Creation of biomass logistic centres within the agro-industry

Training for non-target regions, 20th May 2016

Landwirtschaftskammer Steiermark

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

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Contents

- Quick recap of training 1
- How to make an feasibility study
- Feasibility study Tschiggerl
- Start-up of a logistic centre – first steps

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The SUCELLOG concept

creation of biomass logistic centres for the production and distribution of agro-fuels inside agro-industries

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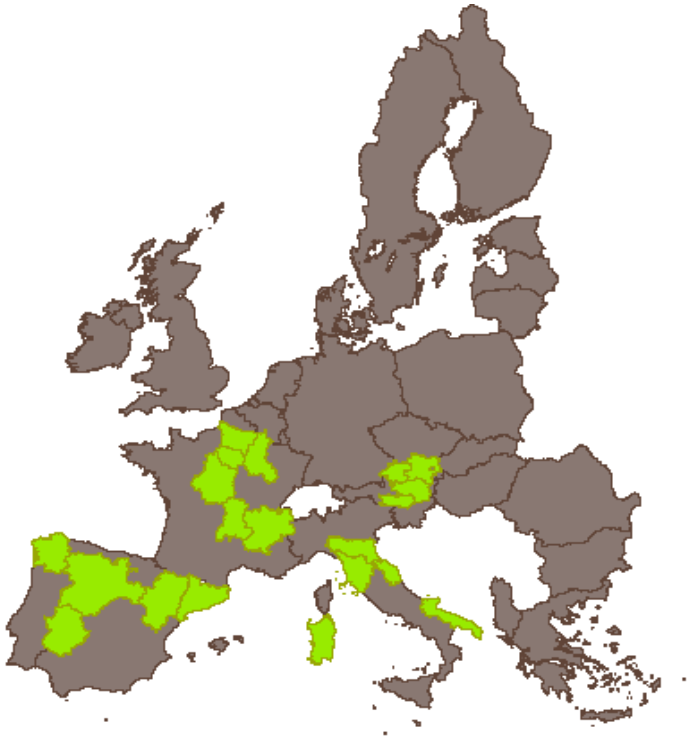
Implementation of SUCELLOG concept

Project Area:



- potential analysis of residues
- creation of a logistic centre in each country
- Feasibility studies (techno-economical)
- free support of all interested persons

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Why Agro-Industries?

- **They have existing infrastructure/machinery**
  - dryer, mill, pelletizer, storage, etc.
  - little or no investments costs
- **idle periods**
- **They have experience with similar products**
- **access to residues through their regular activities**
  - residues as waste from regular activity
  - residues from farmers with existing business relationships

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WHAT HAPPENED IN THE PROJECT

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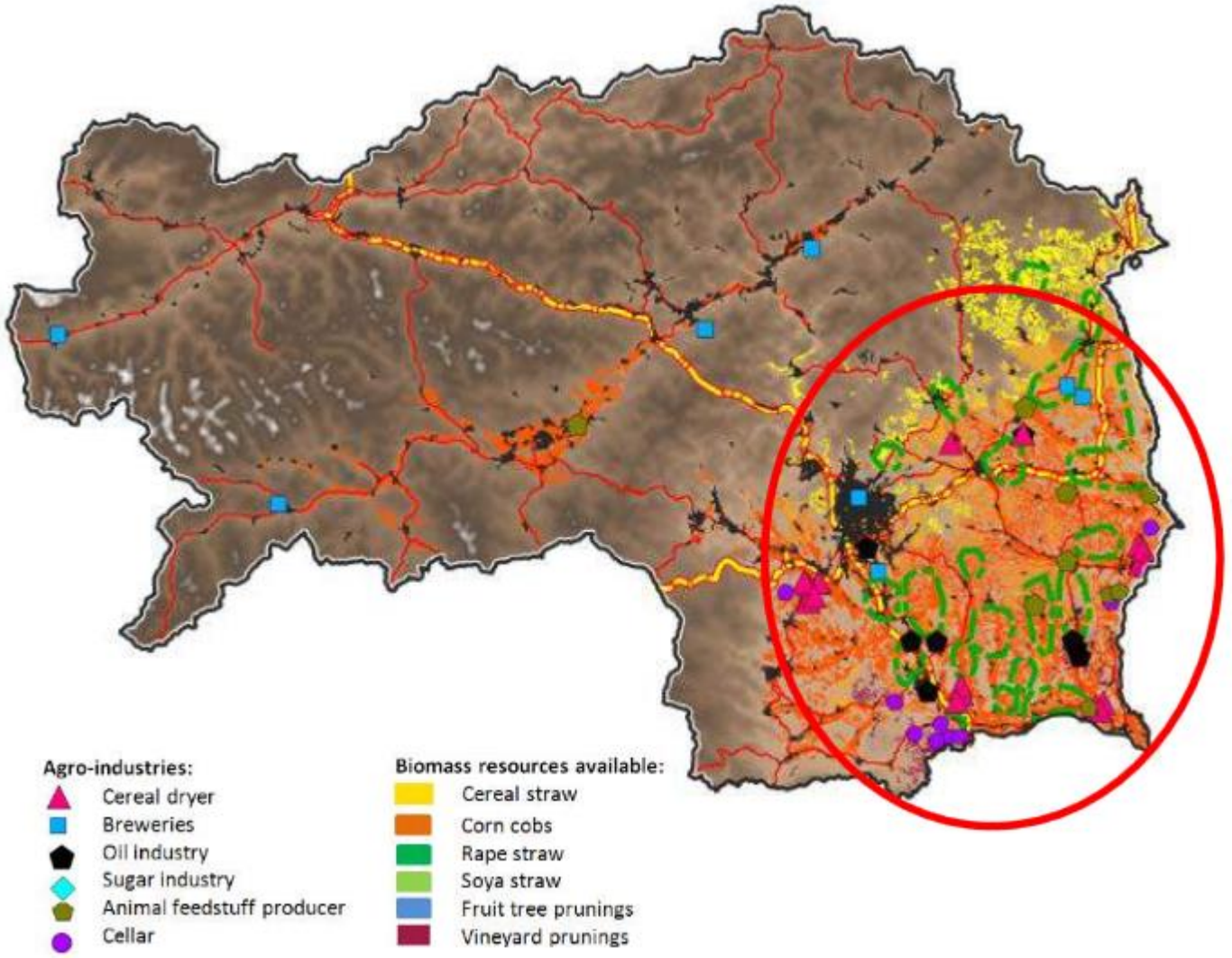
Regional evaluation of resources and agro-industries



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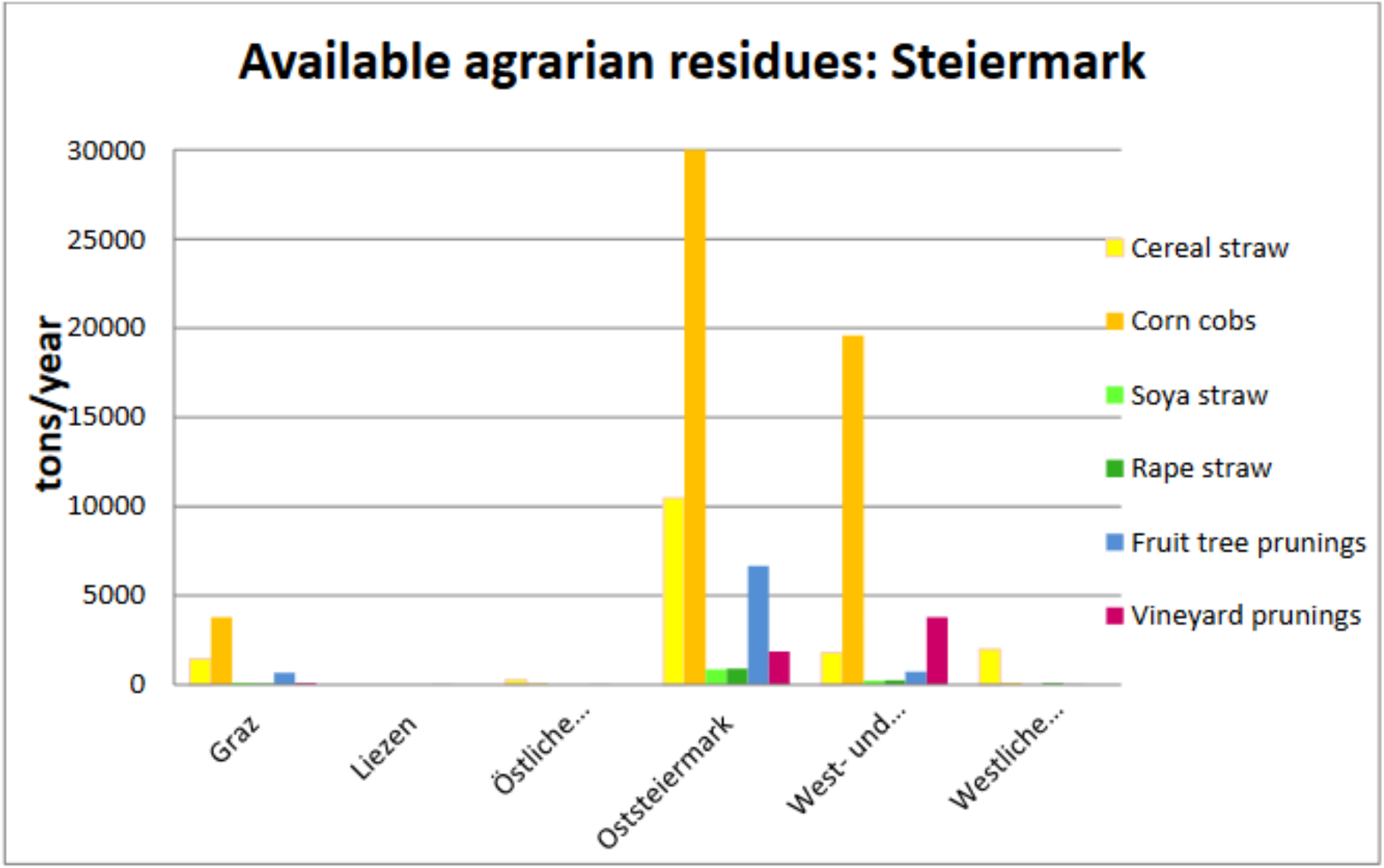
Regional evaluation of resources and agro-industries



Tschiggerl Agrar GmbH

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Starting to build a logistic centre

EVALUATION OF THE BOUNDARY CONDITIONS

EVALUATION OF THE COMPANY

STUDY OF THE DIFFERENT POSSIBILITIES TO BECOME A LOGISTIC CENTRE

BUILDING A BIOMASS LOGISTIC CENTRE

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Starting to build a logistic centre

EVALUATION OF THE BOUNDARY CONDITIONS

Raw material to be procured
Biomass market to enter

EVALUATION OF THE COMPANY

Evaluation of existing equipment
Analysis of company organization

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Starting to build a logistic centre

EVALUATION OF THE BOUNDARY CONDITIONS

EVALUATION OF THE COMPANY

STUDY OF THE DIFFERENT POSSIBILITIES TO BECOME A LOGISTIC CENTRE

BUILDING A BIOMASS LOGISTIC CENTRE

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HOW TO MAKE A TECHNO-ECONOMICAL FEASIBILITY STUDY

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Contents

- Techno-economic feasibility study…what does it mean?
- Technical feasibility – biomass resources
- Technical feasibility – equipment
- Technical feasibility – market
- Economic feasibility – minimum selling price
- Economic feasibility – competitiveness
- Economic feasibility – project profit

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Techno-economic feasibility study

TECHNICAL FEASIBILITY…WHAT DOES IT MEAN ??

1. **Resources available in quantity and at a convenient price (€/t)**
   Security of supply (logistic chain)

2. **Compatible equipment for treatment of these resources**
   (in technical terms but also in terms of seasonality-idle periods)
   Or possibility to invest in new equipment

3. **There is a consolidated market for solid biomass**
   The market demands quality requirements that the agro-industry is able to fulfill with the equipment and type of resources

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Techno-economic feasibility study

ECONOMIC FEASIBILITY…WHAT DOES IT MEAN ??

1. **The price in the market of a similar product (in quality terms) is higher than the production costs of the product that the agro-industry is willing to generate**

2. **The product is competitive in the market (€/kWh and ash content)**

3. **The new business line is viable**

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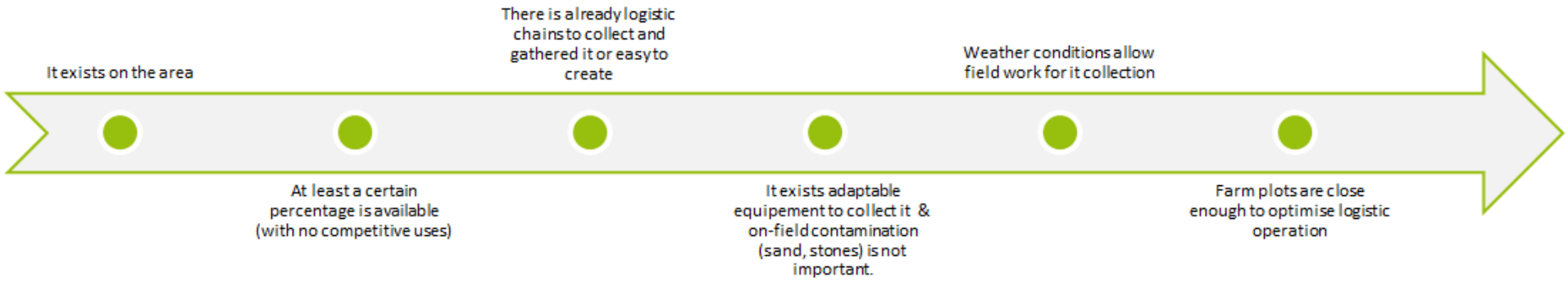
Technical feasibility – biomass resources

1. Identification of the biomass resources in the area:

MEANS SOLVING THESE QUESTIONS:

- **Which type of resources are around ?**
- **Are they available? How many t/yr in a radio of X km?**
- **Which is their price (€/t) at the agro-industry?**
- **Is their supply secure in the time?**

A resource is available in the area if:

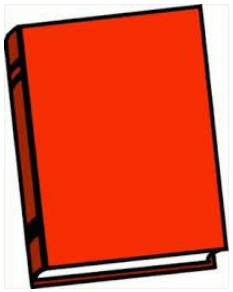


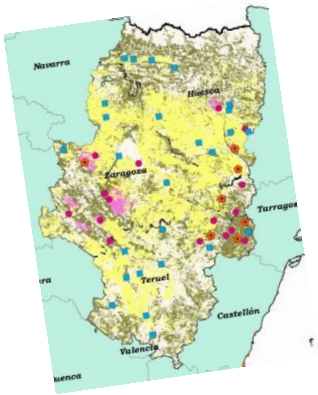
Technical feasibility – biomass resources

1. Identification of the biomass resources in the area:

Consulting…

National/regional inventories
Surveys/Databases
GIS maps





Provides you a first idea of the type of resources and their seasonality but…
CAREFUL: they can provide wrong data about AVAILABILITY !
They do not say if there is a logistic chain able to supply them!

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Technical feasibility – biomass resources

1. Identification of the biomass resources in the area:

MEET WITH THE AGRO-INDUSTRY AND ASK:

- **Which are the biomass resources around?**
- **Are they available or they have other uses?**
- **How much % of the resource is used?**
- **How many t/yr is it possible to get in a radio of < 50 km ?**
- **Is it possible to gather this resource? logistic chains already created?**
- **Which is the price (€/t) in the agro-industry (not in the field)?**
- **In which format is it going to be supplied to the agro-industry (bales, loose, bundles)?**
- **Which months it is produced?**
- **At which moisture content is collected?**

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Technical feasibility – biomass resources

1. Identification of the biomass resources in the area:

CALL SOME FARMERS (POSSIBLE SUPPLIERS OF THE RESOURCES) AND ASK:

- **How many t/yr is it possible to get in a radio of < 50 km ?**
- **Which is the price (€/t) in the agro-industry (not in the field) ?**
- **What type of contract would you make to supply it?**

Ask SEVERAL farmers to have different sources of information !
Confront this information with the one provided by the agro-industry

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Technical feasibility – market

2. Assessment of solid biomass market:

MEANS SOLVING THESE QUESTIONS:

- **Is there a real demand on solid biomass ? How is the long term prospect?**
- **Which are going to be the target consumers ?**
- **Which quality requirements should be fulfilled ?**

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Technical feasibility – market

2. Assessment of solid biomass market:

CALL EXPERTS (university, biomass association, boiler manufacturers, boilers installers, …) AND ASK:

- **Which is the main biomass demand in the area ?**
- **Is there a long term prospect ?**
- **Which type of consumers are present in the area (households, agro-industries, farms, large consumers) ?**

For each type of consumer:

- **What format of solid biomass is consumed ?**
- **Which is the price (€/t or €/kWh)?**
- **Which is the quality requirement demanded (LHV and ash content)?**
- **Are boilers prepared for agro-fuels? Which are the quality constrains?**
- **Is there any national limitation for the use of our resource ?**
- **Do you think there will be a problem for feeding our resource in the consumer's boiler?**

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Technical feasibility – market

2. Assessment of solid biomass market:

MEET WITH THE AGRO-INDUSTRY AND DISCUSS ABOUT:

- **Is there any target consumer already ?**
  How much and when is the demand?

- **Inform about the conclusions obtained from the conversation with experts.**
  Does the agro-industry see any obstacle?

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Technical feasibility – market

2. Assessment of solid biomass market:

Average quality values of resource according to ISO 17225-1

Resource	LHV (kJ/kg db)	A (w-% db)	Cl (w-% db)
Soft wood stem	19,1	0,3	0,01
Soft wood logging residues	19,2	3	0,01
Cereal straw	17,6	5,0	0,40
Corn cobs *	16,5	1,0-2,0	0,02
Grape pomace	19,0	6,0-13,0	0,03-0,18
Olive pomace	13,9-19,0	3,4-11,3	0,1-0,4
Olive pits	17,3-19,3	1,2-4,4	0,10-0,40
Rice husks	14,5-16,2	13,0-23,0	0,03-0,30

These are average values obtained from experience in scientific work !!

(*MixBioPells project)

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Technical feasibility – market

2. Assessment of solid biomass market:

Compare the resources quality values that you have with the quality values demanded by the consumer !

Is it possible to achieve market demands?

If the format desired is a pellet, sometimes is possible to upgrade the quality

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Technical feasibility – equipment

3. Evaluation of the compatibility of the equipment with the resources:

MEANS SOLVING THESE QUESTIONS:

- **Which type of equipment is existing? Is it compatible with the type of resources?**
- **Is the idle period compatible with the seasonality of the products?**
- **Which is the capacity of the whole system in the idle period?**

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Technical feasibility – equipment

3. Evaluation of the compatibility of the equipment with the resources:

Technical compatibility -> Essential equipment to be evaluated:

- **CHIPPER or GRINDER: to reduce particle size. It is normally the first step of the pre-treatment**
- **DRIER: if the desired product should have a lower moisture content than the resource. Drying is needed for pelletising in most of resources (unless they are around 13 w-%, ar)**
- **PELLETISER: only if the final product is a pellet**
- **SCREENER: interesting to eliminate fines in any type of product (increase quality)**
- **STORAGE: silos, outdoor storage or warehouses. Key point for agro-industries.**

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Technical feasibility – equipment

3. Evaluation of the compatibility of the equipment with the resources:

Technical compatibility -> Essential equipment to be evaluated:

Raw material	Pre-treatment needed	Product
Cereal straw (15 w-%, ar)	Grinding Milling+pelletising	Pellet (10 w-% ar)
Maize stalks (25 w-%, ar)	Grinding Drying Milling+pelletising	Pellet (10 w-% ar)
Vineyard prunings (35 w-%, ar)	Chipping Drying Screening	High quality wood chips (20 w-%, ar)
Olive prunings (35 w-%, ar)	Natural drying Chipping	Hog fuel (25 w-%, ar)

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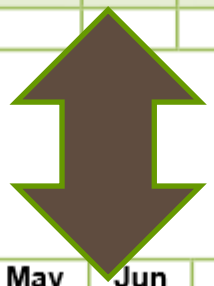
Technical feasibility – equipment

3. Evaluation of the compatibility of the equipment with the resources:

Seasonal compatibility -> Essential equipment to be evaluated:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pelletiser												
Dryer												
Mill												
Chipper												
Screener												
Other, specify												



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Residue 1:												
Residue 2:												
Residue 3:												
Residue 4:												
Residue 5:												

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Technical feasibility – equipment

Synergies between idle period of agro-industries (green) and crops seasonal availability (brown)

IDLE PERIOD	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Forage dehydration												
Feedstuff producer												
Cereal dryer												
Rice dryer												
Tobacco dryer												
Distillery												
Sugar industry												
Olive oil pomace industry												
Dried fruits												
CROPS AVAILABILITY												
Feedstuff residues												
Cereal straw												
Sova Straw												
Rape stalks												
Corn stalks												
Corn cobs												
Husks and silo dust from cereal dryers												
Rice husks												
Husks and residues from oil seeds												
Tobacco residues												
Distillery residues												
Beet pulp												
Vineyard prunings												
Olive prunings												
Seed fruit pruning												
Stone fruit pruning												
Dry fruit pruning												
Citrus pruning												
Grapevine oilseed cake												
Grape marc and stems												
Grape pits												
Olive pits												
Olive oil pomace												
Nut shells												

Periods where facilities equipment used to be idle

Periods when the biomass is produced by harvest or processing activities

Technical feasibility – equipment

3. Evaluation of the compatibility of the equipment with the resources:

Assessment of the capacity for the new resource:

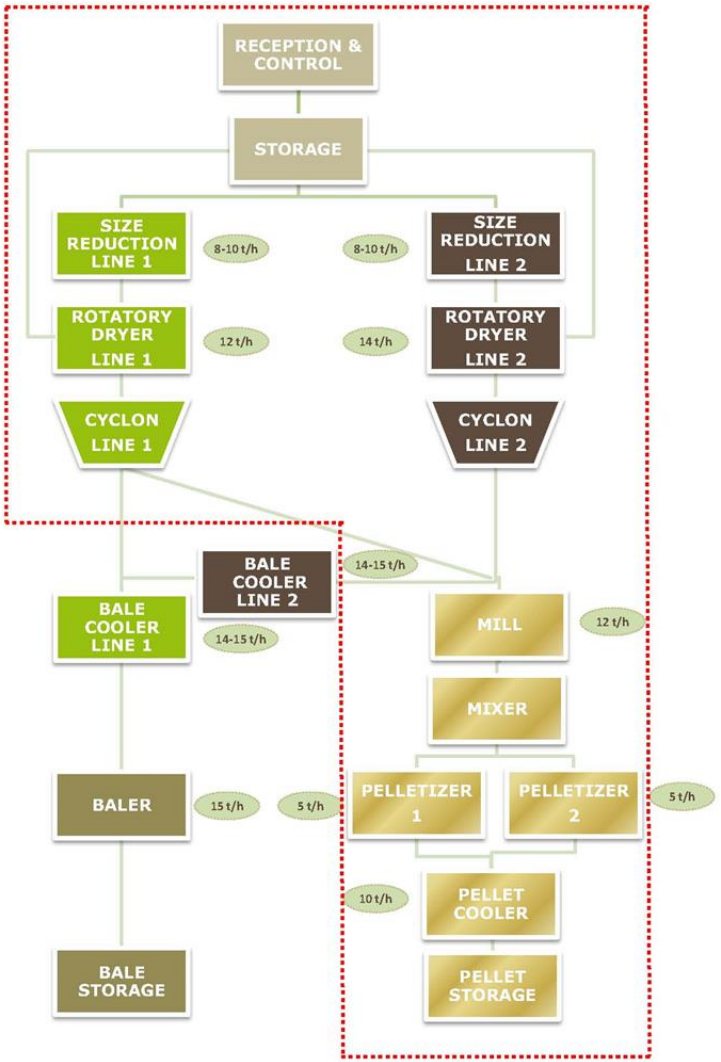
Example from a real case of forage dehydration facility (indicated flows for the forage). It can be observed that:

1. **The pelletiser is the bottle-neck**

2. **The maximum capacity of each whole line for alfalfa is 10 t/h.**

What would be the capacity for the new resource?
The responsible for operation will tell you!

7 t/h for cereal straw
7.5 t/h for maize stalks
5 t/h for wood



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Technical feasibility – equipment

2. Evaluation of the compatibility of the equipment with the resources:

How many tons per year is the facility being able to produce with the new resource?

Possible resources

7 t/h for cereal straw
7.5 t/h for maize stalks
5 t/h for wood

✖

Idle period

HOURS/year

=

Tons / Year

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Technical feasibility – equipment

3. Evaluation of the compatibility of the equipment with the resources:

ONCE ANSWERED THESE QUESTIONS WE HAVE TO START THINKING ABOUT NEW ISSUES CONNECTED:

- **Which type of equipment is existing? Is it compatible with the type of resources?**
  Do we need some modification/adaptations for the production?

- **Is the idle period compatible with the seasonality of the products?**
  Is the storage possible (or the resource will degrade)?

- **Which is the capacity of the whole system in the idle period?**
  Does the agro-industry wants to produce so much? Does it exist enough resource for that?

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Economic feasibility

- **The aim of the economic study is to help decision-making. The economic study has no sense if the project is not technically feasible**
- **SUCELLOG has built a guide to assist you in the economic analysis. It can be downloaded in the website.**
- **It is accompanied by an excel-sheet**

CAREFUL !!! the excel cannot address all cases…
it is required that you understand the excel and play!

Different scenarios can be assessed and compared!

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Economic feasibility

Steps for the economic assessment

For an amount of production per year !!!!

STEP 1

DETERMINATION OF THE MINIMUM SELLING PRICE

STEP 2

EVALUATION OF COMPETIVENESS IN THE LOCAL MARKET

STEP 3

ASSESSMENT OF THE PROFIT OF THE PROJECT

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Economic feasibility– Minimum selling price

1. Determination of the minimum selling price:

The minimum selling price (€/t of product) is the price at which the logistic centre would be able to sell the product covering:

- **Production costs.**
- **Amortization rate of the investment in equipment required for production (if desired).**
- **The minimum profit stated by the agro-industry (if any).**

Include:

- **Raw material purchasing costs**
- **Pre-treatment cost**
- **Personnel cost**

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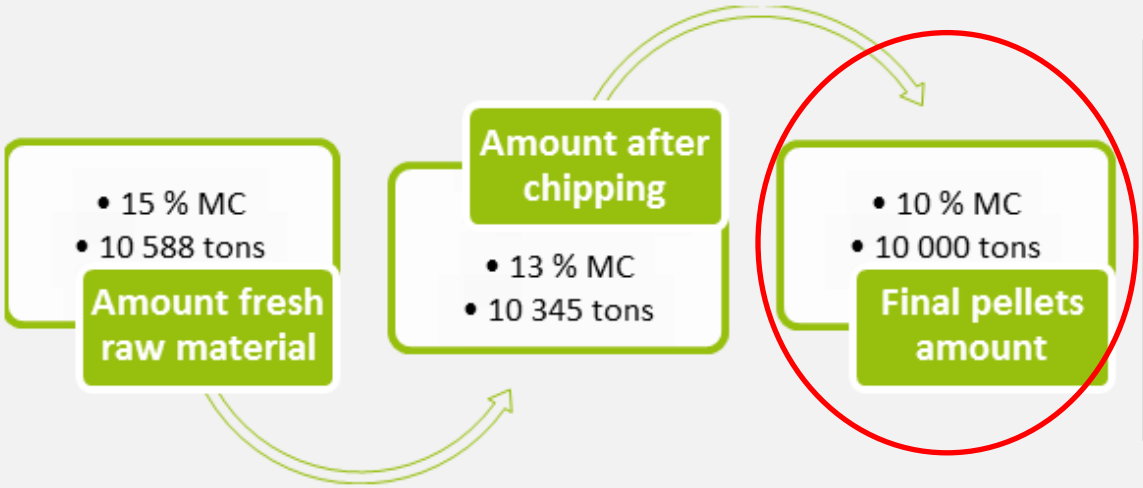
Economic feasibility– Minimum selling price

1. Determination of the minimum selling price- Production costs

- **Raw material purchasing costs**

Moisture content is a key factor!!!!!!!!!! The % variates with the pre-treatment process meaning that the amount of material to be pre-treated changes!



$$Dry\ matter = final\ amount - final\ water\ amount$$

$$\Leftrightarrow Dry\ matter = final\ amount\ (1 - {}^{MCfinal}/_{100})$$

$$\Leftrightarrow Final\ amount = \frac{Dry\ matter}{(1 - \frac{MCfinal}{100})}$$

$$\Leftrightarrow \boldsymbol{Final\ amount = Initial\ amount\ \frac{(100 - MCinitial)}{(100 - MCfinal)}}$$

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Economic feasibility– Minimum selling price

1. Determination of the minimum selling price- Production costs

- **Pre-treatment costs:**

Think which is the quality and format of the solid biofuel you want to produce… and the characteristics of the raw material …

TYPE OF PRE-TREATMENT NEEDED

IMPORTANT

The higher the quality of the product, the more pre-treatment needed

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Economic feasibility– Minimum selling price

1. Determination of the minimum selling price- Production costs

Raw material	Pre-treatment needed	Product
Cereal straw (15 w-%, ar)	Grinding Milling+pelletising	Pellet (10 w-% ar)
Maize stalks (25 w-%, ar)	Grinding Drying Milling+pelletising	Pellet (10 w-% ar)
Vineyard prunings (35 w-%, ar)	Chipping Drying Screening	High quality wood chips (20 w-%, ar)
Olive prunings (35 w-%, ar)	Natural drying Chipping	Hog fuel (25 w-%, ar)

Operational costs
(electricity; heating; manpower)
Maintenance costs
(consumables ; manpower)

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Economic feasibility– Minimum selling price

1. Determination of the minimum selling price- Production costs

Maintenance costs:

personnel consumables

MAINTENANCE COSTS	Include "Type of raw material"				
Type of operation	Hours spent in maintenance h	Cost of replacement €	Tonnes processed t/yr	Maintenance costs h/t	Maintenance costs-replacement €/t
Storage of raw material			0,00	#¡DIV/0!	#¡DIV/0!
Handling			0,00	#¡DIV/0!	#¡DIV/0!
Particle size reduction			0,00	#¡DIV/0!	#¡DIV/0!
Drying			0,00	#¡DIV/0!	#¡DIV/0!
Milling + pelletizing			0,00	#¡DIV/0!	#¡DIV/0!
Storage of final product			0,00	#¡DIV/0!	#¡DIV/0!

Think on the maintenance cost for the new material !!
Example: the die for forage can be changed every 4000 t while with maize stalks every 2000 t

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Economic feasibility– Minimum selling price

1. Determination of the minimum selling price- Production costs

Operational costs: Think on the cost for the new material !!

OPERATINAL COSTS: HEATING COSTS			
Type of operation	Include "Type of raw material"		
	Fuel consumption t or m3	Fuel price €/t or €/m3	Heating costs €
Drying			0

OPERATIONAL COSTS: ELECTRICITY COSTS	
Type of operation	Include "Type of raw material"
	Electricity costs €/t
Storage of raw material	
Handling	
Particle size reduction	
Drying	
Milling + pelletizing	
Storage of final product	

OPERATIONAL COSTS: PERSONNEL	
Type of operation	Include "Type of raw material"
	Spent hours h/t
Storage of raw material	
Handling	
Particle size reduction	
Drying	
Milling + pelletizing	
Storage of final product	

Sometimes you cannot disaggregate, modify the excel accordingly!

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Economic feasibility– Minimum selling price

1. Determination of the minimum selling price- Personnel costs

MAINTENANCE*

Total salary per year	€/year	
Working hours per year	h/year	
Hourly Rate	€/h	#¡DIV/0!

OPERATIONAL*

Total salary per year	€/yr	
Working hours per year	h/yr	
Hourly Rate	€/h	#¡DIV/0!

The information here feeds the pre-treatment costs!

Do you want to charge some hours of the administrative personnel to this new business line?

SUPPORT PERSONNEL

		GENERAL MANAGER	SALES MANAGER	ADMINISTRATION DEPARTMENT	
Total salary per year	€/yr				
% spent in new business	%				
Total costs	€/yr	0	0	0	0

Economic feasibility– Minimum selling price

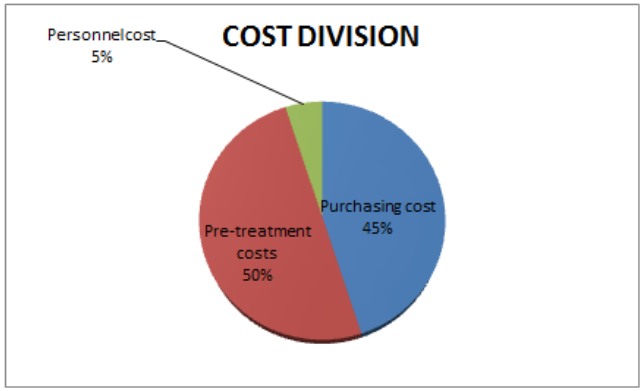
1. Determination of the minimum selling price- Production costs

4. PRODUCTION COSTS

SCENARIO 1					
Solid biomass type	Quantity produced	Total costs			Production cost
		Purchasing cost	Pre-treatment costs	Personnel cost	
	t/yr	€/t	€/t	€/t	€/t
Include "Solid biomass type"	0	#¡DIV/0!	#¡DIV/0!	#¡DIV/0!	#¡DIV/0!

Which is the one that contributes the most to the production costs?
Example:

Percentage of contribution (%)		
Purchasing cost	Pre-treatment costs	Personnel cost
45	50	5



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Economic feasibility– Minimum selling price

1. Determination of the minimum selling price- Amortization rate & Minimum profit

5. INVESTMENT

Investment items	Investment costs €	Years of amortization yr	Amortization rate €/yr
			#¡DIV/0!

Does the agro-industry wants to charge some rate from the amortization to each ton of product?

6. MINIMUM PROFIT

Minimum profit €/t*	

Does the agro-industry wants to have a minimum profit per ton of product in order to cover possible risks ?
It can be a fixed quantity or a % of costs

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Economic feasibility– Minimum selling price

1. Determination of the minimum selling price

7. MINIMUM SELLING PRICE

SCENARIO 1						
Solid biomass type	Quantity t/yr	Production cost €/t	Transport cost* €/t	Amortization rate €/t	Minimum profit €/t	Minimum selling price €/t
Include "Solid biomass type"	0	#¡DIV/0!		#¡DIV/0!	0	#¡DIV/0!

To be able to compare with other products sometimes should be included

Is it a competitive price?

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Economic feasibility – competitiveness

2. Evaluation of competitiveness in the market

Are you competitive in terms of price-quality? Check you competitors!

QUALITY DATA FROM THE PRODUCT

Product	LHV kWh/kg db	Ash content (w-%db)	MC final product (w-%, ar)	LHV kWh/kg ar	Minimum selling price €/kWh
			0	0	#¡DIV/0!

COMPETITORS

Product	Price €/t	LHV kWh/t ar	Price €/kWh	Ash content (w-%db)	Transport €/t	Taxes (included or not)
			#¡DIV/0!			*included*
			#¡DIV/0!			*included*
			#¡DIV/0!			*included*
			#¡DIV/0!			

Included?

Bulk density should be also taken into account!

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Economic feasibility – Project profit

3. Assessment of project profit

4 economic indicators will be calculated and the agro-industry will decide according to them if the project is convenient

- **NPV: Net Present Value**

Indicates that the projected earnings generated exceed the anticipated costs. Generally, the higher is the NPV, the more profitable is the project.

- **IRR: Internal Rate of Return**

An investment is a good option if its IRR is higher than the rate of return that can be earned by investing the money elsewhere at equal risk (ex: bank investment).

- **Return on Sales**

Indicates how much profit an entity makes after paying for variable costs of production such as wages, raw materials, etc. (but before interest and tax).

- **Payback period**

The time in which the initial cash outflow of an investment is expected to be recovered from the cash inflows generated by the investment.

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FEASIBILITY STUDY TSCHIGGERL AGRAR GMBH

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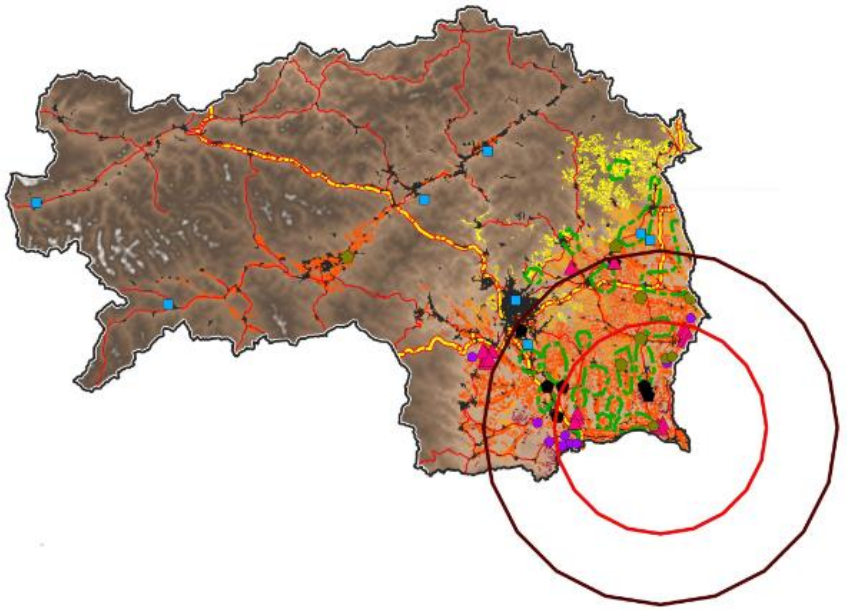
Assessment of the biomass procurement

Example: Tschiggerl Agrar GmbH

AVAILABLE RESOURCES (30 km radius)
3280 t/yr wheat straw
1910 t/yr barley straw
15249 t/yr maize cobs
200 t/yr poor quality hay

Manager is a logistic operator, having access to 2100 t/y

Manager processes the grain from 1350 ha = 2025 t/yr
He has 1 of the few machinery in the market



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Feasibility study Austrian case

IMPORTANT FINDINGS FROM THE STUDY:

- Cereal straw products **are not so good from the quality point of view (high ash content)** and should be mixed with wood in order to make an agro-pellet according to ISO 17225-6 A **(max ash content 6 w-% db)**

AVAILABLE RESOURCES	LHV ar (kWh/kg)	Ash content (w-% db)	Ash fusion temperature (°C)	N (w-% db)	Cl (w-% db)
cereal straw	4,18 - 4,68	4,4-7,0	800-900	0,3-0,8	0,03-0,05

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AVAILABLE RESOURCES	LHV ar (kWh/kg)	Ash content (w-% db)	Ash fusion temperature (°C)	N (w-% db)	Cl (w-% db)
cereal straw	4,18 - 4,68	4,4-7,0	800-900	0,30-0,80	0,03-0,05
Mixed straw (70%) wood (30%) pellets	4,32 - 4,67	< 5,11	To declare	0,30-0,65	0,04
Agro-pellets ISO 17225-6 A	≥ 4	< 6,0	To declare	< 1,5	< 0,1

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IMPORTANT FINDINGS FROM THE STUDY:

Product	Purchasing cost (€/t)	Personnel cost (€/t)	Pre-treatment cost (€/t)
Mixed pellet ISO 17225-6 A: straw (70%) + wood (30%)	89,05	3,26	111,82

COSTS ARE NOT COVERED !

- **Suggested market price:**

Pellets quality A should be 20 % cheaper than wood pellets (so 192 €/t)

Product	€/t	€/kWh	A (w-% db)
Mixed pellet straw / wood	192	0,043	4,20
Forest wood pellet	240	0,051	<2

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IMPORTANT FINDINGS FROM THE STUDY:

- **Hay products are not good from the quality point of view (high heavy metals, low heating value, high ash content) and the mixture with straw will produce a low-quality pellet.**
  To be able to produce agro-pellets according to ISO 17225-6 A, a mixture 15 % hay- 85 % wood is needed. ✖ **Too high production costs!**

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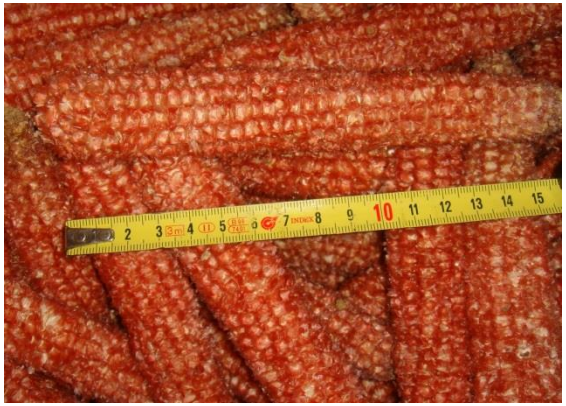
IMPORTANT FINDINGS FROM THE STUDY:

- **Maize products**



Loose cobs

Cobs grits

Cobs pellets and Mixed cob pellets with wood

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IMPORTANT FINDINGS FROM THE STUDY:

- **Maize solid fuels production costs:**

Example for grits:

Product	Quantity (t/yr)	Purchasing cost (€/t)	Personnel cost (€/t)	Pre-treatment cost (€/t)
Cobs grits	750	55,35	3,26	13,27
	1500	59,10		12,35
	2200			12,19

> 750 t/yr Purchasing in the market

Economy of scale

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IMPORTANT FINDINGS FROM THE STUDY:

- **Maize solid fuels production costs:**

Comparison considering the same quantity produced: 1500 t/yr

Product	Production costs (€/t)
Loose cobs	57
Cobs grits	73
Cob pellets	192
Cob + wood pellets (70% cobs/30 %wood)	196

- **Suggested market price for maize solid fuels :**

Loose corn cobs should be 20 % cheaper than wood chips (-> 58 €/t)
Corn cob grits should be 40 % cheaper than wood pellets (-> 144 €/t)
Pellets quality A should be 20 % cheaper than wood pellets (-> 192 €/t)
Pellets quality B price should be no higher than 110 €/t

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IMPORTANT FINDINGS FROM THE STUDY:

- **Maize products are not so bad from the quality point of view:**
  Acceptable ash content but Chlorine content should be examined

< 0,10 w-% db

- **Maize solid fuels production costs and market price**

Comparison considering the same quantity produced: 1500 t/yr

Product	Production costs (€/t)	Suggested market price (€/t)
Loose cobs	57	58
Cobs grits	73	144
Cob pellets	192	192 (class A) -110 (class B)
Cob + wood pellets	196	192 (class A) -110 (class B)

Minimum profit !

We should achieve quality A

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Different Scenarios Tschiggerl

Type of Scenario	Quantity produced	Production cost	Selling price	Profit
	t	€/t	€/t	€/t
Scenario MH				
Corn cob grits	750	68	144	76
Loose corn cobs	750	51	58	6
Mixed cobs and hay pellets	830	179	110	-69
Mixed straw and hay pellets	2,120	198	110	-88
Scenario MH2				
Corn cob grits	1,500	73	144	71
Loose corn cobs	1,500	57	58	1
Mixed cobs and hay pellets	1,660	180	110	-70
Mixed straw and hay pellets	4,240	190	110	-80
Scenario MWA				
Corn cob grits	750	67	144	77
Loose corn cobs	750	51	58	7
Mixed straw & wood pellets	2,120	200	192	-8
Mixed cobs & wood pellets	830	194	192	-2

Not profitable!

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Different Scenarios Tschiggerl

Scenario noMP-A				
Corn cob grits	750	68	144	76
Loose corn cobs	750	51	58	6
Straw pellets category B	2,120	202	110	-92
Corn cobs pellets category A	830	185	192	7
Scenario noMP-B				
Corn cob grits	750	68	144	76
Loose corn cobs	750	51	58	6
Straw pellets category B	2,120	202	110	-92
Corn cobs pellets category B	830	185	110	-75
Scenario CC-A				
Corn cob grits	2,200	71	144	73
Loose corn cobs	750	55	58	3
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Scenario CC-B				
Corn cob grits	2,200	71	144	73
Loose corn cobs	750	55	58	3
Corn cobs pellets category B	1,500	192	110	-82

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Feasibility study Austrian case

CONCLUSIONS FROM THE STUDY:

- Only **corn cob-derived fuels** (loose, grits and pellets) are recommended by the SUCELLOG project
- The **economic feasibility** of the new business line **is subject to quality characteristics** (mainly to Chlorine percentage)
- **A previous quality analysis** (mainly determination of moisture content, calorific value, ash content and Chlorine percentage) **of a representative sample of the corn cob to be used** as raw material for the logistic centre **is strongly advisable** before starting the new business activity in order to avoid consumers dissatisfaction
- Initial **combustion tests** with some target boilers can be a good option **to test the viability of the product during conversion** (evaluation of slagging formation for example)

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START-UP A LOGISTIC CENTRE

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Start-up a logistic centre

- **Support**
  - planning of the logistic centre
  - planning of the supply
  - planning of the sales
- **Implementation of QA/QC**
- **Several tests**
- **Monitoring of the first operation period**

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Pelletizing Test

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LOT 1
WATER
LOT 2
WITH WATER

Combustion Test

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Emission Messurement

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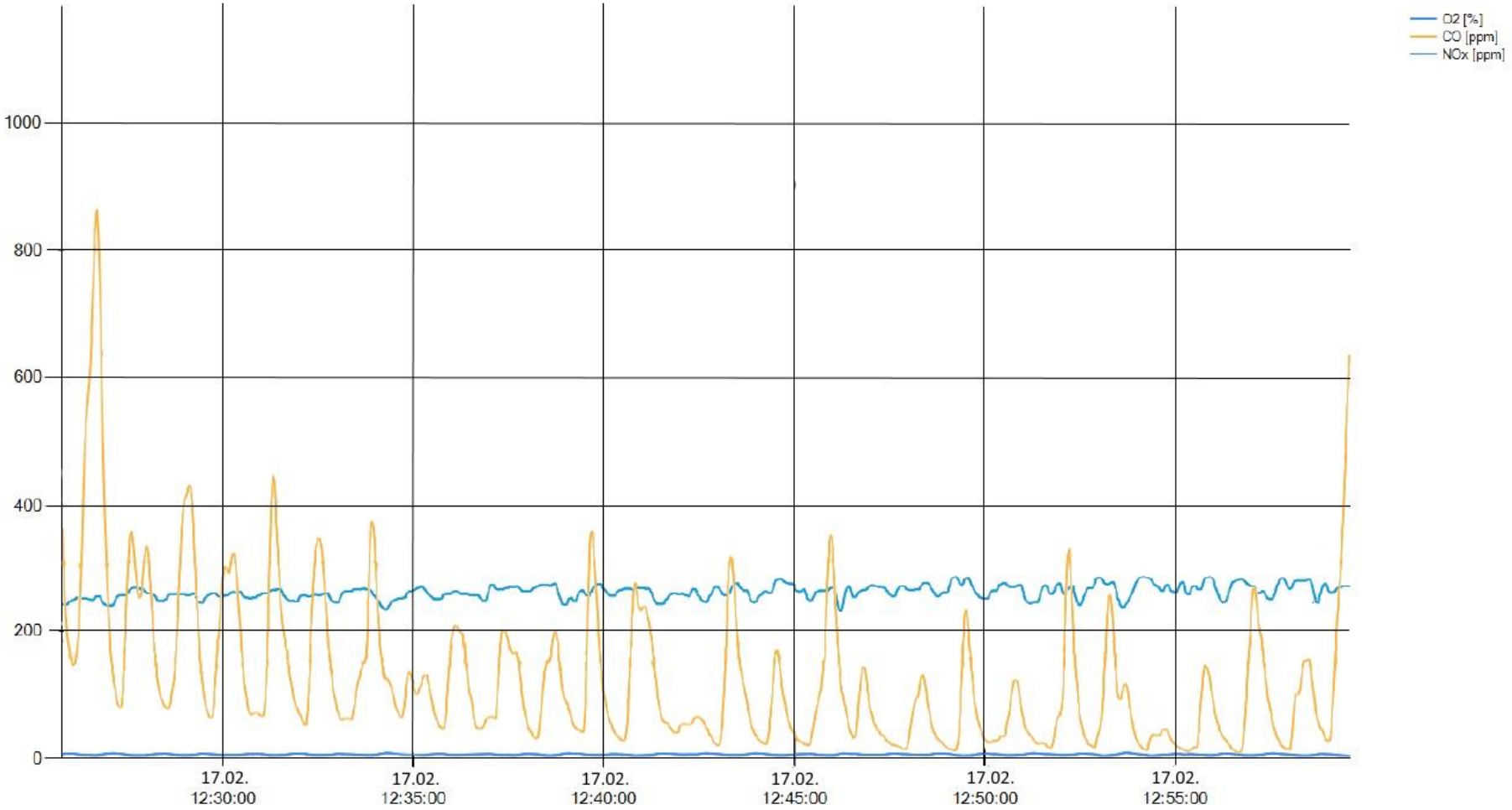
Emission test grits



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Ash analysis

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Thank you for your attention !!

Landwirtschaftskammer Steiermark

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