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

SUCELLOG: IEE/13/638/SI2.675535

D4.4b
Summary of Cooperativa Agraria San Miguel Business Model

30.08.2015

Co-funded by the Intelligent Energy Europe Programme of the European Union

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.

Project coordinator

circe
RESEARCH CENTRE FOR ENERGY RESOURCES AND CONSUMPTION

Project partners

agri-food cooperatives Spain
>we are future

D.R.E.AM. ITALIA

R·A·G·T ENERGIE

lk landwirtschaftskammer steiermark

Services COOP DE FRANCE
Union de Coopératives Agricoles

WIP

About this document

This report corresponds to D4.4 of the SUCELLOG project - Summary of Cooperativa Agraria San Miguel Business Model. It has been prepared by:

D.R.E.AM. Italia Soc. Coop. Agr. For.
Pratovecchio Stia (AR)
E-mail: sucellog@dream-italia.it
Tel: +39 575 529514

With collaboration and input from Spanish Cooperatives, WIP and CIRCE

This project is co-funded by the European Commission, contract N°: IEE/13/638/SI2.675535

Table of contents

List of Tables

List of Figures

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 Agraria San Miguel, the Spanish agro-industry selected to be support by the project, the scenario chosen was to produce mixed straw and wood pellets (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 Customer Segment (costs must be subtracted	Forms of revenue, sale of goods, use of services, fees, rentals and leasing,

Block	What does this block defines	What does this block identifies
	from revenues to create earnings).	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. Agro-industry Cooperativa Agraria San Miguel

After the feasibility study performed by SUCELLOG project, the Company has decided that the best scenario for the new business line is to produce and sell:

- 1,626 t/yr of mixed straw and wood pellets class B (ISO 17225-6).

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

2.1. Customer segments

As a general objective, the Cooperative wishes to produce solid biomass enough to cover 10 % of the heating demand of the pig farms in a radio of 50 km.

In this area, other consumers could also be dehydration facilities, sport centres and a retirement home consuming biomass during winter. Some consumers have a heating demand during all the year (with a second gas burner for the peak of consumption), others during their industrial process (dehydration from May until November): currently, they are mainly consuming wood pellets, almond shells, olive pomace or wood chips.

In the initial phase of production the Cooperative, with the purpose of testing the response from the consumers and the appreciation of the product, aims to **supply solid biomass mainly to its members**. In a radio of 18 km from the facility there are 45 pig farms whose owners are members of the Cooperative which need heat during all the year: they are supposed to consume about 4,429 t/yr of biomass. Moreover, these members could be themselves suppliers of straw for the activities of the logistic centre, taking back a profit for providing the raw materials. Considering that generally they do not have so much space to store low density materials (wood chips), they are

currently consumers of olive pomace, olive pits, wood pellets, almond shell or grape marc.

The forecasting of the production for the first year (1,629 t) can be considered as rightly prudential: **it aims to fulfil the needs of about one third of the associated potential consumers, remaining inside a protected market within the association**; this small production, just a little higher than a batch of product launch, will allow to assess the acceptance of the consumers and, consequently, an adjustment of production parameters will be possible.

The following table lists the Cooperative target customers and types of products currently consumed in their boilers:

Table 2: List of target customers and type of solid biomass currently consumed

Customer segment	Type of product currently consumed
pig farmers	olive pomace
	olive pits
	wood pellets
	almond shell
	grape marc
dehydration facilities	wood chips
	olive pomace
	almond shell
sport centres	wood pellets
retirement home	wood pellets
	wood chips
	almond shell

2.2 Value propositions

The business idea related to the creation of the logistic centre is to valorise the agricultural residues of the members to produce an agro-fuel which can fulfil the heating demand of the pig farms in the region (within a radio of 50 km from the logistic centre).

In a first phase, however, it is expected to create a self-consumption chain, taking into account the straw delivered by only members of the Cooperative in a radio of 18 km, fulfilling the needs of about the 37 % of the pig farms from associated members of the Cooperative. This opportunity would provide a high added value, allowing the experimentation and the assessment of the acceptance of the product on a reduced scale inside a “friend” market, which provides technical and economic feedbacks, really important to adjust the qualitative characteristics of the product.

The new activity will allow the Cooperative to gain an extra-profit compared to the current activities as agro-industry, producing and selling mixed straw and wood pellets.

The members of the Cooperative will be able to obtain the following **advantages** from the activity of the logistic centre:

- **Economic enhancement of the residuals from cereals crops:** the Cooperative ensures the coverage of the costs for gathering the straw and a small gain for the farmer. The advantage for the farmer is higher if he/she is also a pig farmer because, through the enhancement of his residuals, he/she would get a benefit (as employment and profit) to be interpreted as a lower cost of fuel.
- **The possibility of feeding the existing boilers** with a local alternative fuel useful for the main part of the potential consumers in the area, taking in account that in a radio of 50 km from the Cooperative about the 90 % of the boilers are multi-fuel and 75 % of these have already an expired warranty.
- **The possible sale of the product on the outside market** gives the farmers the possibility of valorising their own residuals, gaining a profit from their conversion into solid biomass.
- Due to the high energetic density of the product, comparable to wood pellets, **lower storage volume is required than current used solid biomass; moreover,** the number of **supplies can be reduced during the year** as indicated in the following table:

Table 3: Supply frequency or storage volume ratio of new product.

Type of product (depending on boiler)	Bulk density kg/m^3	Supply frequency or storage volume ratio of new product vs. current solid biomass (different bulk density)	
wood chips	250	mixed pellets vs. wood chips	0,4
wood pellets	650	mixed pellets vs. wood pellets	1
olive pomace	500	mixed pellets vs. olive pomace	0,8
olive pits	500	mixed pellets vs. olive pits	0,8
almond shell	500	mixed pellets vs. almond shell	0,8
grape marc	500	mixed pellets vs. grape marc	0,8

- Finally, also the **member of the Cooperative who would provide the wood for the process** gains a profit from the activity of the logistic centre.

The possible **drawbacks** that can be foreseen are the following:

- **With big consumers,** that generally consume low cost solid biomass, it is not possible to manage a price policy.
- A **medium-low quality solid biomass** is produced compared to the ones in the market. During combustion, there is a production of a **high amount of ash, double** compared to many types of solid biomass currently used.
- **The combustion of herbaceous material can imply the generation of slagging problems in the boiler due to the low melting point of ash fraction.**

- **The high content of chlorine in the straw** causes the presence of corrosive compounds which could damage the metal components of boilers.

2.3 Channels

From the marketing assessment developed in the task 4.5, it was detected that currently the Cooperative does not have a sales department since customers are mainly loyal customers and it is considered that till the moment there is no need. Products are advertised on the website and on the magazine of the regional association of cooperatives.

The new product, at least in a first phase in which it would be sold only to members, could be advertised "**word-of-mouth**" or using current channels. Advertising on website and, eventually, a channel of e-commerce with a larger diffusion even outside the context of the members or of the areas closest to the logistics centre, could be considered enough to guarantee a visibility also in a larger area and to different kind of customers.

In future, being present in agrarian fairs should be taken into account (i.e. fairs about agrarian devices, livestock, feedstuff, etc.) to gain a larger promotion of the product for potential consumers. On-site demonstrations should also be considered for this purpose.

2.4 Customer Relationship

Taking into account the forecasted costs of supply and production, the selling price of the product traded by the logistic centre can be considered as intermediate in comparison to the price of the other solid biomass currently used. Therefore, **a marketing only based on a low price policy is not possible**: it is required to create and moreover make the consumers perceive that there are a series of advantages derived from the use of the proposed product.

In a radio of 18 km from the facility, **pig farmers are expected to be the most important customers since there is already an existing relationship due to the fact they are members of the Cooperative**. Regarding the logistic centre, these farmers, who own cereal fields, will be also suppliers of straw necessary for mixed pellets production.

The mutual interest of developing an added value of the activities, both of the members and of the Cooperative, comes from the relation of membership:

- **the interest of the member** comes from the maximising of the value of his/her products (including residuals) and from the satisfaction of heating needs using a self-produced solid biomass with a medium-low price compared to other market products;

- **the interest of the Cooperative** comes from the reduction of its idle periods, the diversification of the activities through solid biomass production, increasing the employment and the profits for all the members.

The relationship with the other potential consumers can be considered as different because it is based on the supply of a solid biomass with:

- **lower prices** or, at least, competitive prices;
- **a quality of the product** under the standard ISO 17225-6 for non-woody pellets;
- **less logistic problems in the use**, thanks to a best managing of the storage (especially compared to wood chips) and a reduction in the number of supplies during the year.

In the relationship with no-farmer customers and specially with those who consume large quantities of biomass, **in order to increase the competitiveness with alternative products** that can be sold annually at lower prices, **the logistic centre should also offer an additional service, consisting in collecting the ashes resulting from combustion**, whose disposal at a certain point (or in the future) could be difficult.

The Cooperative **could also use the ash collected to improve the fields of its members, generating an additional advantage with the savings in the use of fertilizers** (in particular potassium based ones).

2.5 Key Resources and key activities

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

- raw materials;
- agro-fuel for heat production;
- 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.:

- cereal straw;
- wood.

These materials will be used for the production of agro-fuels to be introduced in the market.

Cereal straw is a by-product mainly of barley and wheat crops: **it will be purchased from the members of the cooperative located in the nearby** (maximum 18 km far). Wood chips for the production of the mixed pellets will be purchased from a company that works in the area (being the owner a member of the Cooperative as well): this will imply less risk in supply to the logistic centre.

The risk of not having enough cereal straw for the logistic centre is very low: in non-watered areas the only crop is represented by cereal (wheat or barley), while in watered areas nowadays is mostly wheat and maize. Depending on the surface, farmers are obliged to diversify crops: in the surrounding most of the members have alfalfa, cereal or/and maize and, sometimes, rice.

Agro-fuel for heat production

The other key resources are represented by almond shells, olive pomace, olive pits and grape marc purchased for heat production: for the drying of wood during the idle period, the logistic centre will use the dryer of Line 1 (currently used for the dehydration of alfalfa) operating on heat produced from combustion of this type of agro-fuels. The cereal straw does not need to be dried as it is usually left on the fields to be dried naturally.

The equipment

In its facility, the Cooperative owns the equipment for the treatment of the straw and wood up to the realisation of the finished products (mixed pellets), as indicated below, in the scheme of the key activities section.

The logistical components present in the facility and to be used in the logistic centre are: particle size reducer, dryer, mill, pelletizer and a boiler for heat production (details are indicated in the feasibility study, see document D4.3).

The key activities are represented by:

- particle size reduction (straw and wood);
- drying (only wood);
- milling (straw and wood);
- pelletizing (straw and wood).

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

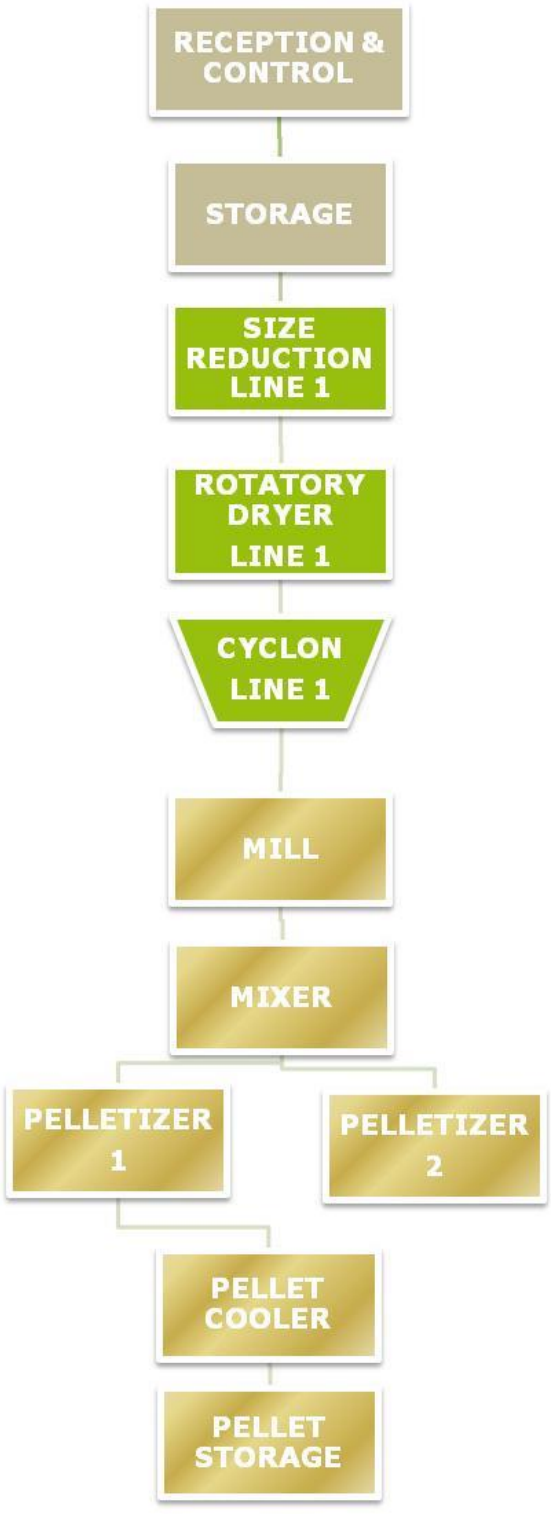

Figure 1: Scheme of logistic centre manufacturing processes.

2.6 Cost structure

Regarding production costs, these consider:

- purchasing costs;
- pre-treatment costs;

- transport costs;
- personnel costs.

The price of the cereal straw bales is constant from many years: 36-40 €/t at the consumer's place. However, every year more and more straw is left on the soil since the main market for cattle feeding and bedding is decreasing considerably. A price of 36 €/t has been considered in this Business Model.

Wood is purchased at a market price of 73 €/t including transport in a chip format.

The table below shows the purchase costs of the raw material which is necessary for the new business line; price including transport costs to logistic centre:

Table 4: Raw material purchasing costs

Residues type	Quantity	Price	Total costs
	t	€/t	€
Cereal straw (15% w, mainly barley and wheat)	1,205	36	43,372
Wood (17% w)	529	73	38,601
Total	**1,734**		**81,973**

The main pre-treatment costs are represented by:

- particle size reduction of straw (chopping);
- drying of wood (from 17 % to 13 % moisture content);
- milling and pelletizing of straw and wood to produce mixed pellets.

as shown in the table below:

Table 5: Pre-treatment costs

Type of product	Pre-treatment type			Total costs
	Reducing particle size	Drying	Milling + Pelletising	
	€	€	€	€
Cereal straw for pellets	2,893	0	33,391	36,284
Wood for pellets	1,951	13,255	20,216	35,422
Total	**4,843**	**13,255**	**53,608**	**71,706**

Personnel costs are already included in pre-treatment costs.

There will not be any extra investment cost, as the equipment which will be used are already available in the agro-industry.

Lastly, we shall consider the transport costs to consumers (average **10 €/t**).

The results are visible in the following table:

Table 6: Production costs of mixed straw and wood pellets

Solid biomass type	Total costs					Production costs
	Fixed costs		Purchasing costs	Pre-treatment costs	Transportation costs to consumers	
	Investment	Personnel*				
	€	€	€	€	€	€
Mixed straw and wood pellets	0	0	81,973	71,706	16,255	**169,934**

** Already included in pre-treatment costs*

2.7 Revenue streams

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

- 1,626 t/yr of mixed straw and wood pellets class B.

As a result of the sale, it intends to reach the revenue of 189,440 € according to the following table:

Table 7: Sales revenue of mixed straw and wood pellets

Solid biomass type SALE	Quantity	Production cost*	Sales revenue		
			Unit Price (min selling price)	Profit	Total Price (min total revenue)
	t	€/t	€/t	€/t	€
Mixed straw and wood pellets	1,626	104.54	116.54	12.00	189,440

** Including transport costs to consumers*

Since there is not a defined price for the agro-pellets in the region, the market price of the product results from:

- production costs;
- the minimum profit acceptable to the Cooperative.

The Cooperative considers that a minimum profit of 12 €/t of agro-pellets would be feasible to start the new business line.

2.8 Key Partners/Suppliers

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

- **the farmers associated** who own the cereal fields and are located in the vicinity of the Cooperative (maximum 18 km away), since they will be suppliers of agricultural residues (straw) necessary to produce mixed pellets in the logistic centre;
- **the company associated** who will supply wood to produce mixed pellets;

- **the local carriers**: for the product delivery the Cooperative can contract a company, who almost works exclusively for them, or loyal companies of the area.

2.9 Competitors

The biomass market in the area (Aragón and neighbouring regions, such as Navarra) has different suppliers with a wide range of variety products (mainly agro-industrial residues, which price is highly fluctuating from one year to another).

The main part of suppliers (see the list in **¡Error! La autoreferencia al marcador no es válida.**) provides biomass to specific consumer segments, as households, dehydration facilities, cooling plants, farmers, etc.: households consume mostly pellets and/or olive pits, industrial installations use cheap biomass such as forestry chips or recovered wood chips. Other consumers mainly use wood chips, wood pellets and agro-industrial residues such as olive pomace, olive pits, almond shell and grape marc. Some supplier also can provide cork and fruit or vineyard prunings.

Table 8: List of Company main competitors in the region

Company	Biomass Products	Location
Bioenergía Borjas sl	Forestry pellet	Zaragoza
Ecolive SC	Almond shell	Huesca
	Olive pits	
	Dry Pomace	
	Forestry pellet (Burpellet distributor)	
ENATICA (manufacturer and Biomass distributor)	Pine pellet EN PLUS A1 & A2	Zaragoza
	Industrial pine pellet	
	Chips	
	Almond shell	
	Olive pits (broken and dried)	
Moncayo agrícola	Almond shell	Zaragoza
SAT Nº 3117. Bajo Aragón Turolense	Almond shell	Teruel
EUR-URIBOR SL	Almond shell	Zaragoza
	Olive pits	
	Vineyards prunings	
	Dry pomace	
Agropellets sl (Agrogenera Grañen SRL) (society made by Secadero Santiago + Coop los Monegros + Ingenieria)	Forestry pellet	Zaragoza
Splinter energía (L Solé + Biomasa del Gironés)	Produce and manage more than 100,000 t / year with its own resources	Navarra
Pellet (RIB pellet distribuitors)	Pellet (EN Plus A1)	Zaragoza
Biomasa del Aneto (no transport costs to the areas: Sobrarbe, Ribagorza y Somontano.)	Pellet (EN Plus A1)	Huesca
	Chips	
	Shredded olive pits	
	Cork	

The competitors average prices and their quality (ash content in dry base) are:

- Olive pomace: 110 €/t (ash content 5-7 w-% db)
- Olive pits: 150 €/t (ash content 1-4 w-% db)
- Almond shell: 70-130 €/t (ash content <1 w-% db)
- Grape marc: 70 €/t (ash content 3-4 w-% db)
- Wood chips: 73 €/t (ash content <3 w-% db)
- Wood pellets: 165 €/t (ash content <3 w-% db)

Prices include transport (VAT excluded).

Additionally, it should be highlighted that in the region, **no companies or organizations currently provide products like the ones the Cooperative wants to produce**.

2.10 Market

In general, in Spain the biomass sector is not as much developed as it is in other European countries such as in Austria in terms of consumers knowledge about quality issues. But in the last 10 years, because fossil fuels price has importantly increased, the biomass is being more utilised in the industries as well as for households for thermal production and most of them have changed their gasoil installations to biomass ones.

Biomass distributors expect a consumption rise in the coming years as well as boilers manufacturers, because biomass is considered as one of the most promising renewable energies. But the lowering of gasoil prices occurred last months has made the industries to think more carefully on the possibility of installing this equipment because the payback time has increased due to lower revenues obtained.

Considering the interviews accomplished in the task 4.3, the domestic sector might be overloaded while in the industrial one there are still many opportunities for biomass. An oversupply of solid biomass characterises the local market, with several suppliers and different types of biomass. **The consequence is that local market looks very competitive and marketing of a new product should be carefully evaluated.**

In the region, main competitors offer several types of solid biomass, as highlighted in **Table 8**, with different and variable prices from year to year. Due to these, the consumers and, moreover, the pig farmers in the area, generally own **multi-fuel boilers** to be able to use the type of solid biomass with the lowest price year by year.

Moreover, from an inquiry about boilers present in the surrounding of the Cooperative, it appears that the 75 % are out of warranty. This condition **allows the fact that the owner can experiment different types of solid biomass with diverse characteristics** and could suggest the substitution of the own boiler by one much more specific for the self-produced solid biomass.

From the interviews of task 4.3, dehydration facilities seemed not to be interested in the new product of the Cooperative, both for the particle size characteristics of the solid biomass proposed and for a desired price not higher than 80-85 €/t. Therefore, this appears to be a market hardly affordable.

Contrariwise, other local consumers (i.e. sport centre, elderly residence, pig farmers, etc.) generally use wood pellets and they could represent an interesting potential market, since the Cooperative can propose an agro-pellet, classified under the ISO standard, with a considerable lower price.

Regarding the oil sector, the hypothesis of market penetration **actually seems a difficult task as the market of oil and its derivatives generally show a price decreasing trend.**

The evaluation of the real convenience of the offered product price, compared to main competitors in the region, was carried out with reference to the cost of energy, comparing the €/kWh price of mixed straw and wood pellets (class B) with the one of the product it would replace. The results are indicated in Table 9.

Table 9: Evaluation of convenience of product comparing with other type of solid biomass

Competitors							Cooperativa San Miguel						
Type of solid biomass	Bulk density kg/m3	Ash content w-% db	Moist. Cont. w-% ar	LHV ar kWh/kg	price €/t	price €/kWh	Type of solid biomass (wood-fuel substitute)	Bulk density kg/m3	Ash content w-% db	Moist. Cont. w-% ar	LHV ar kWh/kg	price €/t	price €/kWh
wood chips	250	≤ 3	30	3.3	73	**0.022**	**mixed straw and wood pellets class B**	650	4.14	10	4.39	117	**0.027**
wood pellets	650	≤ 2	8	4.67	165	**0.035**							
olive pomace	500	5-7	7.7	4.8	110	**0.023**							
olive pits	500	1-4	7.7	4.84	150	**0.031**							
almond shell min	500	<1	7	4.78	70	**0.015**							
almond shell max	500	<1	7	4.78	130	**0.027**							
grape marc	500	3-4	10	3.6	70	**0.019**							

Moreover, an estimation of the convenience of mixed pellets compared to other products in terms of money savings was made, comparing the unit cost of energy (€/kWh) of each product. The results can be observed in the following table:

Table 10: Comparison between products cost (cost per unit of energy)

Substitutable products	Savings of mixed straw and wood pellets class B	
mixed pellets vs. wood chips	-22 %	
mixed pellets vs. wood pellets	**25 %**	
mixed pellets vs. olive pomace	-16 %	
mixed pellets vs. olive pits	**14 %**	
mixed pellets vs. almond shell (min)	-82 %	-27 %*
mixed pellets vs. almond shell (max)	**2 %**	
mixed pellets vs. grape marc	-37 %	

** Calculated for almond shell average price of 100 €/t*

The table shows that the mixed pellets fuel is more convenient only respect to wood pellets and olive pits: a price policy based strategy can allow the penetration in the market of only these two types of solid biomass.

Nevertheless, **taking into account the price stability of straw, the price of mixed pellet should be sufficiently stable in time**, having the possibility of penetrating also other solid biomass markets: in fact, **prices of solid biomass look very unstable (specially agro-fuels since they depend on the campaign) and, in few years, they also could exceed the price of agro-fuel produced in the logistic centre**.

2.11 Authorization process and permits required

At this stage, since, by the moment, they are not going to do modifications in their installations, such as those related to air emissions, and the initial production of the new business line will not be very significant - such as to cause an increase in emissions by more than 25% or increase the production capacity of the cooperative in more than 50%- there is no need to ask for any environmental additional permission. Otherwise, they should review their permission related to the INTEGRATED ENVIRONMENTAL AUTHORIZATION (Law 16/2002, July, 1st).

The following administrative permits will have to be updated in order to register the new activity:

- CNAE codes identification

Companies have to identify their main activities in relation with an economical activity code included in the National Classification of the Economic Activities (CNAE, in Spanish.), NACE (Nomenclature o economic activities). This identification has to describe the activity of the enterprise as good as possible and must be unique for the whole administration.

To become a Biomass Logistic Centres means the cooperative has to include new economic activities in their registration activities, here follows the CNAE codes identified for the activity of the Biomass Logistic Centre:

Group E: Water supply, sanitation activities, residues management and decontamination.

38: Residues collection, treatment and removal. Valorization.

3831: Material separation and classification (Materials recovery, following NACE codes)

3832: Valorization of classified materials. (Recovery of sorted materials (following NACE codes)

- IAE (Impuesto sobre actividades económicas)

It is a tax to natural and legal persons, bodies or entities referred to in Article 35.4 of Law 58/2003, of 17 December when their business activities take place on the national territory.

3. Recommended Business Strategy

Previous analyses have shown which is the target segment of customers for the new activity. In this section, the best production and commercial strategy for the Cooperative is identified. This strategy is the one where there is a meeting point between:

- the needs of product quality and price convenience from the customers and
- the expectations of the Cooperative in maximising the gross operative margin.

The evaluation has been performed on the base of the information compiled in 3 tables (**Table 11**-**Table 13**).

Table 11 summarizes and compares the main technical and economical positive or negative features of the different types of fuel supplying scenarios chosen by the customers.

Table 11: Added values for the customers

Type of product (depending on boiler)	Savings of mixed pellets (energy cost)	Supply frequency ratio (different bulk density)	Ash content ratio	Pig farms average savings per 480 MWh/yr	Sport centre average savings per 1100 MWh/yr	Elderly residence average savings per 0,3 MWh/yr
				€	€	€
mixed pellets vs. wood chips	-22%	**0.4**	1.4	-	-	-1.5
mixed pellets vs. wood pellets	**25%**	1	2.1	**3,840**	**8,800**	**2.4**
mixed pellets vs. olive pomace	-16%	**0.8**	**0.7**	-1,920	-	-
mixed pellets vs. olive pits	**14%**	**0.8**	1.7	**1,920**	**-**	**-**

mixed pellets vs. almond shell (average price)	-27%	**0.8**	4.1	-2,880	-	-1.8
mixed pellets vs. grape marc	-37%	**0.8**	4.1	-3,840	-	-

- **The first column** shows possible replacement with mixed straw and wood pellets class B fuel compared to those currently in use;
- **the second column** shows possible energy costs savings by using Cooperative product;
- **the third column** shows increase ratio of stocking or frequency of supplies due to the different energy density of the products;
- **the fourth column** shows the increase medium ratio of ashes between the different products;
- **the next columns** show three 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 obtained in the table, it can be stated that **the customer target segment is formed by consumers of wood pellets and olive pits** because a saving of 25 % and 14 % is gained. However, it is important to keep into consideration that proposed **mixed pellets produce about twice ashes compared to these fuels** (meaning more boiler maintenance required).

This last remark about ash production is of importance for consumers of the external market (i.e. sport centre, elderly residence) because they mostly use wood pellets. The same can be said about a small part of pig farmers (members or not) that use wood pellets since they prefer to ensure a proper operation of their boiler, regardless the product market price. **Nevertheless, the main part of pig farmers is aware of the trend of price and production of solid biomass, choosing, year by year, the one that guarantees the best compromise between the proper operation of the boiler and the lowest price**.

So, the potential market for the proposed product is very uncertain. Since the market is very unstable and with high annual fluctuations, the **risk of a non-sustainable raise of product that is stored in the logistic centre without being sold is high.**

The production of the logistic centre could be **really variable**, linked to annual forecast of the production and prices of the alternative solid biomass.

Table 12 shows the production costs of the manufactured product 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 12: Economical convenience of the product

Type of product	Quantity	Production costs	Sales revenue	Profit (EBITDA*)	ROS*	Cost/Revenue ratio
	t	€	€	€		
mixed straw and wood pellets class B	1,626	€ 169,934	€ 189,440	€ 19,506	10.3 %	89.70 %

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

As shown in the table, with an investment from a production cost of about 170,000 €, a gross operating profit of only 19,506 € is obtained (ROS 10,3%): **this highlights a non-acceptable firm risk if the sales quotas are extremely yearly variable and non-consolidated (absence of contracts),** as explained before.

It is necessary to adopt loyalty schemes for potential consumers represented by pig farmers. It could be happened with:

- **plurennial supply agreements** highlighting, as advantages for the customer, the certain of supply and the price stability during the agreement life;
- **engendering additional advantages for these customers:** the purchase of the agricultural residues (straw) gives a small extra-profit to the farmer and a potential employment opportunity.

Table 13 shows the ratio between costs and revenues for each production phase.

Table 13: Summary table of cost sharing for each production item

Type of product	Raw material purchasing costs/Sales revenue ratio	Pre-treatment costs/Sales revenue ratio	Transport costs/Sales revenue ratio
mixed straw and wood pellets class B	43.29 %	37.86 %	8.58 %

Since **the purchase of raw material represents the highest cost of the production**, it is appropriate to try to valorise it highlighting its value as a secondary advantage for a potential buyer of agro-pellets. This shows that **pig farmers that are also straw suppliers for the logistic centre are the best target customers.**

Considering that inside the Cooperative this type of farmers is very representative, **the best Business Model forecast a chain of self-consumption inside the association itself** and **the logistic centre should purchase the straw from pig farmers only under the condition of an annual or plurennial agreement of agro-pellet supply**.

So, the Cooperative has two different target markets:

- **an internal market,** the self-consumption chain for members, in which secondary advantages for farmers should be enhanced, and in which it is possible to invite

changes to the agricultural practices and to the boilers of the consumers. In this market the **acceptance of consumers of a whole herbaceous pellet** should be tested, **also with an experimental batch**.

- **An external "open" market,** in which an ISO standard product should be produced, in order to hinder the competition of other products sold at a lower price. This characteristic of quality cannot be enough to enter the market, so **services offering, and therefore additional advantages, for consumers are needed, as for example ash collection** (that in some occasions can be hardly disposable by consumers that are not farmers).

Internal market

To make **more efficient the self-consumption chain inside the Cooperative**, the possibility of making an **only straw made pellets** could be suggested: according to the available bibliographic quality data, at the moment this product cannot be classified under the standard ISO 17225-6, not even as agro-pellet of type B (see D4.3 Feasibility Study). This product, 100 % straw, can be considered interesting for farmers that are members of the Cooperative, because it represents a **competitive solid biomass, also considering the most economical alternative products** (almond shell, olive pomace and grape marc).

Main disadvantages in the use of this type of solid biomass are:

- **the high quantity of residual ash** in post combustion;
- **the risk of slagging and fouling**;
- **the risk of corrosion** of the metallic components of boilers because of the high content of chlorine in the straw.

Concerning the **high quantity of residual ashes** produced, it is important to highlight to pig farmers that the potential problem can become a resource through **their use as fertilizer** (thanks to the high content of K, Ca and P of residual ashes), partially substituting the current fertilization done with KCI. Adding in fields about 1,2 t/ha of residual ashes is in average enough to substitute the potassic fertilization done in the area with fertilizers N-P-K (8:24:8): an average pig farm using residual ashes from mixed pellets or straw pellets could save about 390-470 €/yr, respectively.

To avoid the problem of pouncing during the dispersion on fields, ashes can be mixed with effluents produced by the pig farm.

Specific additives can be added to restrict phenomena of slagging and fouling that reduce the efficiency in heat exchangers and increase maintenance to remove vitreous slags from the boiler. In fact, the **ash melting temperature** of elements (mainly K) can be increased by **adding additives during the pellets production**

process, like as calcium hydroxide **$Ca(OH)_2$** or calcium carbonate **$CaCO_3$**, in a percentage of 1 % in weight (with an added production cost of about 1,5 – 3 €/t pellets produced).

The other possibility for developing this production line, and obtaining a solid biomass qualitatively acceptable, is given by **supplementary agricultural practices to reduce the content in chlorine on the soil and therefore on the straw**: interested farmers could use the residual ashes from combustion or potassium sulphate K_2SO_4 instead potassium chloride KCl in current fertilization plans.

For example, in the tables below the production costs (included 1 % of the additives with an average cost of 225 €/t), forecasted revenues and economic convenience are reported, always taking into account a minimum profit of 12 €/t for the Cooperative, **for the production of only straw pellets**:

Table 14: Production costs of straw pellets (simulation)

Solid biomass type	Quantity produced after pre-treatment	Quantity produced + additives (1 %)	Total costs						
			Fixed costs		Purchasing cost	Pre-treatment costs		Transportation costs to consumers	Production costs
			Investment	Personnel*		Pre-treatment	Additives		
	t	t	€	€	€	€	€	€	€
Straw pellets	1,610	**1,626**	0	0	61,369	51,340	3,600	16,260	**133,569**

** already included in pre-treatment costs*

Table 15: Sales revenue of straw pellets (simulation)

Solid biomass type SALE	Quantity	Production cost*	Sales revenue		
			Unit Price (min selling price)	Profit	Total Price (min total revenue)
	ton	€/t	€/t	€/t	€
Straw pellets	1,626	81.53	**93.53**	12.00	**152,081**

** including transport costs to consumers*

Table 16: Economical convenience of straw pellets (simulation)

Type of product	Quantity	Production costs	Sales revenue	Profit (EBITDA*)	ROS*	Cost/Revenue ratio
	ton	€	€	€		
Straw pellets	1,626	€ 132,569	€ 152,081	€ 19,512	12.83%	87.17%

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

For a better economic comparison between the production of mixed pellets and straw pellets, the table 17 has been elaborated, in which next points are highlighted:

- **direct saving on purchase** of mixed pellets and straw pellets for farmer consumers, in comparison with other types of solid biomass;

- **savings obtained from the secondary benefit**, estimating in 15 % the profit that can be gained by farmers selling their own straw to the logistic centre at the price of 36 €/t;
- **total savings** gained by farmers who sell straw to the logistic centre and buy the pellets from it, as the sum of the two previous values;
- **recommended starting production** of pellets to be produced for selling (mixed and straw);
- **total savings** to farmer consumers from the market, either for each product, either for each business segment;
- **total profit for the logistic centre**, either for each product, either for each business segment.

Table 17: Commercial Potential and recommended starting production

Substitutable products	Savings on finished products purchasing price (for farmer consumers)	Savings due to secondary benefit (farmers revenue on straw sale to logistic centre)	Total savings for farmers	Quantity of products on sale	Total savings offered to farmer consumers from the market	Total profit for logistic centre
	€/t	€/t	€/t	t	€	€
mixed pellets vs. wood pellets	**48**	3.8	**51.8**	325.2	16,839	
mixed pellets vs. olive pits	**33**	3.8	**36.8**	325.2	11,961	
mixed pellets vs. olive pomace	-7	3.8	-3.2	-	-	
mixed pellets vs. almond shell average	-17	3.8	-13.2	-	-	
mixed pellets vs. grape marc	-47	3.8	-43.2	-	-	
Total				**650.4**	**28,800**	**7,805**
	€/t	€/t	€/t	t	€	€
straw pellets vs. wood pellets	**71**	5.4	**76.4**	162.6	12,423	
straw pellets vs. olive pits	**56**	5.4	**61.4**	162.6	9,984	
straw pellets vs. olive pomace	**16**	5.4	**21.4**	325.2	6,959	
straw pellets vs. almond shell (average)	**6**	5.4	**11.4**	325.2	11,707	
straw pellets vs. grape marc	-24	5.4	-18.6	-	-	
Total				**975.6**	**41,073**	**11,707**
GENERAL TOTAL				**1,626**	**69,872**	**19,512**

The simulation has been carried out considering the minimum unitary profit forecasted by the Cooperative (12 €/t produced), **to transform savings into advantages for the consumer** in the self-consuming chain and to increase the acceptance of the product in comparison with other cheaper solid biomass.

It should be noted, in fact, that considering the **same profit for the Cooperative**, straw pellets shall be sold at a lower price than olive pomace and almond shell;

moreover, straw pellets will guarantee higher savings (in comparison with mixed pellets), with regard to wood pellets and olive pits.

Taking into account what has been evaluated and explained above and considering this scenario of production, it seems **appropriate** to **remodel the amount of pellets to be produced according to the two types indicated** (mixed and 100 % straw pellets), to:

- minimize the risk for the Cooperative, diversifying the productions;
- increase the amount produced for the internal market, for the potentially most acceptable products.

All this, maintaining unchanged the total amount of the product and the total profit for the Cooperative.

A distribution of the production according to the Table 17, is proposed below:

- 650.4 t of mixed pellets (40 % of the total amount in production), **to that conservative consumers of wood pellets and olive pits** or those who don't want to risk any maintenance problem of the boiler because the use of different fuels;
- 325.2 t of straw pellets(20 % of the total amount in production), for consumers of wood pellets and olive pits **interested in testing the new solid biomass for an higher savings**;
- 650.4 t of straw pellets, (40 % of the total amount in production) **for consumers that also use low cost alternative solid biomass** and that are willing to take the risk in the boiler performance in change of a high savings in fuel cost and a certain supply at a stable price.

An efficient business model should therefore keep into consideration the progressive growth of the production during the following years, at least up to the saturation of the internal self-consumption market, value in about 4,420 t/yr of biomass. The acceptance of the product in the external market cannot be properly evaluated at the moment.

4. Conclusions

The building blocks analysis of the present Business Model allowed us to highlight the strong and weak points of the best possible scenario set in the feasibility study. The canvas (see Figure 2) highlights the most important features of each building block.

The analysis was carried out in order to be able to prove real economical convenience of the new business line; this also allowed to make hypothesis regarding possible changes to the scenario resulting from the feasibility study

selected by the agro-industry (see D4.3), in order to achieve the maximising of profit and of effectiveness of commercial strategies.

Marketing policy of the agro-industry is to put a new product (mixed straw and wood pellet) in an established market: this, however, does not aim to replace a solid biomass of choice (ie "preferred by consumers") but **to fit in a range of solid biomass fuels which have different prices that vary from year to year**.

While trying to pursue a pricing policy, the cost of production cannot go below certain values and, for that reason, **the price of the product offered by the logistic centre is positioned in the middle of the range of prices of solid biomass in the local market**.

Considering the cost of production and the income the Cooperative wants to achieve, the **main target customer segment should be the consumer of wood pellets and olive pits**: on them the Cooperative may exercise a commercial policy of low price while maintaining sufficient quality of the product. In fact, the cost of production and the profit that the Cooperative wants to achieve lead to a **selling price of the product that is competitive only with the price of wood pellets and olive pits**. This customer segment is made up in part by consumers not farmers and in part by pig farmers associated, or not, to the Cooperative.

However, compared with wood pellets and olive pits, the amount of ash produced is almost doubled even if, for an average consumer farmer, their agricultural use in their own fields is certainly not a problem. Additionally, **higher emissions of chlorine compounds** can be reached and the corrosion effects on the metal components of the boiler are unknown.

It should be highlighted that there is a negligible share of pig farmers who, despite having multi-fuel boilers, prefer to use only one or two types of solid biomass which give less problems to the boilers, as wood pellets and olive pits. **The larger share of these pig farmers**, however, **prefer to choose, every year, the solid biomass that offers the best compromise between price, quality and availability in the market**. Taking into account that many products (almond shell, olive pomace, grape marc for instance) are often available at prices much lower than the product offered by the logistic centre, it is evident that the **consolidation of sales in this customer segment presents considerable difficulties**.

Considering that inside the Cooperative the number of farmers **that are also straw suppliers** is very representative, **the best Business Model forecast a chain of self-consumption inside the association itself** and **the logistic centre should purchase the straw from pig farmers only under the condition of an annual or plurennial agreement of agro-pellet supply**.

To pursue a trade policy towards the pig farmers, especially those associated, is possible, but **secondary benefits should be offered to farmers like the possibility**

of reusing the ash for agricultural purposes to save in fertilisers and reduce the Chlorine content of the soil, and therefore on the straw produced in these fields.

Finally, it is important to highlight (as it was done also in the feasibility study) that the appropriateness of producing **both the straw-wood pellet and a 100% straw pellet** would have to be verified through:

- **the execution of a combustion test**;
- **the repetition of tests over the years** on straw from treated surfaces either with the agronomic model proposed innovative, either with the traditional model.

Cooperativa Agraria San Miguel

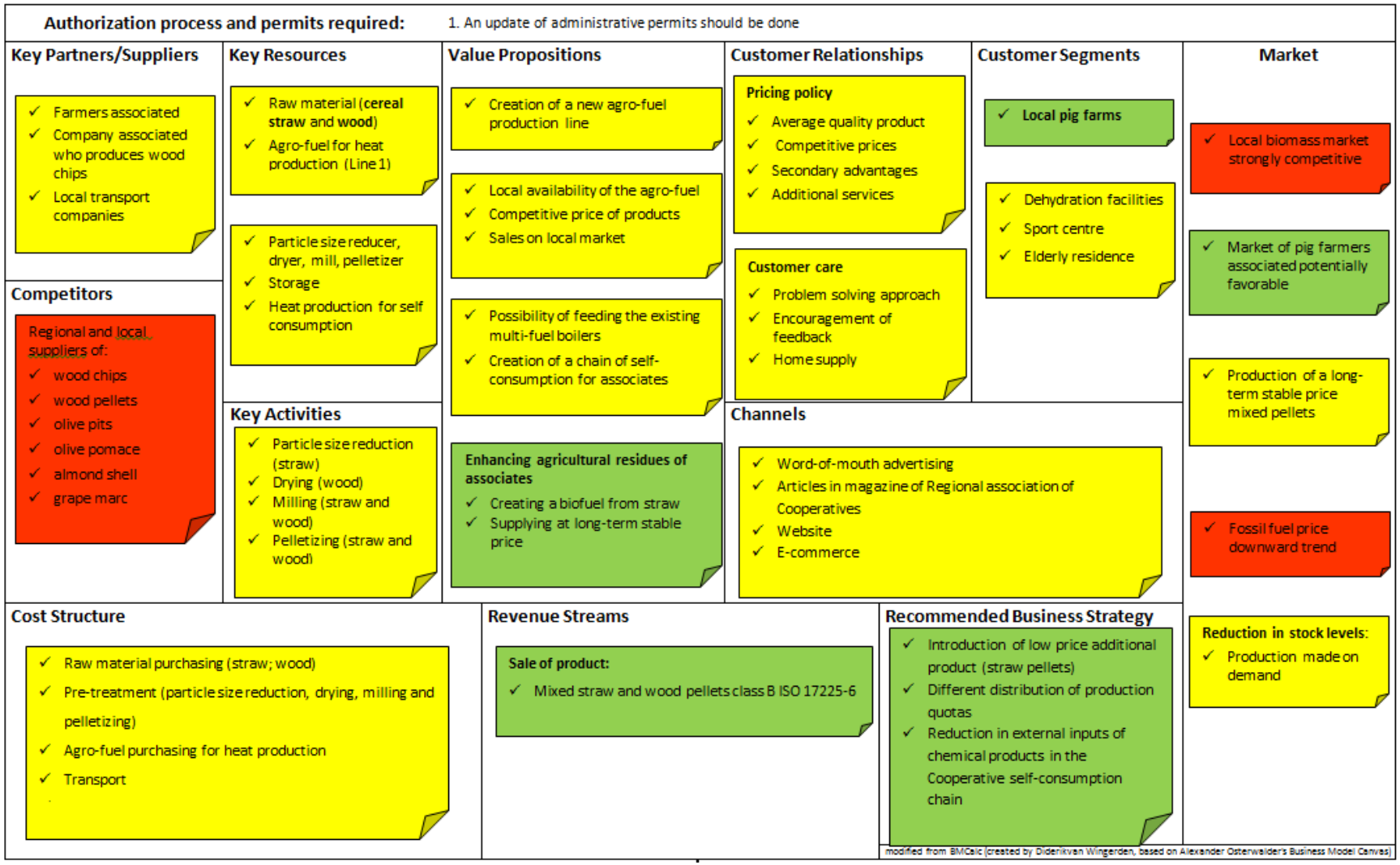

Figure 2: Business Model Canvas