

**SUCELLOG: IEE/13/638/SI2.675535**

**D4.4a**

**Summary of Tschiggerl Agrar GmbH  
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](http://www.sucellog.eu).

## Project coordinator



## Project partners



## 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 Tschiggerl Agrar GmbH, the Austrian agro-industry selected to be support by the project, the scenario chosen was to produce corn cob derived products (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 Table 1.

**Table 1: Basic building blocks of the Business Model.**

Block	What does this block defines	What does this block identifies
<b>Customer segments</b>	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)
<b>Value propositions</b>	The bundle of products and services that create value (benefit) for a specific Customer Segment.	Problems or needs to be solved or satisfied
<b>Channels</b>	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
<b>Customer Relationship</b>	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
<b>Key Resources</b>	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.
<b>Key Activities</b>	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
<b>Cost structure</b>	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.)
<b>Revenue streams</b>	The cash a company generates from each Customer Segment (costs must be subtracted from revenues to create earnings)	Forms of revenue, sale of goods, use of services, fees, rentals and leasing, brokerage fees, advertising fees

Block	What does this block defines	What does this block identifies
<b>Key Partners/Suppliers</b>	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
<b>Competitors</b>	Analysis of the competitive environment	Information on similar products available in the market (price, quality, service granted); profiles of competitors, strengths and weaknesses
<b>Market</b>	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)
<b>Authorization process and permits required</b>	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 Tschiggerl Agrar GmbH Business Model

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:

- 750 t/yr of loose cobs;
- 2,200 t/yr of cobs grits;
- 1,500 t/yr of cobs pellets.

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.

### 2.1. Customer segments

The biomass market in the region is seasonal and the 80 % of the demand is from households and 20 % from farms and industries: whilst the first mainly use wood pellets, the latter prefer wood chips.

The local production of wood chips is not sufficient to fulfil the farmers' requirements, and they are the main users, so they have to import a large amount of wood from Romania, Hungary and Slovenia. For them it would be a great improvement to use local available agricultural residues such as corn cobs, because this way they would not be submitted to the prices fluctuation of the market, which is presumed to be generally increasing due to lack of local product.

For this reason, the Company thinks that the target consumers of its products will be the farmers, because most of them are currently using wood chips for heating their houses and farms; but also thinks that the main customers will be farmers having corn fields, for two other reasons:

1. The Company already maintains relationships with farmers because it harvests and buys corn and corn cobs from them and makes some services for them (corn and straw harvest as logistic operator and corn drying).
2. The Company intends to harvest the corn cobs from the farmers, and resell products to farmers themselves after pre-treatment (drying, chipping, pelletising).

Furthermore, the Company plans to sell its products in the region at competitive prices to households (who own wood chips or pellets boilers), agro-industries, business activities and district-heatings which use wood chips, wood pellets and some of them even corn cobs.

The following table lists the Company target customers and potential types of products usable in their boilers:

**Table 2: List of target customers and usable type of biofuel**

Customer segment	Type of product currently consumed	Type of T.A. GmbH product usable (depending on boiler)
farmers (and their household)	loose corn cobs, wood chips	loose corn cobs
	wood pellets	corn cob grits
		corn cob pellets
other households	wood chips	loose corn cobs
	wood pellets	corn cob grits
		corn cob pellets
agro-industries and other business activities	wood chips, sometimes corn cobs	loose corn cobs
	wood pellets	corn cob grits corn cob pellets
heating districts	wood chips, sometimes corn cobs	loose corn cobs

## 2.2 Value propositions

The business idea related to the creation of the logistic centre is to make the production of corn cobs with their current activity as agro-industry compatible, allowing the Company to gain more profit, producing and selling loose corn cobs, cob grits and cob pellets.

Compared to the most important competitors, the potential customers of the Company will be able to obtain the following **advantages** from the activity of the logistic centre:

- **A convenient price** since the collection of residues will be done directly by the Company simultaneously to the harvesting of corn grain. Moreover, since the aim is to reach the local market, low transport costs will decrease the final product price.
- **The possibility of using the existing boilers:**
  - Corn cob grits and pellets can be compared with wood pellets, in terms of format, not requiring a specific screw feeding system for the boiler.

- Similarly, loose corn cobs can use the feeding system of wood chip boilers.
  - The money saved using a corn cob based product can be spent to buy multi material- powered boilers.
- **Local availability** of the agro-fuel because the Company has the aim to collect the cobs and re-sell them inside the Region, within the range of 30 km from the agro-industry. The local availability is also a further guarantee for the consumers in terms of product quality since a higher control of possible contamination will be placed (e.g. caused by the use of pesticides and other agro-chemicals, but also stones from harvesting procedure) due to the fact that the farmers themselves take part to the production of their own agro-fuel.

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

- Generating **products which are not certified nor contemplated by most of boiler manufacturers** may cause guarantee expiration: as a consequence, it would only be possible to use these materials with old boilers (no longer covered by guarantee).
- Due to the lower energetic density of the products in the case of loose cobs and grits, **the need for a larger stocking area or requiring more frequent supply**. This is not the case of the corn cob pellets, which have similar density compared to wood pellets, as indicated in the following table.

**Table 3: Increase of supply or storage frequency**

Type of product	Bulk density kg/m <sup>3</sup>	Supply or storage volume incremental ratio	
<b>wood chips</b>	250	loose corn cobs vs. wood chips	1.4
<b>loose corn cobs</b>	178		
<b>wood pellets</b>	600	corn cob grits vs. wood pellets	2.4
<b>corn cob grits</b>	250		
<b>corn cob pellets</b>	650	corn cob pellets vs. wood pellets	~ 1

- **The production of the raw material used in the logistic centre highly depends on the agrarian campaign production.** This can imply that, in case of low production yield, the end user would have to temporary renounce to short supply chain and go back to the traditional biofuels.
- In the area of the agro-industry approximately 150 people are currently using corn cobs for heating in their farms, but not all of them use a special boiler adapted for this type of fuel so they may not be fulfilling emissions level (the legislation is not so strict at the moment).
- **According to the current regional law, in Styria there is no possibility to use corn cobs in household** on the contrary to what happens in the rest of Austrian regions. Therefore currently in Styria, cobs can only be used in farms or agro-

industry and heating districts. The legislation is expected to change in a very near future to adequate to other regions situation.

### 2.3 Channels

The choice of communication channel must be adapted to the type of product offered and to the type of customers to reach. In this case, **the Company will get its products to the consumer directly without going through agents/dealers or wholesalers.**

#### Farmers

A lot of people in the region know the Company, so no special marketing activities have been planned.

The most likely consumers, the local farmers, do know the Company very well. Some of them have already known of its plan of production solid biofuel from corn cobs and already have showed interest. **The Company mostly will do word-of-mouth advertising:** assuming that it is not a specific commercial activity, it will not generate any cost.

#### Households

The Company is popular among most part of the potential customers, due to its local activity.

Therefore, the contact channel to most customers will be word-of-mouth advertising. However, the Company is also evaluating the possibility of publishing articles in newspapers and magazines **highlighting the economic and environmental advantages of the short supply chain** proposed with this new business line.

#### Agro-industries and district heatings

Concerning promotional activities, the Company is evaluating the possibility of organising **guided tours through the facilities**, in order to explain and show how the products are manufactured to reach good quality at low and competitive prices. In this case, no cost is expected.

### 2.4 Customer Relationship

**Farmers are expected to be the most important customers since there is already an existing relationship due to the Company activity as agro-industry.** Regarding the logistic centre, those farmers who own corn fields can be the companies cob suppliers but also the companies consumers after the pre-treatment of the cobs.

So this customer segment expects to have a relationship with the company to be based on established confidence and on the benefit from the personal trust built in time:

- **to be able to have an offer for good quality biofuel with low price** (convenient compared to other suppliers in the region);
- **to have home delivery a few times a year of enough quantity**, not to require frequently supplies from retailers.

This model (**customized relationship with the buyer**) will be also carried out with **the agro-industries and the district heating facilities**: in this case it will be based on **quantity, quality and promptness of the supplies**, rather than on personal trust.

For what concerns **the households** – many customers but buying small quantities since they do not have large storage space – it is not so easy to customize the relationship. In this case the only way to create contacts and relations will be to **advertise**:

- **the economical convenience for a good quality product, besides demonstrating the environmental advantages from the short supply chain**;
- **the advantage of a local product, which strengthens the local economy, in comparison to imported fuels from other countries.**

## 2.5 Key Resources and key activities

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

- the raw material;
- the machines for the collection of corn cobs;
- the available equipment in agro-industry.

### Raw material

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 material, i.e. the corn cobs: these will be used for the production of various types of agro-fuel which will be introduced on the market.

The cobs are by-product of corn cultivation from:

- areas belonging to the Company;
- farmers for whom the corn is collected;
- direct purchase on local market.

### The harvesting machines

The other key resource is represented by the harvesting machines, which are especially modified in order to be able to collect corn cobs and at the same time separate the grain. The Company owns two of just few modified machines available in the region.

### The equipment

In its facility, the Company owns the equipment for the treatment of the corn cobs up to the realisation of the finished products (grits and pellets), as indicated in the scheme of the key activities section below.

The logistical components which are present in the facility include: chipper, dryer, pelletizer, storage and a boiler for heat production (details are indicated in the feasibility study, see document D4.3).

The equipment is totally owned by the Company, except the pelletizer which is property of “Heu and Pellets Association”: as an associate, the Company pays for the use of this machine the price of 110 €/ton of produced pellets. At the same time the Company rents the warehouse where the pelletizer is located with a profit of 18,000 €/yr.

The key activities are represented by:

- corn cobs harvesting
- chipping
- drying
- pelletizing

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;
- amortization of equipment;
- personnel costs.

Currently, the Company has access to about 2,025 t/yr of corn cobs, but for the new business line it needs about 5,547 t/yr of fresh corn cobs, of which 750 t/yr will be

used for the drying process of the seeds and of the logistic centre: this is the reason why it will be necessary to have access to a higher quantity of corn cobs, in accordance with the total availability of the region which is about 15,250 t/yr.

A portion of these residues remains to farmers but most of corn cobs (1,500 t/yr) can be purchased directly from them at a low price of 36 €/t.

The remaining amount required for the future process of the logistic centre will be bought from the market at a price of 50 €/t, i.e. purchasing cobs which were collected by other farmers.

The table below shows the purchase costs of the raw material which is necessary for the new business line (i.e., only the material which will be sold), including transport to logistic centre:

**Table 4: Raw material purchasing costs**

Residues type	Quantity	Price	Transportation cost	Total residues cost	Total Transportation cost	Total costs
	t	€/t	€/t	€	€	€
loose corn cobs (20-35% w)	750*	46.28	9.12	34,711	6,843	41,553
corn cobs (20-35% w) for grits	2,347	46.28	9.12	108,606	21,410	130,016
corn cobs (20-35% w) for pellets	1,800	46.28	9.12	83,306	16,422	99,728
<b>Total</b>	<b>4,897</b>			<b>226,623</b>	<b>44 674</b>	<b>271,297</b>

\* Without 750 tons for own boiler consumption

**The main pre-treatment costs are represented by:**

- chipping of corn cobs in grits;
- drying of loose cobs and grits;
- milling and pelletizing of grits to produce pellets

as shown in the table below:

**Table 5: Pre-treatment costs**

Type of product	Pre-treatment type		
	Chipping	Drying	Milling+Pelletising
	€	€	€
Corn cob grits	28,963	20,758	-
Loose corn cobs	-	-	-
Corn cobs pellets	1,137	1,274	16,500
<b>Total</b>	<b>30,100</b>	<b>22,032</b>	<b>16,500</b>

**A new person is planned to be hired for the regular agro-industry activities and for the new business line**, for a corresponding cost associated to the new business line of 14,500 €/yr.

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

Lastly, we shall consider the cost to rent the pelletizer from the same Association for each ton of produced pellets (**variable cost**).

The results are visible in the following tables:

**Table 6: Production costs of corn cob products**

Solid biomass type	Total costs				Production cost**
	Fixed costs		Purchasing cost	Pre-treatment costs*	
	Investment	Personnel			
	€	€	€	€	
Corn cobs grits	0	7 169	130 016	26 825	164 009
Loose corn cobs	0	2 444	41 553	0	43 997
Corn cobs pellets	0	4 888	99 728	189 229	293 845
<b>Total</b>	<b>0</b>	<b>14 500</b>	<b>271 297</b>	<b>216 054</b>	<b>501 851</b>

\* Including rental cost of pelletizer - \*\* Gross of fixed benefit (rental of warehouse)

## 2.7 Revenue streams

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

- 750 t/yr of loose cobs;
- 2,200 t/yr of cobs grits;
- 1,500 t/yr of cobs pellets.

As a result of the sale, it intends to reach the profit of 648,000 € according to the following table:

**Table 7: Sale revenue of corn cob products**

Solid biomass type SALE	Quantity	Production cost*	Sales revenue		
			Unit Price**	Profit	Total Price
	t	€/t	€/t	€/t	€
Corn cob grits	2,200	70.50	144.00	73.50	316,800
Loose corn cobs	750	54.62	58.00	2.98	43,200
Corn cobs pellets	1,500	191.85	192.00	0.15	288,000
<b>Total</b>					<b>648,000</b>

\* Net of fixed benefit (rental of warehouse) - \*\* All prices include VAT (10%) but not transport.

Since the products offered by the agro-industry logistic centre do not have a real market yet, in order to fix a market price **it has been considered the price of the products that can be competitive in terms of quality as calorific value, bulk density and ash content** (see the market section below).

Besides the sales of the products, **the profits will also be generated by the rental of the warehouse to the “Heu and Pellet Association”** (already deducted from production costs).

## 2.8 Key Partners/Suppliers

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

- **the farmers** who own the corn fields, since they already contract the Company to harvest the corn seeds and supply the corn cobs;
- **the “Heu and Pellet Association”**, which rents the pelletizer to the Company at a price in Euros for each ton of produced pellets; at the same time, the Company rents a warehouse to the association making profit from this;
- **the local carriers:** the Company is using trucks from other companies for carry the products to the market.

## 2.9 Competitors

The study of the current competitors allows us to understand where are already firmly placed and, eventually, if margins insertion for the new enterprise are possible in chosen segments. See the comparative in Table 8.

**Table 8: List of Company main competitors in the region**

	<b>Sterf Handels GmbH</b>	<b>Hardware stores</b>	<b>Bigger, local farmers</b>
<b>Product / Service</b>	Chips	Wood logs Wood pellets	Wood logs sometimes chips
<b>Quality (high/medium/low)</b>	Medium to low	High	Medium
<b>Price</b>	Low	High	Medium
<b>Other</b>	Main customer: local district heatings		Mostly offer just small amounts

The main competitors of the Company in the market of biofuel are **represented by local wholesalers or retailers of wood chips and wood pellets**; wholesalers are providers of local district heating. Some farms also offer wood logs and sometimes chips but for small amounts.

Competitors offer standard of variable quality (low to high) and, generally, the type and quality of the product corresponds to the price charged (low quality chips = low price; pellets of high quality = high price).

**The competitors average prices are:**

- wood chips (72 €/t, M20, A3)
- wood pellets (240 €/t, M10, A3)
- loose cobs (80 €/t, M25, A3)

Other competitors are importers of wooden biomass from Hungary, Slovenia and Romania but quality and prices are similar to the national ones.

**The Company considers the 10 % of its target market belonging to Sterf Handels GmbH.**

Additionally, it should be highlighted that in the region, **no companies or organizations currently provide products like the one the Company wants to produce (corn cobs grits and pellets):** nobody offers these types of agro-fuels, but someone offers loose corn cobs.

## 2.10 Market

In the area up 30 km away from the Company, the heating demand is covered by:

- 60 % by solid biomass (forest biomass: chips, firewood or pellets);
- 30 % by oil;
- 10 % by electricity.

**In the biomass energy sector, the aim is to substitute this 30 % oil with biomass but it is impossible with forest wood available in the region** (the demand is overloaded and they have to import a significant amount of wood chips from Romania, Hungary and Slovenia) **so agrarian local biomass can be the key.**

In the region, the current most important biomass production is represented by wood chips and firewood. There is no pellets production and most of this comes from other region in Austria and Eastern Europe.

In order to be strongly introduced in the market of bio-fuels, **the strategy of the Company will be based on proving the effective economical convenience the end users can obtain by replacing wood-fuels with agro-fuels made from corn cobs.** Replacing wood chips with loose corn cobs or wood pellets with corn cob grits or cob pellets in boiler which can work also with corn cob fuel apart from regular woody fuels will be recommended.

Moreover, **it will also be possible to recommend replacement of the wood chip boiler with a pellet one, to have the possibility of using corn cob grits in the future.** As a matter of fact, according to the opinions collected during some interviews, some consumers have declared their interest in changing their boiler (from wood chips to pellets) if this means to save money on fuel (at least 20 % difference): it must be proved if this interest will remain even in case of loss of guarantee on the boiler.

Regarding the oil sector, the hypothesis of market penetration is based on pushing the major consumers to replace the central heating system with an agro-fuel (loose corn cobs) boiler or small-medium consumers with a pellet boiler (to be fed with corn

cob grits and/or pellets). **At the moment this actually seems a difficult task, as the market of oil and its derivatives generally show a decreasing trend.**

In both cases, sale prices of agro-fuel must be competitive with those of wood fuel and have to be convenient even in case of changes in the heating system ( i.e. the consumers must save money immediately, by using new fuel, in order to amortize the investment).

**The evaluation of the concrete 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 corn cobs product with the one of the equivalent wooden product it would replace. The results are indicated in Table 9.

**Table 9: Evaluation of convenience of corn cob products comparing with wooden products**

Competitors							Tschiggerl Agrar						
Type of biofuel	Bulk density (kg/m <sup>3</sup> )	Ash content (w-% db)	M (w-% ar)	LHV ar (kWh/kg)	Price (€/t)	Price (€/kWh)	Type of biofuel (wood-fuel substitute)	Bulk density (kg/m <sup>3</sup> )	Ash content (w-% db)	M (w-% ar)	LHV ar (kWh/kg)	Price (€/t)	Price (€/kWh)
wood chips	250	≤ 3	20	3.9	72	<b>0.018</b>	loose corn cobs	178	2.77	25	3.5	58	<b>0.017</b>
loose corn cobs	178	2.77	25	3.5	80	<b>0.023</b>							
wood pellets	600	≤ 2	10	4.7	240	<b>0.051</b>	corn cobs grits	250	2.77	20	3.8	144	<b>0.038</b>
							corn cobs pellets (A)	650		15	4.33	192	<b>0.044</b>
				LHV kWh/L	price €/L								
oil	-	-	-	10	0.77	<b>0.077</b>							

Moreover, an estimation of the convenience of corn cobs compared to wooden products in terms of money savings was made, comparing the unitary 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 corn cobs products (%)
loose corn cobs vs. wood chips	10
corn cob grits vs. wood pellets	25
corn cob pellets vs. wood pellets	13
corn cob grits vs. oil	51
corn cob pellets vs. oil	42
loose corn cobs vs. oil	78

The table shows that the cob derived fuels are more convenient respect to the rest of currently used fuels (woody or fossil). Regarding the substitution of oil, the consumer

should bear in mind that this implies the replacement of the whole boiler and the deposit as well as its disposal.

**It's clear as the corn cob based products are indeed cheaper compared to the equivalent wood based, particularly concerning the use of cob grits.**

**Unfortunately the market does not seem to be so free at the moment in Styria for the introduction of corn cobs products.** As mentioned previously, the current regional legislation makes not possible for households to use corn cob based products (only farms, agro industries and district heating facilities are allowed).

**If the regulation adopted in Styria should be conform to the rest of Austria, then the Company could easily penetrate the households market, achieving very good positions: as a fact, it will be ready – compared to other competitors – to supply the market with processed corn cob based products.**

Delaying adaptation to regulations would obstruct the sales to the households on the local market, forcing the Company to move to nearby regions for this type of customers (causing price to increase due to higher transport charges).

### 2.11 Authorization process and permits required

The Company already has the permit of corn drying and processing and trading of corn cobs and corn cob products and doesn't needed new permits: in any case, as it will not require any important amendment to standard production process there is no need for any special authorization. As a fact:

- the necessary equipment is already available in agro-industry;
- there is no contamination hazard, as the processed materials are already part of the standard productive cycle.

The Heu and Pellets Association, which own the pelletizer, has obtained new permits (e.g. trading permits, industrial plant regulations, emission permits, traffic permits, approval certificate on explosion protection).

## 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 Company 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 Company in maximising the gross operative margin.

The evaluation has been performed on the base of the information compiled in 4 tables (**Table 11-Table 14**).

**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 corn cobs products on energy costs (%)	Supply incremental ratio (different bulk density)	Ash content (w-% db rate)	Household average savings per 22 MWh/yr (€/yr)	Farmer average savings per 97 MWh/yr (€/yr)	Distric heating and business activities average savings per 161 MWh/yr (€/yr)
loose corn cobs vs. wood chips	10	1.4	1	41	526	872
corn cob grits vs. wood pellets	25	2.4	1.4	312	-	2,983
corn cob pellets vs. wood pellets	13	1	1.4	87	-	647

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

Taking into consideration the results obtained in the table, it can be stated that the two customer target segments are:

- Those who own boilers of any size using wood chips and **who may find good convenience replacing them with loose corn cobs, saving about 10%**. This solution would also imply the necessity of more room for storage or more frequent supplies.
- Those who own pellet boilers and may have some convenience in replacing wood pellets with corn cob pellets (13 % saving), but **could be more interested in using corn cob grits (25 % saving)** even though this would cause over twice the need for stocking room and of the number supplies. It is important to keep into consideration that both cob grits and cob pellets produce more ashes compared to wood pellets (more boiler maintenance required).

These two conclusions are confirmed by the table below, showing the **commercial potential for each product line**, i.e. the total savings that the company proposes to the market.

**Table 12: Evaluation of Commercial Potential of corn cob product lines**

Substitutable products	Savings of corn cob products			Quantity of corn cob products on sale	Commercial potential	Corn cob product lines
	€/t	€/t	€/t	t	€	
loose corn cobs vs. wood chips	14			750	10,500	loose corn cobs
corn cob grits vs. wood pellets		96		2,200	211,200	corn cob grits
corn cob pellets vs. wood pellets			48	1,500	72,000	corn cob pellets

An important deterrent factor that should be highlighted is that **replacing wood pellets with corn cob products causes loss of guarantee of the boiler, due to the use of non-recommended products**. If on one side this causes the possible reduction of the number of customers willing to use corn cob products, on the other side it allows identification of an under segment of users represented by **those who own boilers which are not covered by guarantee anymore** (usually the guarantee for a boiler is 3 years, but if the customer signs a service contract it can be extended to 5-6 years); **this group may be particularly interested to these products, as they could use the money they save to buy a new multi-material powered boiler**.

**Table 13** shows the production costs of each of the three 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 13: Economical convenience with reference to the different production lines**

Type of product	Quantit	Production cost	Sales revenue	Profit (EBITDA)*	ROS* (Return On Sales)	Cost/Revenue ratio
	t	€	€	€	%	%
corn cob grits	2,200	164,009	316,800	152,791	48.2	51.8
loose corn cobs	750	43,997	43,200	- 797	-1.8	101.8
corn cob pellets	1,500	293,845	288,000	- 5,845	-2.0	102.0
<b>Total</b>	<b>4,450</b>	<b>501,851</b>	<b>648,000</b>	<b>146,149</b>		

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

**The results prove that the only convenient line is the production of corn cob grits**, as the other products have a higher marginal cost – even slightly – compared to sales price, as shown by negative EBITDA.

Table 14 shows the ratio between costs and revenues for each processing phase.

**Table 14: Summary table of cost sharing for each processing item**

Type of product	Raw material purchasing cost/Sales revenue ratio	Pre-treatment cost/Sales revenue ratio	Personnel cost/Sales revenue ratio
corn cob grits	41.04 %	8.47 %	2.26 %
loose corn cobs	96.19 %	0.00 %	5.66 %
corn cob pellets	34.63 %	65.70 %	1.70 %

Observing cost sharing table, it can be seen that production of loose corn cobs is burdened by the high cost of raw material compared to sales revenue (96,19 %); in any case, production costs seem to be burdened by too high personnel costs. This is the reason why **loose corn cobs production line should only be developed for the quote regarding self-consumption. The sales of this product may be carried out only after a reduction of raw material purchasing costs.**

Additionally, taking into consideration **Table 13** and **Table 14**, at first sight, also the **corn cob pellets line do not seem feasible, as both EBITDA and ROS are very low. To be able to improve its growth, it is absolutely necessary to reduce pre-treatment costs and/or raw material purchase costs**, which at the moment affect the revenues by 65,7 % and 34,63 % respectively. Moreover, **the production of corn cob pellets represents a very important risk element** for the whole business activity due to important absolute values of costs and expected revenues and the negative profit value: this is also proved by the costs /revenue ratio, which is over 100 %. **As the production cost is higher than sale price, even a slight negative market inflection** (product sale price decrease) **or any other unexpected event** (i.e. a further increase of production costs) **may cause very serious problems for gross operating profit** (EBITDA). Moreover, the market segment potentially interested to this product seems to be very weak: it mainly consists of consumers owning boilers with expired guarantee, who do not have enough room for storage or do not want too many supplies during the year and would in any case achieve very low saving.

**After all these conclusions, it is quite clear that the best product to be commercially supported and promoted is the corn cob grits, which offers the chance for a large potential market and maximum profits.** Cob grits is the only product able to support the actual costs of raw material purchasing and pre-treatment.

**From an economical point of view, it is therefore recommendable to eliminate or strongly reduce pelletization line, and instead increasing of production of cob grits.** However, it can be advisable to offer this product to enter the pellet customers market. **The commercial strategy takes into consideration that, later these cob pellets will be replaced by quality comparable products (corn cob grits)** but still able to grant higher saving for the customers and better profit for the producer.

An efficient business model should therefore keep into consideration the progressive growth of the production during the following years; starting production should be reduced for cob pellets as indicated in the following table (simulation).

**Table 15: Recommended starting production (simulation)**

Type of product	Quantity	Production costs	Sale revenues	Profit (EBITDA)
	ton	€	€	€
corn cob grits	2,200	€ 161,243	€ 316,800	€ 155,557
loose corn cobs	0	0	0	0
corn cob pellets	150	€ 28,184	€ 28,800	€ 616
<b>Total</b>	<b>2,350</b>	<b>€ 193,394</b>	<b>€ 345,600</b>	<b>€ 156,173</b>

The remaining pellet production may be considered, but with great caution because sale revenues are too close to production costs. In the following years, in accordance with the market trend, the quantity of produced corn cob grits and pellets can be gradually increased.

#### 4. Summary and 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 analysis was carried out selecting production lines, in order to be able to prove real economical convenience of each of them; this also allowed making hypothesis regarding possible changes to the scenario in order to achieve the maximising of profit and effectiveness of commercial strategies.

The analysis shows that from all possible cob products resulting optimum from the feasibility study **the corn cob grits line offers the chance for a large potential market and maximum profits** and the target customer segment is the one that may have convenience in replacing wood pellets with corn cob grits. However, **the best strategy would be also to produce a small amount of corn cob pellets to be proposed to the consumers as test products in order to facilitate the transition to grits.**

Moreover, loose corn cob products showed a low commercial potential and a negative gross operative margin: therefore, **it's advisable to abandon this production line keeping the quantity for self-consumption in the agro-industry boiler.**

The following canvas highlights the most important features of each building block.

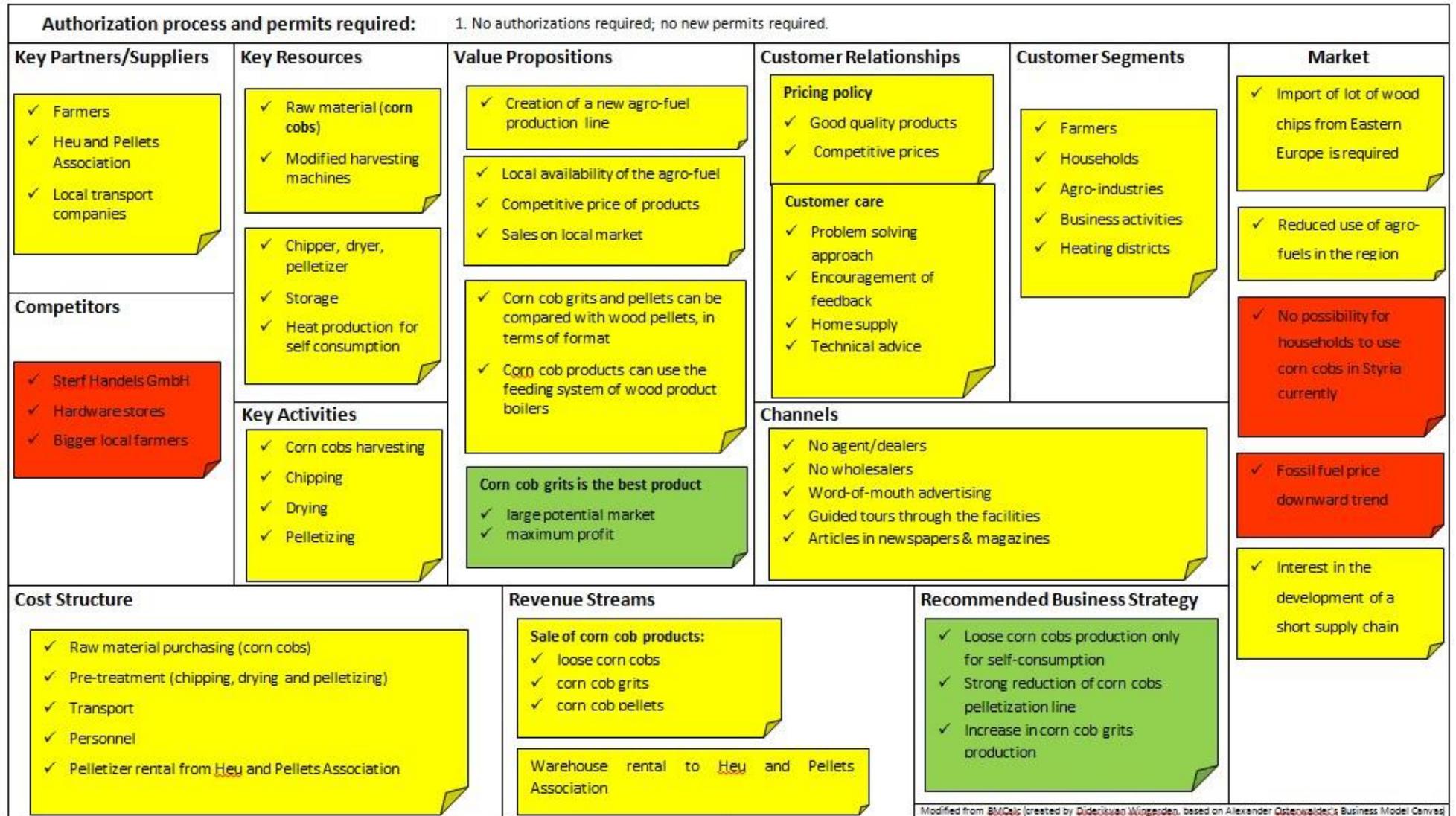


Figure 2: Business Model Canvas.