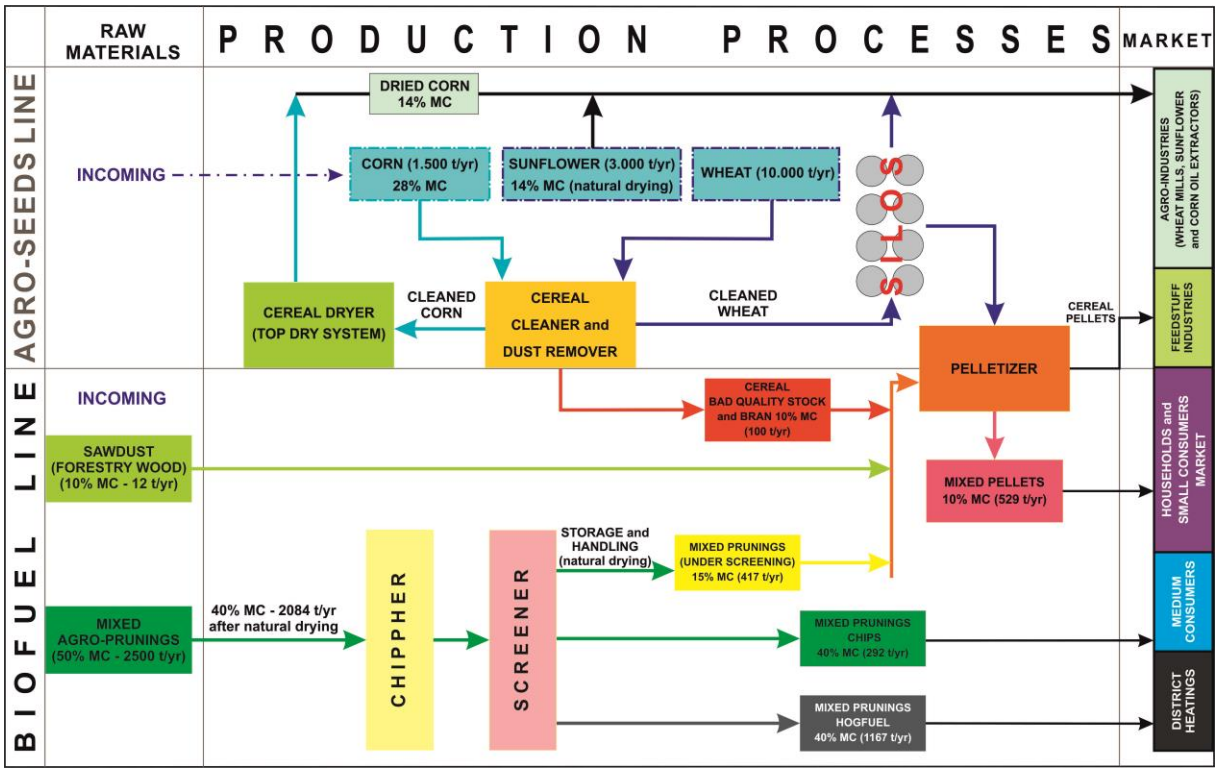

Figure 1: Scheme of logistic centre manufacturing processes.

2.6 Cost structure

Regarding production costs, these consider:

- raw materials and processing residue costs;
- pre-treatment costs;
- personnel costs;
- transport costs.

The only costs for raw materials are those of purchase of the agro-prunings from the local farmers. These are charged **1 €/t** including direct transport to the facility: it is a symbolic price that avoids the suppliers having to handle disposal, which would be much more expensive.

The residues from cereal cleaning are a result of the standard activity as agro-industry of the facility and have no market, whilst **sawdust** resulting from the forestry timber processing will be given to the Cooperative free of charge by the Organization of biomass Producers.

The table below shows the purchase costs of raw materials which are necessary for the new business line:

Table 4: Raw material purchasing costs

Residues type	Quantity	Price	Total costs
	t	€/t	€
Mixed agro-prunings for pellets (M 50%)	750	1	750
Cereal bad quality stock and bran	100	0	0
Sawdust (forestry wood)	12	0	0
Mixed agro-prunings for chips (M 50%)	1,750	1	1,750
Total	**2,612**		**2,500**

The main pre-treatment costs are represented by:

- chipping of mixed agro-prunings;
- screening of mixed agro-prunings, in the fractions of medium quality chips (40% moisture content), low quality chips (40 % moisture content) and under-sieve material.
- handling of the under-sieve material for natural drying, with power driven skid steer loader (moisture decreases from 40 to 15 %);
- pelletising of the blend of under-sieve material, cereal cleaning residues and forestry timber sawdust

as showed in the table below:

Table 5: Pre-treatment costs

Type of product	Pre-treatment type				Total costs
	Chipping	Screening	Handling of under-sieve material	Pelletising	
	€	€	€		€
Mixed agro-prunings	22,714	11,970	1,412		36,097
Under-sieve material, cereal cleaning residues and sawdust				3,807	3,807
Total					**39,904**

The costs for chipping and screening and for handling of under-sieve materials have been calculated as the sum of equipment rental and fuel and ordinary maintenance costs carried out by the logistic centre.

The personnel costs consist of the hourly cost of skilled manpower which is employed for the necessary processes for above mentioned pre-treatments, for a total amount of **€ 8,625**.

Transport costs (5 €/t) refer to the carriage of fine materials from the facility, which manages the first stage processes (chipping, screening and handling), to the pelletiser (about 3-4 km away).

Investment costs are not provided for in the selected scenario and the involved equipment is that which is already located in the logistic centre.

2.7 Revenue streams

For the new business line as biomass logistic centre, the Cooperative intends to produce and sell:

- 529 t/yr of agro-pellets class A (ISO 17225-6), which represents the top product of the new logistic centre and that is composed by:
  - Residues from cereal cleaning (18.9 % of the agro-pellet);
  - Fine material from agro-prunings coming from the screening of the material resulting from the chipping process (78.8 % of the agro-pellet);
  - Sawdust from wood processing (2.3 % of the pellet).
- 292 t/yr of medium quality wood chips, the main product of the chipping process of mixed agro-prunings;
- 1,167 t/yr of hog fuel, with a high percentage of leaves and bark, the residual product of the chipping of mixed agro-prunings;

The selling prices reported for **the medium quality chips from agro-prunings** (55 €/t) **were established by analogy with reference to materials already on the market having similar features** (with regard to dimensions, heating power, ashes content) .

On the other hand, **the hog fuel already has a consolidated reference market** and is sold by competitors at a maximum of 25 €/t, excluding transport charges, so the Cooperative is forced to comply with that price.

With regard to **agro-pellets, market price for this type of product still haven't been fixed in the region**, so they result from:

- production costs;
- minimum acceptable profit to the Cooperative;
- the comparison with the selling price of forestry products with similar quality features .

The Cooperative considers that the **minimum acceptable profit for feasibility of the new business line will have to be at least 10 % of the production costs**, as a result of agro-pellets sales but also of medium quality chips from agro-prunings. **This profit is greatly exceeded with both products**; on the other hand, with regard to production of hog fuel, this will be sold nearly at cost price due to the existence of a closed market on this line.

The selling price of agro-pellets was intentionally set at a lower rate (80 €/t) compared to similar products, as a precaution in case the quality features, during the

testing phase, should not meet those of the forestry wood pellets they are competing with.

2.8 Key Partners/Suppliers

The **most important partnerships** are represented by:

- **Cooperative of Agricultural producers**, the members of which are owners of farmlands planted with cereals (wheat, corn) and sunflower. This agricultural cooperative is associate in the agro-industry which aims to achieve the logistic centre and rents from it yards, the equipment and the silos of the facility during the collection period of raw materials, to clean the seeds, dry the corn and for the storage of wheat in the silos. **The residues from cleaning should be used by the logistic centre, without any additional cost, for the production of agro-pellets**.

  Moreover, the associates producing corn could, in the future, be interested in becoming also suppliers of corn cobs for biomass production for energy purposes.

- **Organizzazione Produttori di biomassa** (Organization of Producers of biomass), of which the Cooperative is associate, that handles promotion of delivery on the part of the local farmers, associate and not, of the mixed agro-prunings to be used in the logistic centre.

- **Forest contractor**, associate of the Organization of biomass Producers, who rents from the Cooperative portions of yards and warehouses of the facility, to be able to store and process the timber. The company is equipped with various tools: different power chipping machines and a screener which the logistic centre can rent to carry out production of chips from agricultural prunings; machines for cutting the logs in pieces. All the processing residues (under-sieve and sawdust) can be used by the logistic centre for pellet production.

- **Logistic operator** that collects straw for the local farmers (in a 30 km radius area from the facility) and that, in the future, could also collect the corn cobs if the logistic centre should eventually decide to produce biomasses from this material.

2.9 Competitors

A few important suppliers have been operating in Tuscany, for several years now, in the sector of solid biomasses: they mainly produce wood chips of forestry origin and, on a smaller scale, even from poplar plantations and from street and town trees pruning. They usually are big forestry contractors which operate in the environmental sphere, often on Public procurement, for the restoration of forests which have been damaged by adverse weather events or other events (landslides, erosion, parasitical

infections) or manage riverside cleaning, so they are able to introduce large quantities of biomasses in the market. These subjects can offer two types of product:

- **medium-high quality wood chips** (classes A1 and A2) which are purchased by commercial or service activities to heat sheds, greenhouses, hotels, thermal baths, gyms, etc., but also by schools, public offices or small residential units which have installed a biomass boiler as a service for the community;
- **hog fuel** which is mainly sent out of the region towards large energy consuming industries.

These big producers generally supply the market with **wood chips produced on a short distribution chain**, i.e. deriving from the processing of materials which have been collected in Tuscany or in areas very close to their production centre: the reason for this type of management is the need to keep transport charges very low. This type of market also involves many wood chip producers for small quantities, which operate on a local scale (small forestry companies which use timber cutting residues from public and private wooded areas).

With regard to pellets, the production facilities in Tuscany are very rare; generally, the suppliers are represented by companies that buy the certified material (Enplus or DINplus) in Northern Italy or abroad (Europe but also North America) in the following ways:

- in bags, for direct sale or for shops and shopping malls, where they will then be sold again to the end user ;
- loose or in big bags, for direct sale to end users both small and medium sized.

In some cases, the companies only handle the commercial transaction between the producer (located abroad and who is in charge of transport to destination) and the end user; in this case, sale is often carried out only through the web, and the company - which operates on the Tuscan market as well - is located outside the region.

The implementation of the **wooden biomasses logistic-commercial platform of Campotizzoro** is being currently carried out, near Pistoia: it will produce and sell huge quantities both of good quality chips and certified pellets, from local timber deriving from the woods of the mountains around Pistoia.

Finally, due to the importance of oil-making tradition, **there has been a diffusion in the last few years in Tuscany of companies which are producers and retailers of olive pits**. In agreement with the market analysis which was carried out during the previous activities of WP4, it was possible to prove that even though in the past the pomace producers would first take action for the production of olive pits, now also many mills directly carry out pomace centrifugation in order to obtain this type of biomass for self-consumption or selling it directly to small consumers or to shopping malls for subsequent re-sale.

Table 6: List of Company main competitors in the region

Company	Biomass Products	Location
T.U.A. Soc. Coop.	Wood chips (A1, A2 and B)	Lucca
Piattaforma logistica di Campotizzoro	Wood chips (A1 e A2) and local certified forestry pellets	Pistoia
Rimorini legnami	Wood chips	Firenze
Gruppo Morini	Wood chips	Siena
Agriambiente Mugello	Wood chips	Firenze
Coop. Agr. For. Altovaldarno	Wood chips	Firenze
Toscana pellet	Wood pellets	Pistoia
Antonelli s.r.l.	Local certified forestry pellets	Arezzo
Omega pellets	Wood pellets	Arezzo
www.eurobiomass.it	Wood pellets (online sales)	Varese
ITALCOL (Italiana Alcool & Olii)	Olive pits	Firenze
Frantoio S. Luigi	Olive pits	Grosseto
Frantoio Andreini	Olive pits	Grosseto
Frantoio di Sovana	Olive pits	Grosseto
Frantoio di Matraia	Olive pits	Grosseto

The average prices charged by the competitors are listed as follows:

- Loose olive pits: about 173 €/t.
- Olive pits in 15-25 kg bags: about 200-209 €/t.
- High quality forestry wood chips: about 108 € /t.
- Medium quality forestry wood chips: about 54-72 €/t.
- Hog fuel: about 25 € /t.
- Loose certified forestry wood pellets: about 190-200 € /t.
- Certified forestry wood pellets in 15-25 kg bags: about 211-228 €/t.

These prices do not include VAT nor transport charges to end user.

In this region there currently aren't any pellets producers from agricultural raw materials or residues: the only products with similar features are represented by olive pits and dehydrated pomace. With regard to agricultural chips, some attempts have been made to try production from vine pruning, but they failed due to very high raw material cost.

Finally, for general information, some companies in northern Italy started the exploratory production of restricted quantities of **high quality forestry wood chips but in a small size (called "cippatino")** which can be used in pellet powered boilers/stoves but are much cheaper compared to them (from 142 to 171 €/t, respectively loose and in bags, excluding VAT and transport charges).

2.10 Market

Both local and regional market are characterised by a strong offer of solid biomasses fuels: these are nearly exclusively of forestry origin (hog fuel, wood chips and pellets); hog fuel currently has a well established market, represented by the large

industries, whilst medium quality chips are purchased by small and medium commercial, industrial and service activities both public and private; the households and the small business companies represent the only consumers of wood pellets.

Currently, the regional market does not offer agricultural originated fuels (apart from olive pits and dehydrated pomace, used by small consumers): this is the reason why the Cooperative is not able to identify an exact customer target segment, neither to provide for the success its products may have on the market.

In order to identify commercial areas of interest and relative potential customers for the products of the logistic centre, the following table and graphic show the different prices of the various solid biomasses fuels which are actually used and the matching consumer category.

Table 7: Market prices of the most important types of solid biomasses

Type of solid biomass	Minimum price*	Maximum price*
hog fuel		€ 25
medium quality wood chips	€ 54	€ 72
high quality wood chips		€ 108
***cippatino* loose**		€ 142
***cippatino* in bags**		€ 171
olive pits loose		€ 173
olive pits in bags	€ 200	€ 209
wood pellets loose	€ 190	€ 200
wood pellets in bags	€ 211	€ 228

** VAT and transport excluded*

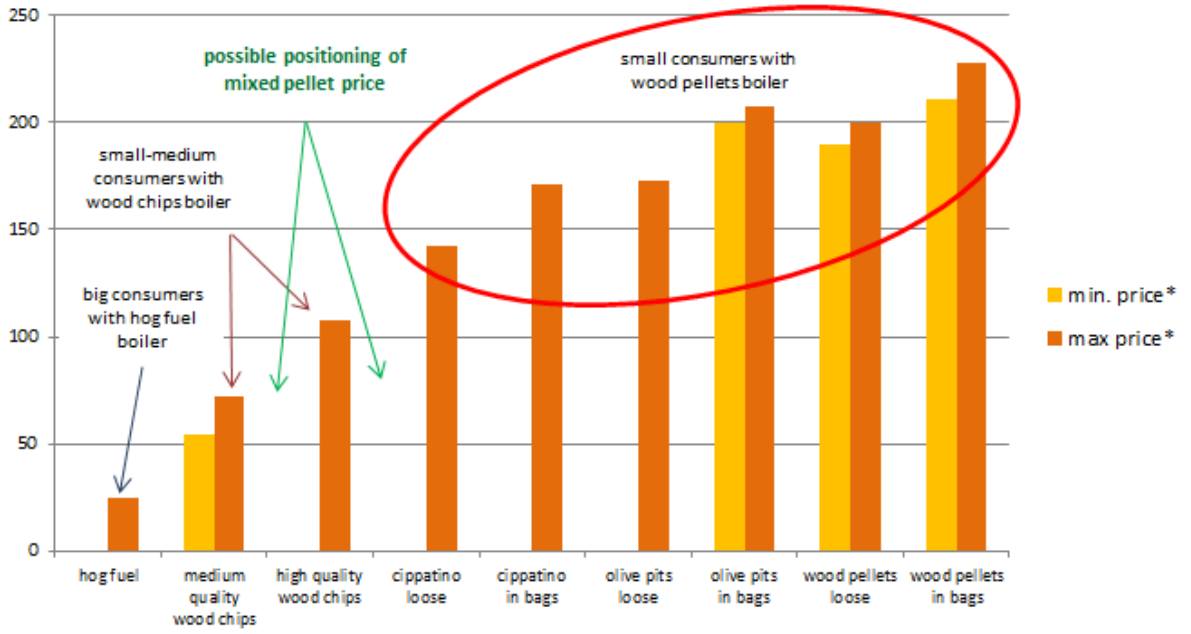

Figure 2: Scheme of the interaction between the market prices of solid biomasses and the type of users.

As highlighted in the graphic, and how reasonably expected due to the typical added value of each fuel, prices increase is **directly proportional to the technological content** (necessary processing for the production of the fuel) and is **inversely proportional to the quantity each single consumer requires** (i.e. to users dimensions).

The graphic also shows two discontinuities in the price increase function, which **represent the interval of possible positioning of agro-pellets** and can be interpreted as follows:

- **Hog fuel** is characterized by price stability (about 25 €/t) and by a consolidated but very competitive market represented by the large industries, located in and outside the region; these industries benefit from the provision of high technology systems for the atmosphere emissions reduction, suitable with the use of low quality fuels. The hog fuel is a low technology content fuel, with a very low added value, commercially interesting only if sold in huge quantities or for the exploitation of leftovers from other producing processes.

- **Medium quality forestry chips** are sold at a price which is from twice to 3 times higher compared to hog fuel (54-72 € /t): **consumers are medium sized public and private users which use wood chip powered boilers** (with mobile grid) and, sometimes, small district heating networks. The added value of this product is rather given by the high quality of the originating material rather than by the complexity of production processes. The high quality level is necessary both to maintain emissions in the atmosphere within the allowed limits, since the boilers are not equipped with abatement systems as efficient as the industrial ones, and to obtain a broader consensus from the population with regard to the plant .

- The price of 108 €/ton is distinctive of **high quality forestry chips used as fuel by small private consumers with fixed grid boilers or with gasifiers**. To operate correctly, these plants must be used with a high quality fuel, with low moisture, homogeneous particle size and low content of ashes and chlorine.

  This price is adequate for the higher technological content and the complexity of management processes which are necessary to produce this fuel.

- **There also is an offer, in small quantities and mainly in northern Italy, for "cippatino**", which is another type of high quality forestry chips, screened at 12-20 mm, dried and de-dusted, **to be used in pellet powered boilers/stoves**. Prices go from 142 €/t for loose product to 171 €/t in bags, representing the current low cost alternative to wood pellets and olive pits.

- **Turning to traditional and more common fuels for pellet powered boilers/stoves**, the graphic shows that the products on the market have prices ranging from 173 €/t for **loose olive pits** and 228 €/t for **forestry wood pellets in bags**. These prices are justified by the good quality of the products of origin,

by complexity of production processes and by intrinsic features (moisture, homogeneous particle size, high volumetric density, low ashes content, etc.) **which makes them suitable to be used by small consumers**.

- **The price distribution highlights a relevant discontinuity** between 108 €/t for high quality wood chips and 173 €/t for loose olive pits: this difference is ascribed to the specific dimensional features which are required for correct functioning of the pellet powered boilers/stoves. **This interval is the range where the commercial offer of "cippatino" is trying to find a place**: as a fact, with a price of 142 €/t for the loose version, it results to be competitive even with an alternative product to pellets such as olive pits.

- **A second discontinuity** can be detected between 72 €/t for medium quality wood chips and 108 €/t for high quality wood chips: this difference is mainly due to moisture and ashes content of the two products.

With regard to moisture and content of ashes, chlorine, etc., **the price of agro-pellets produced by the logistic centre may find a place in either one or the other of the two above mentioned discontinuities.**

The evaluation of the real convenience of the offered products price, compared to main competitors in the region, was carried out with reference to the cost of energy, comparing the €/kWh price of each product with the one of the product it would replace.

The results are indicated in Table 8.

Table 8: Evaluation of convenience of product comparing with other type of solid biomass

Competitors							Le Rene						
Type of biomass	Bulk density kg/m3	Ash content w-% db	M %	LHV ar kWh/kg	price €/t	price €/kWh	Type of biomass	Bulk density (kg/m3)	Ash content (w-% db)	M %	LHV ar kWh/kg	price €/t	price €/kWh
hog fuel	300	≤ 4	> 40	2.2	25	**0.011**	**agro-prunings hog fuel**	300	≤ 4	40	2.2	25	**0.011**
medium quality wood chips	270	≤ 1,5	35	3.1	63	**0.020**	**agro-prunings medium quality chips**	270	≤ 1,5	40	2.8	55	**0.020**
high quality wood chips	250	≤ 1	≤ 10 ≤ 25	4.15	108	**0.026**							
cippatino bulk	300	≤ 1	12-15	4.4	142	**0.032**	**agro-pellets**	650	≤ 6	10	4.0	80	**0.020**
cippatino in bags	300	≤ 1	12-15	4.4	171	**0.039**							
olive pits bulk	500	≤ 2	8-10	4.8	173	**0.036**							
olive pits in bags	500	≤ 2	8-10	4.8	205	**0.043**							
wood pellets bulk	650	≤ 2	8	4.7	200	**0.043**							

Competitors							Le Rene						
Type of biomass	Bulk density kg/m3	Ash content w-% db	M %	LHV ar kWh/kg	price €/t	price €/kWh	Type of biomass	Bulk density (kg/m3)	Ash content (w-% db)	M %	LHV ar kWh/kg	price €/t	price €/kWh
wood pellets in bags	650	≤ 2	8	4.7	220	**0.047**							

The table clearly establishes that **agro-pellets have a much more competitive price than all the other solid biomasses offered by competitors** and which can be used in pellet powered boilers. The only negative feature of the product is represented by ash content, probably significantly higher from about three to six times, compared to the other fuels (literature data for standard ISO 17225-6 class A agro-pellet); this may cause increase of boiler cleaning frequency but **does not generate any kind of problem with regard to disposal, as the target customer is a rural user or, in any case, not citywide**.

Moreover, agro-pellets turn out to be competitive also with high quality wood chips, allowing to **promote the replacement of the chips in the boilers from small consumers**.

A convenience assessment was carried out, in order to confirm the previous data, with regard to achievable saving between agro-pellets and the competitor's products which could be replace by it, by comparing the unit price of energy (€/kWh) of each of them. The result is viewable in the following table.

Table 9: Comparison between products cost (cost per unit of energy)

Substitutable products	Savings of agro-pellets
agro-pellets vs. high quality wood chips	23%
agro-pellets vs. cippatino loose	37%
agro-pellets vs. cippatino in bags	47%
agro-pellets vs. olive pits loose	45%
agro-pellets vs. olive pits in bags	53%
agro-pellets vs. wood pellets loose	53%
agro-pellets vs. wood pellets in bags	57%

2.11 Authorization process and permits required

To be able to integrate the new production line in the agro-industry, the Cooperative doesn't need any new licence or authorization, since this is a simple variation of the existing producing processes.

The new product (agro-pellets) is originated by a production process, of which it is an integral part, and is directly used following to a standard physical-mechanical industrial practice consisting of a “densification”.

In the agro-industry site there is already a space rented to the Biomass Producers Organisation which is dedicated to the chipping of forest resources.

During production, there will not be any emission to water nor in the atmosphere and the employed equipment is already available in the logistic centre.

But, **the production process of agro-pellets for energetic use (so not for food purposes**) requires the use of a pelletiser which is usually designed for *the production of feed for animals for human consumption*: in this regard there will be a risk of contamination of such feed, as besides cereal cleaning residues which do not represent a problem, the production mixture will also contain under-sieve materials from agricultural pruning and forestry timber sawdust.

The Cooperative already has a specific Self regulation manual, in agreement with the CE Regulation 183/2005 (transposed in Italy by the Legislative Decree 193/2007), for the Hazard Analysis and Critical Control Points (HACCP) of the whole food processes (from cereal delivery to pelletising). The law requires that for every change which should occur in an existing production chain already subjected to HACCP control for that specific activity**, the Self regulation manual should be updated in order to allow detection of the new critical points, handling the revision of hazard analysis with the description and introduction of the appropriate practices**.

In particular, with regard to the logistic centre, the pelletiser (which is the only critical feature in the production chain of pellets for energetic purposes) has not been used for about two years: at the moment, the Cooperative has no interest in re-activating it for the production of animal feed, **but it is necessary to update the manual at least with the declaration of non-use for food purposes**. In case the food production process should be restored, it will be necessary to integrate the Self regulation manual of food production chain, taking account of the potential risks which could arise from the periodic use of no-food materials (pruning and sawdust) and that any contamination could affect human health (microbiological and phytosanitary contamination of the products).

3. Recommended Business Strategy

The need not to be able to provide for any kind of investment, repeatedly stated by the Cooperative, determined **the choice of a scenario zero investment for the Business Model**. It is also true that each target product selected in the three assumed different scenarios has the same commercial features and can be placed in the same market niche: i.e., a solid biomass fuel, at a low cost and as an alternative to forestry wood pellets. This is true, in fact, with regard to agro-pellets, to corn cob grits and to so-called “cippatino”.

Therefore, the three scenarios can be considered as development progressive stages of the activities of the logistic centre: new agricultural originated solid fuels

will be introduced on the market by subsequent steps, also through batch launches, testing customers approval by means of a feedback which will allow proving global feasibility of the new production line and carrying out the appropriate adjustments with regard to product quality and price policy.

The analysis which was carried out in the previous paragraphs contributes to recognize the target customer segment for the new activity. This section aims to **identify the best production and commercial strategy for the Cooperative**; this shall match with the meeting point among:

- the expectations of the Cooperative in maximising the gross operative margin;
- the chance to place a specific commercial niche characterized by weak competition;
- the customers' technical-economic convenience requirements.

The following summary tables have been filled in, in order to identify the best outcome among the three above mentioned components (**Table 10** - **Table 12**).

Table 10 shows the production costs of the manufactured products of the new line, besides quantities, production cost, sales revenue, gross operating profit (EBITDA), Return On Sales (ROS) and ratio between costs and revenues.

Table 10: Economical convenience of the product

Type of product	Quantity	Production costs	Sales revenue	Profit (EBITDA*)	ROS*	Cost/Revenue ratio
Agro-pellets	529	€ 25,651	€ 42,320	€ 16,669	39.4%	60.6%
Mixed agro-pruning chips M 40	292	€ 7,281	€ 16,060	€ 8,779	54.7%	45.3%
Mixed agro-pruning hog fuel	1,167	€ 29,101	€ 29,175	€ 74	0.3%	99.8%
Total	**1,988**	**62,034**	**87,555**	**25,521**		

* EBITDA = Earnings Before Interest, Taxes, Depreciation and Amortization; ROS = Return On Sales

The table shows that **hog fuel sales only recover production costs**, as pointed out by 0.3 % ROS and by a profit of just € 74.

On the other hand, it is highlighted that the **mixed agro-pruning chips is the product with the highest added value**, with a 54.7 % ROS and a cost-benefit ratio of 45.3 %. But it must be underlined that **this product has no competitive advantage compared to the similar products made by competitors**. However, even if the quality-price is the same as competitors from forest sources, there might be a social barrier that should be overcome: due to the agriculture origin of this product, it can be considered as less natural or more chemically polluted.

The **agro-pellets** have a different commercial positioning capability, even though it does have negative features compared to the direct competitors (olive pits, “cippatino” and forestry wood pellets): but, in this case, the contractor can opt for an **extremely aggressive price policy**, which only for precautionary reasons settles in

€ 80/t, but could be significantly higher. Effectively, the product holds a very defined market niche, representing **an alternative material compared to the usual fuels which are used in pellet powered boilers/stoves but characterized by a much lower price.**

Table 11 was filled in **to achieve a better comparison amongst the commercial values of the different products of the logistic centre**; for the benefit of consumers, it shows:

- **direct savings on purchase of finished products**, compared to other kinds of solid biomasses currently in use;
- **the total quantity of each product which is manufactured by the logistic centre**;
- **the estimated product sales share** (in % and tons), with regard to every kind of fuel it is intended to replace;
- **the total savings the customers will achieve from the market**, for each commercial product/segment.

Table 11: Commercial Potential

Substitutable products	Savings on finished products purchasing price (for consumers)	Quantity of products on sale	Estimated share of sale of the products, in relation to biomass replaceable		Total savings offered to the market of consumers	
	€/t	t	%	t	€	€
agro-pruning hog fuel vs. hog fuel	0.06	1,167	100%	1,167		70
agro-pruning chips vs. medium quality wood chips	8	292	100%	292		2,336
agro-pellets vs. high quality wood chips	28	529	5%	26	741	53,403
agro-pellets vs. cippatino loose	62		10%	53	3,280	
agro-pellets vs. olive pits loose	93		20%	106	9,839	
agro-pellets vs. wood pellets loose	115		65%	344	39,543	
Total		**1,988**		**1,988**		**55,809**

The table confirms the **large commercial potential of agro-pellets in the place of high quality wood chips, of "cippatino", of olive pits and of forestry wood pellets.**

Effectively, the market niche where this proposal is placed is very large due to the high cost of forestry pellets. Over the past few years, this area was tackled by commercial offers of olive pits and "cippatino", which provide the consumers with interesting savings, even though their prices are high. The low cost of raw material, which will be employed to manufacture agro-pellets, and the related low total production costs lead to a unitary marginal cost slightly lower than 50 €/t, **which is**

equal to about 1/3 of the selling price of the most convenient alternative product (**forestry "cippatino"**), which, however, the regional market scarcely offers.

This allows considerable room for manoeuvre with regard to the price policy the logistic centre can carry out.

Table 12 summarizes and compares the main technical and economic features, both positive and negative, of the different fuel supplying scenarios on the part of the expected customers: these are divided on the basis of the medium energy requirements. Also, the medium annual savings are taken into consideration, in order to estimate the possibility to replace the boiler/stove, in the case of high quality wood chips use.

Table 12: Added values for the customers

Type of product (depending on boiler)	Savings of agro-pellets (energy cost)	Supply frequency ratio (different bulk density)	Ash content ratio	Households average savings per 20 MWh/yr (€/yr)	Holiday farms average savings per 85 MWh/yr (€/yr)
agro-pellets vs. high quality wood chips	23%	0.4	6	-	512
agro-pellets vs. cippatino loose	37%	0.5	6	245	1,043
agro-pellets vs. olive pits loose	45%	0.8	3	321	1,364
agro-pellets vs. wood pellets loose	53%	1.0	3	451	1,917

- **The first column** shows possible replacement with agro-pellets compared to those currently in use;
- **the second column** shows possible energy costs savings by using agro-pellets;
- **the third column** shows increase ratio of stocking or frequency of supplies due to the different energy density of the compared products;
- **the fourth column** shows the increase medium ratio of ashes between the different products;
- **the next columns** show two different groups of potential customers, selected in accordance with typology and energy requirement (average data extracted from interviews carried out in task 4.3): **this shows the annual saving (in euros) they could achieve replacing biofuels.**

Taking into account the results which are reported in the table, it is possible to confirm that **the best customer segment consists of the forestry wood pellets and olive pits consumers** as, by using agro-pellets, they would achieve savings on supply price respectively of 45 % and 53 %.

Indeed, also **the consumers of high quality wood chips and "cippatino"** would achieve strong savings by using the flagship product of the logistic centre, but:

- the regional market currently still presents very low shares of consumers of "cippatino"; it is therefore possible to act through promotional activities towards

them, highlighting the opportunity to buy standard pellet powered stoves but not equipped with the stirrer which is necessary to avoid cavitation phenomena whilst using “cippatino”.

It has to be pointed out that **agro-pellets produce from 3 to 6 times ashes quantity compared with the fuels it aims to replace**: this should not represent a problem, as the consumers are mainly rural or in any case isolated, characterized by the presence of vegetable gardens, gardens and farmlands which allow easy disposal operations.

With regard to the scenario which was selected for the start-up of the task, due to the poor quality of the source material, the manufacturing processes aimed to exploitation of residues will return **a relatively low quote of agro-pellets, amounting to about 26% of total production** of solid biomasses expected by the Cooperative: this quote may be adequately enhanced and it is expected it should benefit from absence of direct competition.

The remaining percentage shares of products, medium quality wood chips (about 15 %) and hog fuel (about 59 %), will instead be introduced in a consolidated market and will be subject to the development of the typical average prices of similar products, in some case only recovering production costs.

In brief, **processing of pruning residues has the only purpose of separating the different sized components**, obtainable by chipping, in order to allow their maximum exploitation. It is considered appropriate to handle a preliminary selection of the delivered wooden material by separating, even roughly, fronds and leaves, pruning, branches and logs in order to obtain qualitatively selected lots to be chipped separately.

The wood chippers are currently equipped in order to be able to cover the whole product sections, i.e.:

- large chips, for gasifiers ;
- medium and fine chips, for co-generation and district heating;
- “cippatino”, for very small plants suitable for individual residential use.

Usually, the same wood chipper can't indifferently produce all kinds of chips, as the cutting length can only be regulated within selected variation limits. This is the reason why the barrel needs to be changed in case of length variation – this operation is quite easy to carry out.

Even just regulating the blades, it will be possible to act on particle size selection by determining the related quotes of fine (< 3 mm) and large fraction which is aimed to obtain. The best quality lots may be chipped with a specifically designed machine for industrial production of “cippatino”, which will be used for pellets production or to power small boilers for individual residential use. For this reason, cutting length will be set at 10 mm and the machine will have to be equipped with a very narrow 30x30

mm square mesh grid. The bad quality lots may be chipped with a higher cutting size for the production of chips and hog fuel.

This possibility will allow, at a certain extent, to adapt the production quotes to the contingent situation of market demand, or to increase the under-sieve fraction to be sent to pelletising, in case the agro-pellet should encounter a good commercial achievement.

The transition to pelletising of a material which is actually comparable in terms of dimensions to a "cippatino" and as such could already replace wood pellets, is attributable to its higher moisture (about 15 %) and to the absence of a drying process, which is replaced by dehydration during the pellet creation process.

The agro-pellet of which production is expected, with a moisture content equal to 10%, **is comparable to the forestry wood pellets, to the "cippatino" and to the high quality wood chips** and, for this feature, can be therefore positioned in a price range between 108 and 142 €/t.

Content of ashes, chlorine, etc. of the finished product is currently unknown, even though it will presumably be higher than that of the aforementioned exclusively forestry-wood based fuels; **on a precautionary basis, it was therefore decided to provide for an indicative selling price** (80 €/t) positioned in the range of 72 and 108/t: this way, it will be possible to promote the product even among small consumers, as an alternative fuel in chip powered boilers, as the price is competitive with that of high quality wood chips.

Moreover, with regard to the products the logistic centre intends to sell, it is not possible to provide for the approval on the side of the consumers nor to assume sales prevision, as these biomasses have never been tested on the market of small and medium consumers. **So it is necessary to provide for**:

- **production of test lots** of the various fuels;
- **implementation of analysis on samples of the test lots**, in order to establish the content of chlorine and sulphur, responsible for possible corrosion effects on the metal components of the boilers, and the content and composition of ashes;
- on the basis of the analytical results, **the definition of a selling price** for the products launch;
- **the production of launch batches** (to the extent of 5% of the expected quantities, partially bagged by hand) to be introduced on the local market in standard packages (15 kg), even in the form of free samples or by 3x2 offers. The launch batches will allow testing the consumers response (through satisfaction surveys); this test will allow to eventually adjust both the selling prices and the quality features of the products, especially with regard to agro-pellets.

4. Conclusion

The analysis of the work blocks carried out in this Business Model allowed to highlight the strong and weak points of the best scenario provided in the feasibility study. As a summary, a scheme of the selected setting is reported, with the focus points of each block (see Figure 3).

The analysis, listed by production lines, enabled to verify the effective economic convenience of each one of them, allowing to assume some amendments to the scenario with the aim to maximize the profits and the efficiency of the commercial strategies.

The business idea consists in improving the manufacturing process of the agricultural pruning which is currently carried out and in re-using the residues from other processes (proper or connected with the agro-industry) in order to manufacture a new product (agro-pellets). These agro-pellets represent the top product of the logistic centre and the sub-products from agro-pellets production (chips and hog fuel resulting from the agro-prunings chipping process) would be secondary products also offered in the new business line.

The improvement of the chipping process of agricultural pruning consists in enhancing the finest fraction, which typically lowers the commercial value of chips themselves; depending on the commercial success of the new product, a part of the fine fraction – greater or lesser – will be deducted from the standard production lines of agro-chips and hog fuel; these lines will remain active in any case, in order to allow total cost covering.

The commercial policy of the agro-industry is to estimate the possibility of introducing the new product (agro-pellets) in the solid biomass market, offering a low cost alternative to the fuels which are used in pellet boilers/stoves.

Thanks to low production costs, **it is possible to pursue an aggressive price policy**: prices will be definitively stated after assessing the quality of the manufactured product through specific analysis (ashes and chlorine content mainly).

With regard to literature data, the ash content is presumably much higher compared to the currently used alternative fuels. However, since potential consumers are those in isolated or rural contexts, this problem would be easily manageable.

According to the different specifications regarding fuels stated by boilers producers, the consumer who may decide to use agro-pellets could lose the guarantee: this is certainly not a problem for owners of old boilers; on the contrary in this case the achievable savings by using agro-pellets may represent an incentive for the subsequent purchase of multi-fuel powered boilers.

It is important to highlight that both the project idea and the commercial policy inherent to the new product (agro-pellets) must be precisely verified and stated through:

- **production of test lots**;
- **implementation of analysis on samples of the test lots** in order to establish the content of chlorine and sulphur and the content and composition of ashes;
- **definition of the selling price**, on the basis of the analytical results;
- **the production of launch batches**.

Cooperativa Le Rene

Authorization process and permits required: 1. No authorizations required; no new permits required. Necessary to update the HACCP Manual for the pelletiser (declaration of non-use for food purpose)

Key Partners/Suppliers
- ✓ Cooperative of Agricultural producers
- ✓ Organization of Producers of biomass
- ✓ Forest contractor
- ✓ Logistic operator

Competitors
- ✓ Local producers of forestry wood chips
- ✓ Re-sellers of certified wood pellets
- ✓ Logistic-commercial platform of Campotizzoro
- ✓ Producers of olive oil (retailers of olive pits)

Key Resources

Raw materials
- ✓ Mixed agro-prunings
- ✓ Residues from cereal cleaning
- ✓ Wood sawdust

- ✓ Cereal cleaner
- ✓ Chipper
- ✓ Screener
- ✓ Mini skid steer loader
- ✓ Pelletiser

Key Activities
- ✓ Cereal cleaning
- ✓ Chipping of prunings
- ✓ Screening
- ✓ Handling of under-sieve material
- ✓ Pelletising

Value Propositions
- ✓ Creation of a new agro-fuel production line
- ✓ Local availability of the agro-fuel
- ✓ Competitive price of products
- ✓ Sales on local market
- ✓ Mixed pellets can be compared with wood pellets, in terms of format

Enhancing agricultural residues and production scraps
- ✓ Flagship product: mixed pellets
- ✓ Penetration of the market of small consumers of forestry wood pellets

Customer Relationships

Pricing policy
- ✓ Good quality products
- ✓ Competitive prices

Customer care
- ✓ Problem solving approach
- ✓ Encouragement of feedback
- ✓ Technical advice
- ✓ Guide to the products

Customer Segments
- ✓ Households
- ✓ Farms
- ✓ Agro-industries
- ✓ Business activities
- ✓ Public and private buildings
- ✓ Heating districts

Channels
- ✓ No agent/dealers
- ✓ No wholesalers
- ✓ Word-of-mouth advertising
- ✓ Web site
- ✓ E-commerce
- ✓ Italian Commodity Exchange

Market
- ✓ Local biomass market strongly competitive
- ✓ Strong offer of solid biomasses fuels (wood chips and pellets)
- ✓ Reduced use of agro-fuels in the region
- ✓ Great convenience in the mixed pellets compared to alternative fuels
- ✓ Interest in the development of a short supply chain

Cost Structure
- ✓ Raw material purchasing
- ✓ Pre-treatment (chipping, screening, handling and pelletising)
- ✓ Transport among plants
- ✓ Personnel

Revenue Streams

Sale of products:
- ✓ mixed pellets
- ✓ mixed agro-pruning chips
- ✓ mixed agro-pruning hog fuel

Recommended Business Strategy
- ✓ Adoption of an aggressive price policy for mixed pellets
- ✓ Production of test lots
- ✓ Production of launch batches to test the response of consumers
- ✓ Development progressive stages of the production activities

modified from BMCalc (created by Diderikvan Wingerden, based on Alexander Osterwalder's Business Model Canvas)

Figure 3: Business Model Canvas