

Creation of biomass logistic centres within the agro-industry

Training for non-target regions, 3rd May 2016



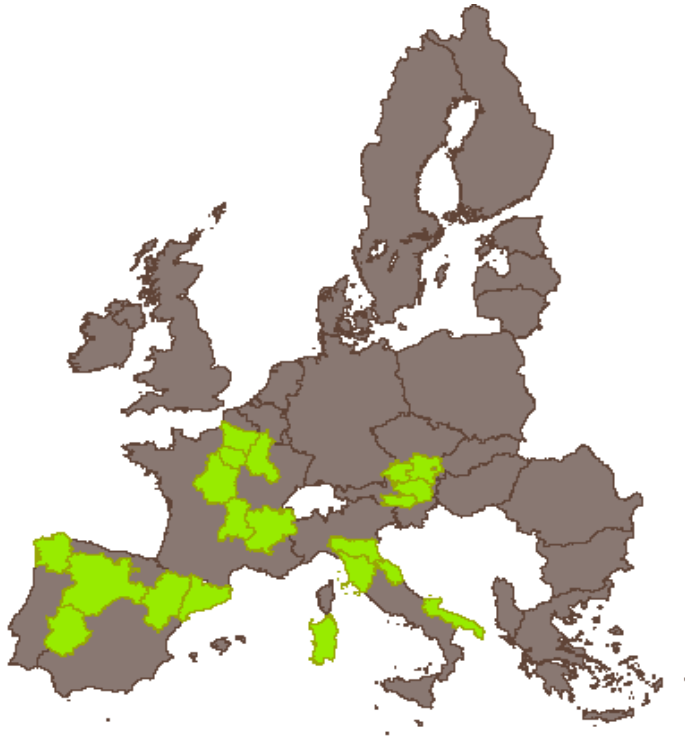
Co-funded by the Intelligent Energy Europe
Programme of the European Union

- **Introduction: Sucellog**
- **Background of the project**
- **The Sucellog-Concept**
- **What happened in the project**
- **Example Tschiggerl Agrar GmbH**
- **Created documents**
- **Outlook for the next training**

GOAL OF SUCELLOG:

- **Foster the creation of a biomass logistic centre inside agro-industries**
 - **Create the capacity on agrarian associations to help decision-making when starting this new business line**
- * Solid biomass produced should have an agrarian origin (agrarian practice and/or agro-industrial residues)
- * No competition for raw material with established markets should be promoted
- * Most efficient energy paths should be promoted

Project Area:

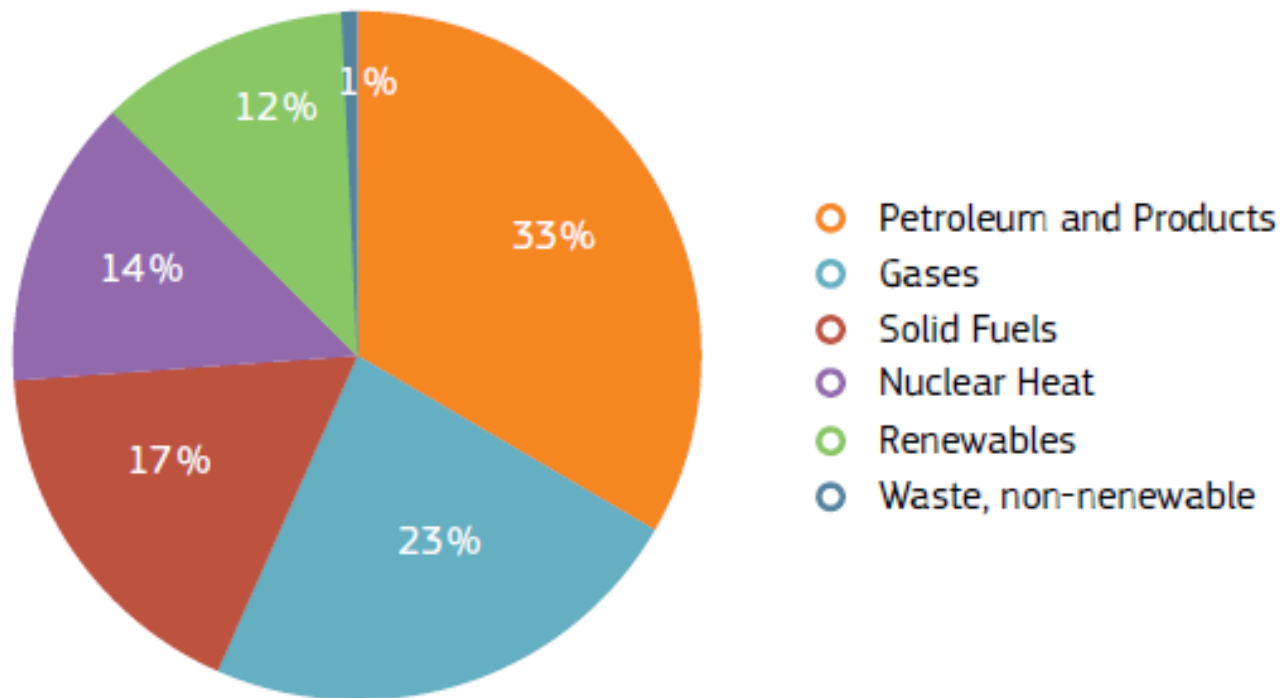


- potential analysis of residues
- creation of a logistic centre in each country
- Feasibility studies (techno-economical)
- free support of all interested persons

- **EU 20-20-20 targets:**
 - A 20 % reduction in EU greenhouse gas emissions as compared to 1990 levels;
 - Raising the share of EU energy consumption produced from renewable resources to 20 %;
 - A 20 % improvement in the EU's energy efficiency as compared to 1990.

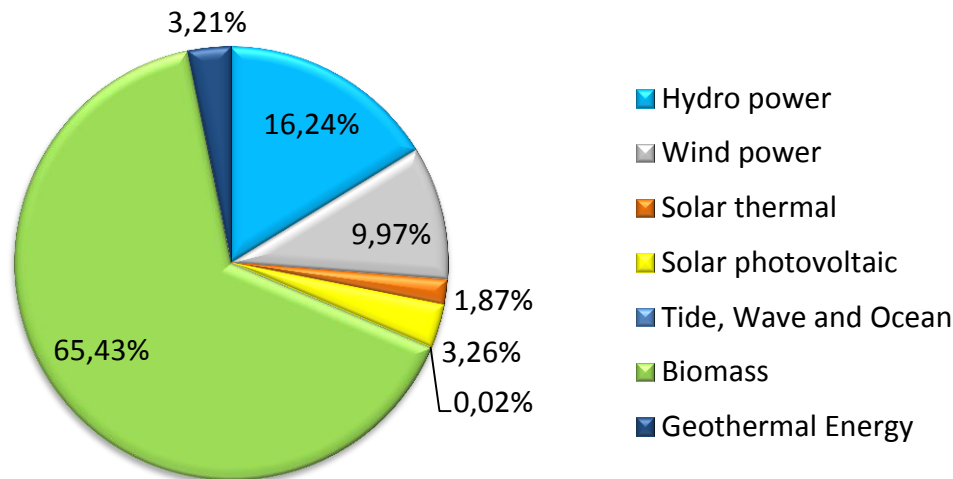
Background of the Project

TOTAL PRIMARY 2013: 1 665 Mtoe
(Total Primary and Secondary 2013: 1 666 Mtoe)



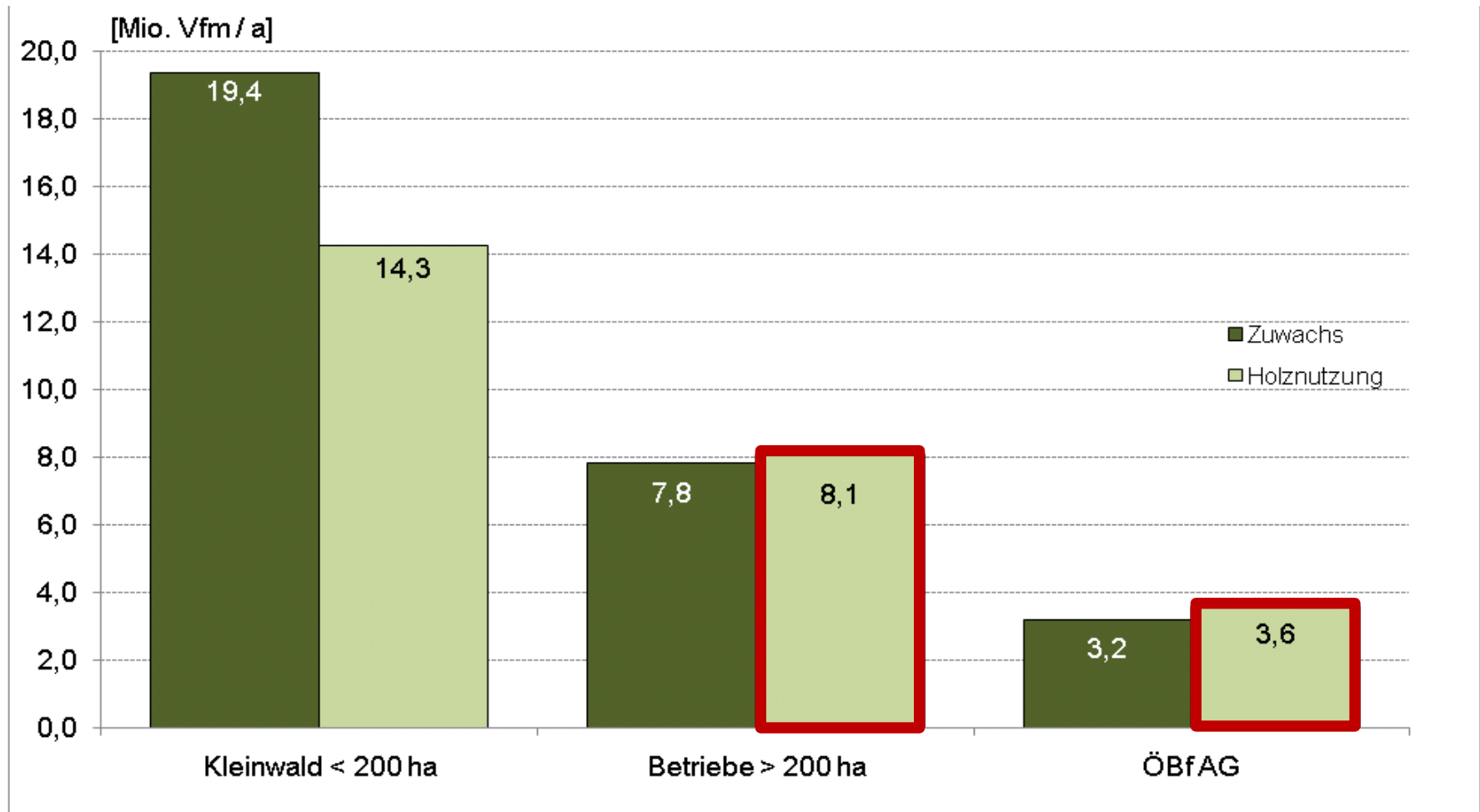
Bioenergy share:

Share of Primary production of renewable energy per type in 2012 in Europe



Primary production of renewable energy by type in Europe – based on 177 Mtons of oil equivalent (source: Eurostat)

Use and growth of wood in Austria



Use of agrarian residues for energy

bioenergy production from crop residues in EU-27
(after considering competitive uses):

~36,5 Mtoe



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

- 1. Evaluation of resources**
- 2. Selection of suitable Agro-Industries**
- 3. Feasibility Studies**
- 4. tailor made business model**
- 5. creation of logistic centre**

- **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

AGRO-INDUSTRIES as SEASONAL BIOMASS LOGISTIC CENTRE

Usual operation
(Nov-Feb)



Operation as
biomass logistic
centre
(Mar-Oct)



Target Agro-Industries

Forage dehydration

Feedstuff producer

Cereal dryer

Rice dryer

Tobacco dryer

Distillery

Sugar industry

Olive oil pomace industry

Dried fruits



- **cereal straw**
- **soya straw**
- **rape stalks**
- **corn stalks**
- **corn cobs**
- **feedstuff residues**
- **nut shells**
- **vineyard prunings**
- **olive prunings**
- **olive pits**
- **olive pomace**
- **grape pits**
- **grape marc**
- **rice husks**
- **etc.**



WHAT HAPPENED IN THE PROJECT

GOAL OF SUCELLOG:

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Regional evaluation of resources and agro-industries

STEPS:

1. Detect biomass quantity per municipality
2. Check the target agro-industries in the region (type and location)
3. Analyse seasonality of biomass production and available equipment

Regional evaluation of resources and agro-industries– Step 1

TO BUILD THE MAPS IT IS ESSENTIAL to rely in REAL DATA of:

- **Tons residue/ha**
- **AVAILABILITY: percentage of the residues that are not used for other purposes (market or soil amendment)**
 - ✓ If a farmer, after taking the wheat grain, leaves the straw on the soil due to agrarian recommendations then availability should be considered 0%.
 - ✓ On the contrary, if the farmer leaves the straw on the soil just because the cost for harvesting does not cover the value in the animal feed market then availability is 100%.
 - ✓ It can also happen that in one region the 40% of the straw is commercialized for animal feed (so it has a market), a 20% is left on the soil as a recommended agrarian practice. Therefore, 40% of the straw is available for other uses like the production of solid biomass.

Regional evaluation of resources and agro-industries – Step 1 & 2

Possible problems when trying to reach the data for building the maps:

- No common practices in the same region (some farmers leave everything on the soil, some others harvest the product). Difficulty in producing a general idea.
- No inventories where to find the agro-industries (type and location)

Regional evaluation of resources and agro-industries – Step 3

Detect compatibilities in biomass production and equipment available in the region in terms of seasonality and technical compatibility



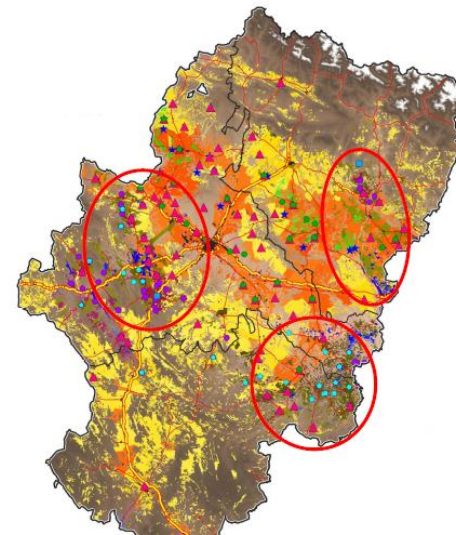
Set which type of agro-industry could work with each type of residue



Set potential areas (transport connections taken into consideration)

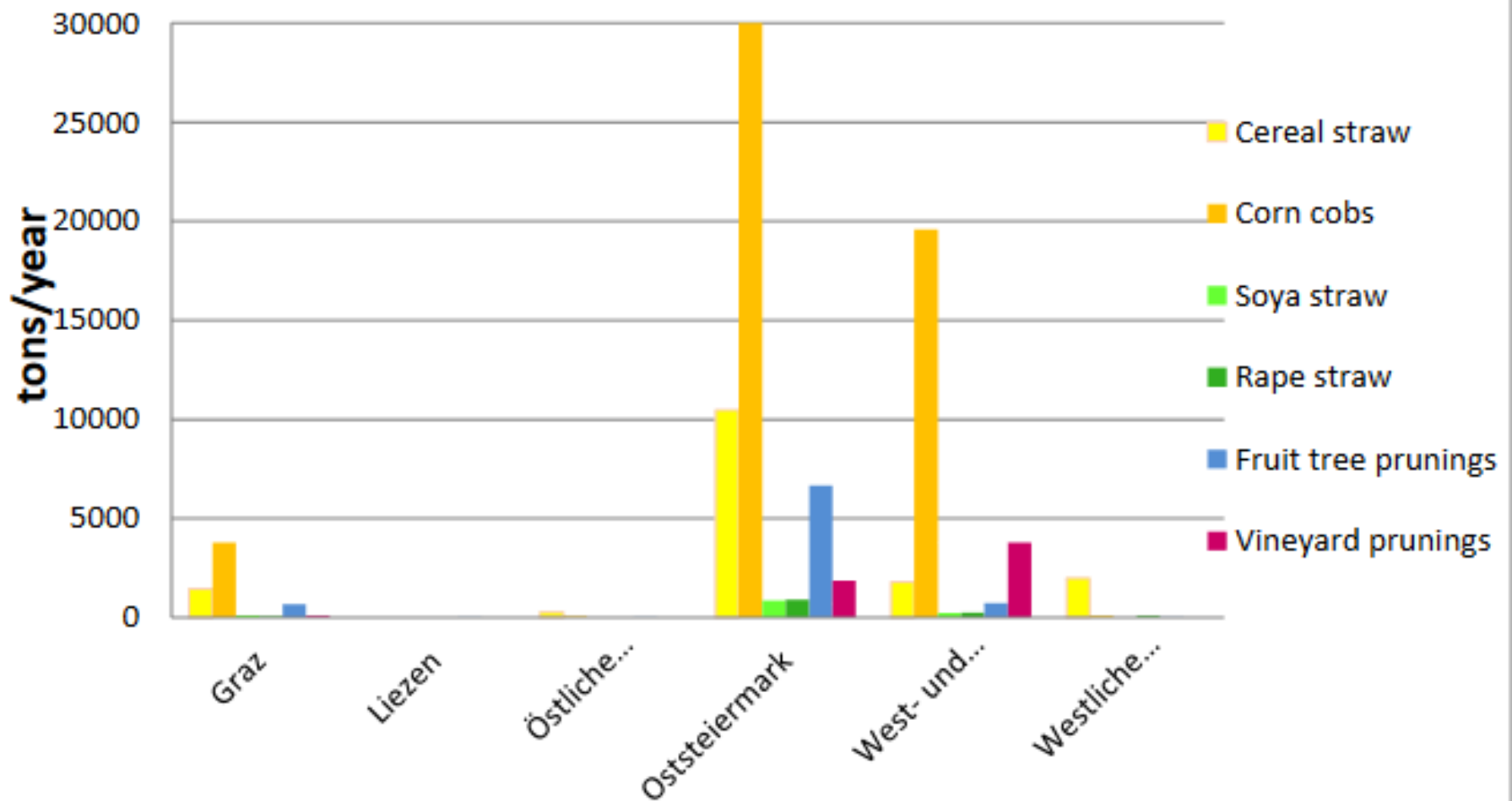
Tabla 3: Meses con disponibilidad de equipos y recursos en Aragón.

	En	Feb	Mar	Abril	Mayo	Jun	Jul	Agos	Sep	Oct	Nov	Dic
Secadero cereal y maíz												
Deshidratadora forraje												
Secadero arroz												
Destilerías												
Paja de cereal												
Paja y zuro de maíz												
Poda de cultivos permanentes												
Cascarilla de arroz												
Raspón de vid												
Granilla de uva y orujillo												
Hueso de oliva												
Cáscara de fruto seco												

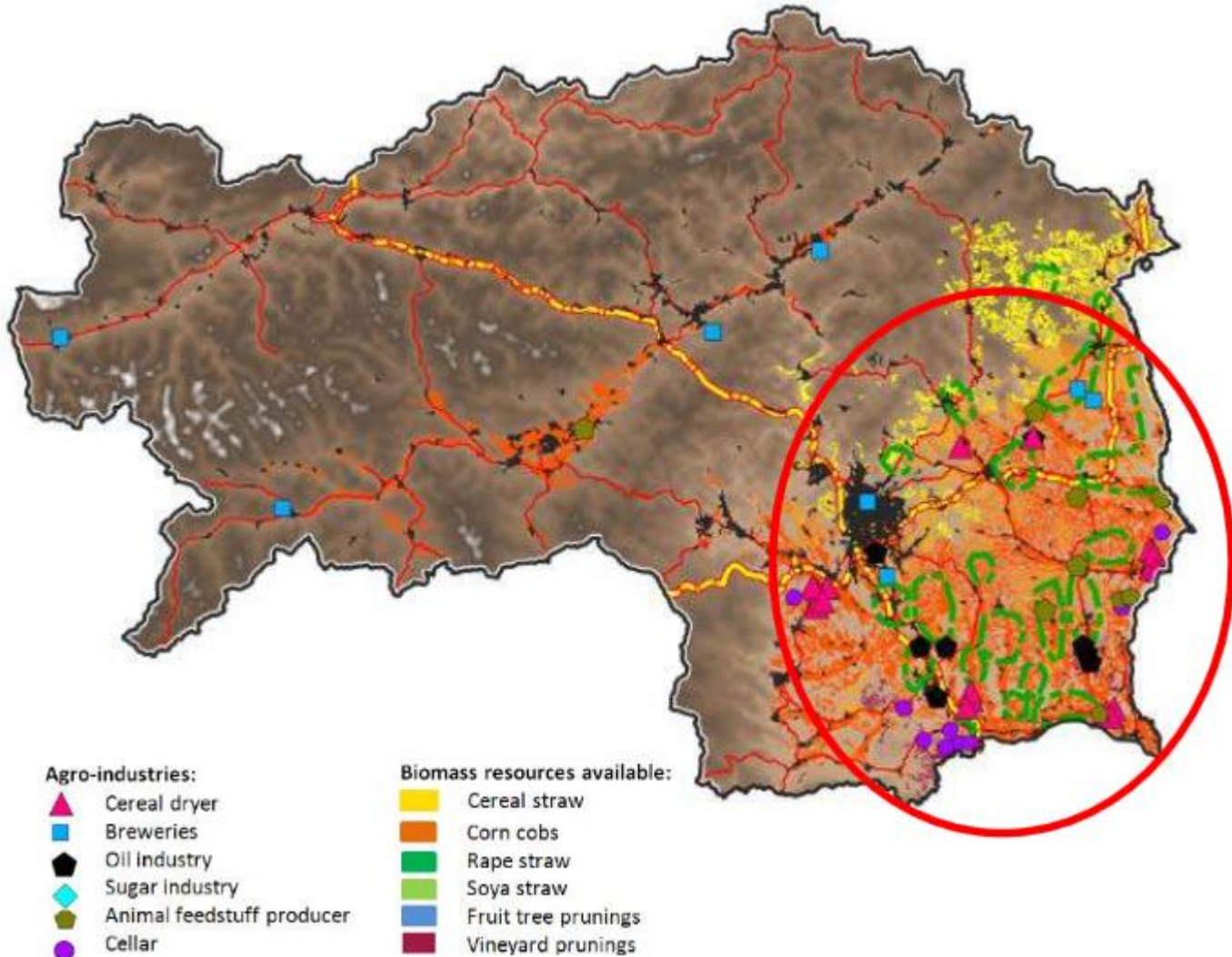


Regional evaluation of resources and agro-industries

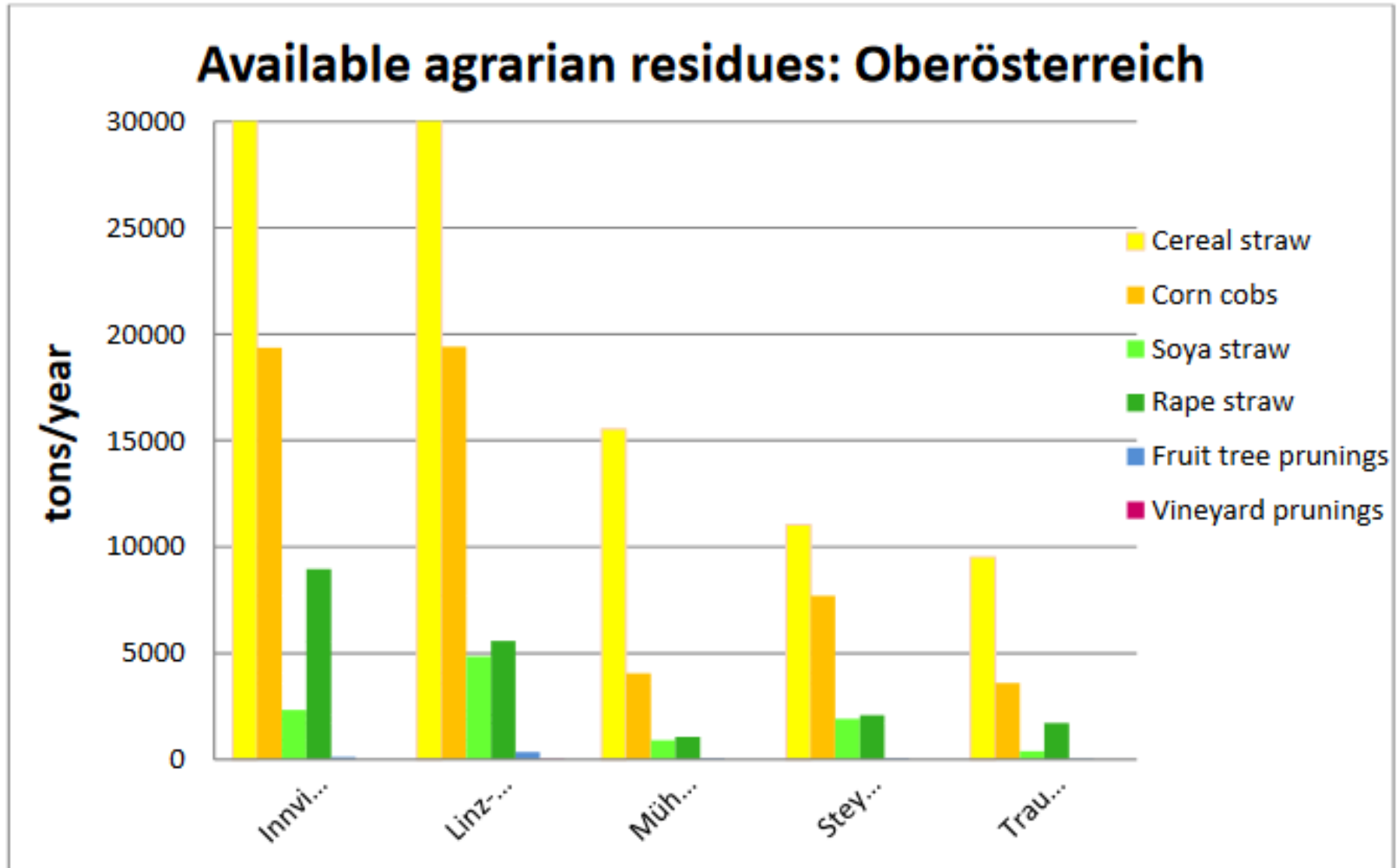
Available agrarian residues: Steiermark

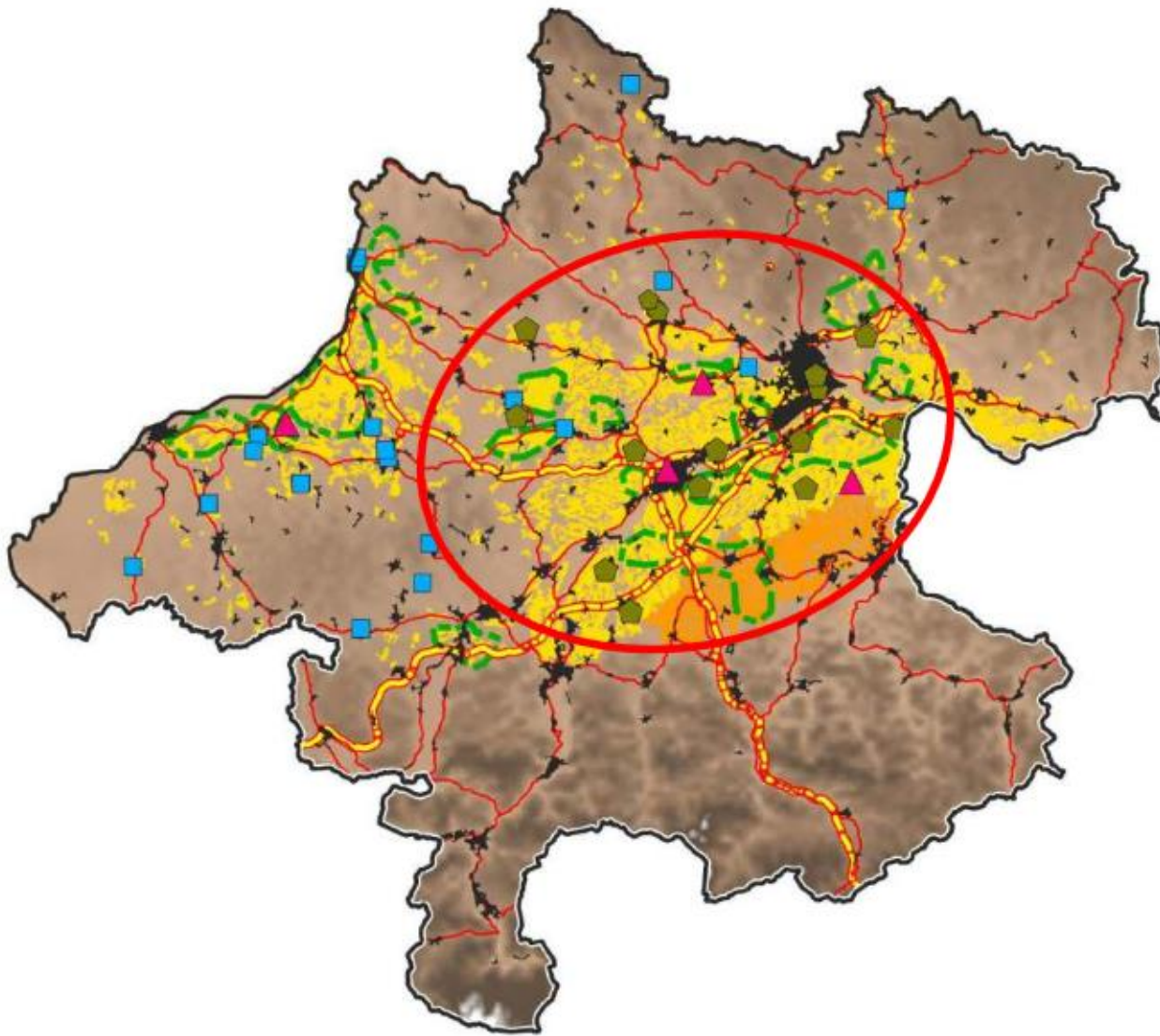


Regional evaluation of resources and agro-industries



Regional evaluation of resources and agro-industries





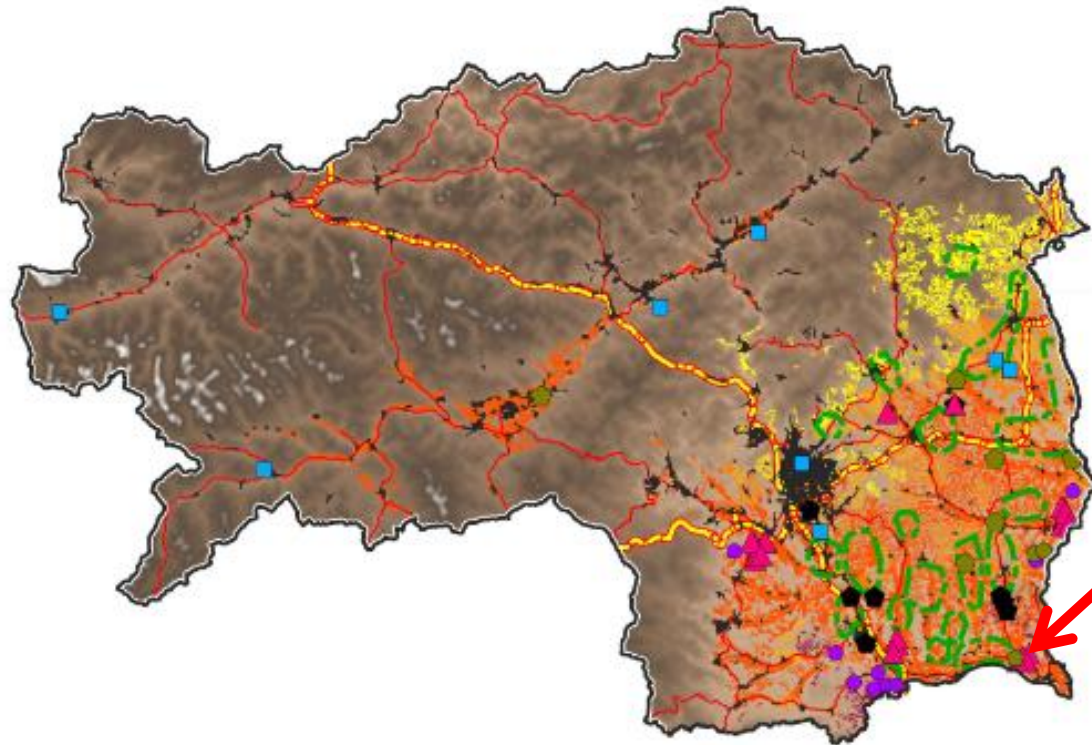
Agro-industries:

- ▲ Cereal dryer
- Breweries
- Oil industry
- ◆ Sugar industry
- Animal feedstuff producer
- Cellar

Biomass resources available:

- Cereal straw
- Corn cobs
- Rape straw
- Soya straw
- Fruit tree prunings
- Vineyard prunings

Selection of beneficiary



**Tschiggerl Agrar
GmbH**



- **Main activities before Sucellog:**
 - **Corn harvest, treatment and trading:**
 - Corn drying to other farmers
 - Buying corn from other farmers and then selling it in the market
 - Harvesting the corn of other farmers acting as a logistic operator
 - Harvesting, drying and commercialising the corn of his own fields (150 ha/yr)

- **Main activities before Sucellog:**
 - **Logistic operator of straw:**
 - Harvesting and baling straw and hay for farmers (~ 600 ha/yr)
- **Just 2-3 months of operation/year**
- **Since 2006: operators are thinking about using corn cobs**

○ patented harvesting machine



- **use of corn cobs to dry corn since 2012**
- **yearly savings:**
 - 250.000 litres heating oil
 - 780 tons of CO₂
- **pay back time:**
 - 2 years



**EVALUATION OF THE
BOUNDARY CONDITIONS**



**EVALUATION OF
THE COMPANY**



**STUDY OF THE DIFFERENT POSSIBILITIES TO
BECOME A LOGISTIC CENTRE**



BUILDING A BIOMASS 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

ESSENTIAL INITIAL QUESTION: do the agro-industry want to start this new activity just to supply their own thermal consumption?

Assessment of the biomass procurement

What type of residue is produced in the field?

In which season it is produced?

Which is the distance from the fields to the agro-industry (km)?

How much residue is produced per year from the farmers (t/ha)?

Cost of harvesting this residue (€/t or €/ha)?

Do the farmers have machinery to harvest this residue? Do all farmers have a harvester or do they share? Does the machinery belong to the company?

Farmers harvest their fields?
Logistic operator?

Cost of transport to the agro-industry (€/t)?

Which is the market of this residue if any? Price in the market (€/t)?

Example: Tschiggerl Agrar GmbH

AVAILABLE RESOURCES (30 km radius)

3280 t/yr wheat straw

1910 t/yr barley straw

15249 t/yr maize cobs

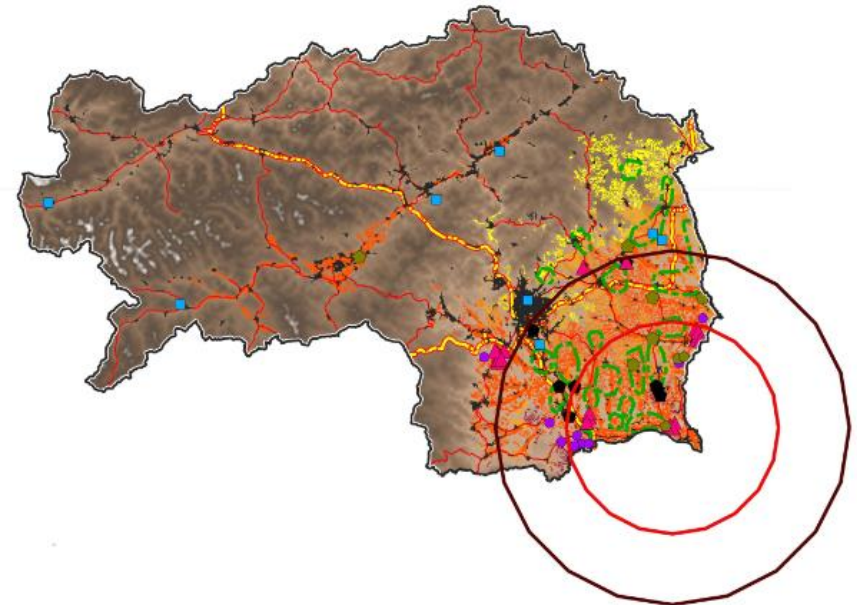
200 t/yr poor quality hay



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



Example:

Maize cobs: 1,5 t/ha

Modifications of regular machinery



Assessment of the biomass procurement

Example: Austrian case

AVAILABLE RESOURCES	SEASONALITY MOISTURE (w-% ar)	PURCHASING PRICE (€/t) by the agro-industry [Transport not included]
wheat straw 3280 t/yr	July-Aug. 15 %	70-90 €/t baled (30-50 €/t resource + 40 €/t harv-baling)
barley straw 1910 t/yr		
maize cobs 15249 t/yr	Sept-Oct 20-35 %	36-50 €/t 36 €/t bulk (2025 t/yr)
poor quality hay 200 t/yr	June-Sept 15 %	0-20 €/t baled

CONTRACTS PER CAMPAIGN according to the market! Like they normally do!

Which is the quality?

When is the DEMAND of the market? Do we need drying?

At which price are we going to sell the product to cover the raw material price ?

Example: Spanish case

Resources available from the **associates**
18 km radio max

AVAILABLE RESOURCES

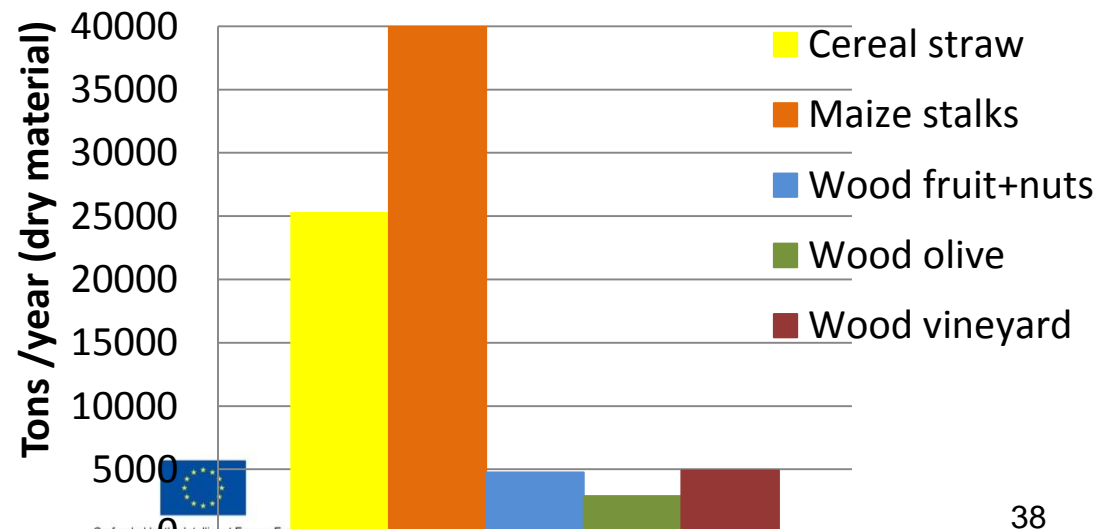
11000 t/yr cereal straw

8000 t/yr maize stalks



**THE COOPERATIVE CAN ENSURE
THE SUPPLY OF RESOURCES
2 ASSOCIATES ARE LOGISTIC OPERATORS**

Biomass resources available 30 km: Tauste



Example: Spanish case

AVAILABLE RESOURCES	SEASONALITY MOISTURE (w-% ar)	PURCHASING PRICE (€/t) by the agro-industry [Transport included, max 18 km]
cereal straw 11000 t/yr	July-Aug. 15 %	36-42 €/t baled
maize stalks 8000 t/yr	Nov. 20-25 %	21 €/t loose, not baled

Which is the quality?

Do we need to dry?

At which price are we going to sell the product to cover the raw material price ?

Understand the characteristics of the possible consumers:

Which is the format and quality (M, AC) required?

Is there a real demand of solid biomass?

Which are our competitors?

At which price is biomass sold in the area?

Who are our potential consumers?

Do consumers asked for standardised biomass?

Example: Austrian case

In the area of the agro-industry:

- 60 % of the heating demand covered by biomass energy, 30 % oil and 10 % electricity. Goal of substituting the 30 % oil by biomass, problem with forest wood: opportunity for agro-fuels!
- **Main market:** farmers for households and farm
- **Competitors:** wood chips (72 €/t, M25, A3)
wood pellets (240 €/t, M10, A1)

Example: Spanish case

In the area of the agro-industry:

- Consumption of forest and agro-industrial products
- **Main market:** pork farms (24 hours demand)
- **Main quality demanded:** A7, M25
- **Competitors:** olive pomace+pits (110 €/t)
grape marc (79 €/t)
wood pellets (160-170 €/t)
wood chips (70- 100 €/t)
almond shell (80-130 €/t)

Example: Austrian case Biomass assessment vs market analysis

AVAILABLE RESOURCES	PURCHASING PRICE (€/t) by the agro-industry [Transport not included]
wheat straw	70-90 €/t baled
barley straw	
maize cobs	36-50 €/t
hay	0-20 €/t baled

+ €/t production costs
+ €/t transport to consumer
= €/t MINIMUM



COMPETITORS

wood chips 72 €/t
wood pellets 240 €/t

**IS THIS PROJECT
FEASIBLE FROM THE
ECONOMIC POINT OF
VIEW?**

Study of the boundary conditions

**IS THIS PROJECT
FEASIBLE FROM THE
QUALITY POINT OF
VIEW?**

Example: Austrian case

Biomass assessment vs market analysis

AVAILABLE RESOURCES	LHV db (MJ/kg)	Ash content (w-% db)	Ash fusion temperature (°C)	N (w-% db)	Cl (w-% db)
cereal straw	17,0-19,0	4,4-7,0	800-900	0,3-0,8	0,03-0,05
maize cobs	16,5	1,0-3,0	1100	0,4-0,9	0,02
hay	18,3	5,5	820-1150	1,6	0,09
Wood ISO 17225-2 A1	≥ 16,5	≤ 0,7	To declare	≤ 0,3	≤ 0,02
Agro-Pellets ISO 17225-6 A	> 14,1	< 5,0	To declare	< 1,5	< 0,2
Agro-Pellets ISO 17225-6 B	> 13,2	< 10,0	To declare	< 2,0	< 0,3

Mixture with wood is required? Possible?



Source: MixBioPells Initiators Handbook,
EN-ISO 17225

Example: Spanish case Biomass assessment vs market analysis

AVAILABLE RESOURCES	PURCHASING PRICE (€/t) by the agro-industry [Transport included]
cereal straw	36 €/t baled
maize stalks	21 €/t loose

+ €/t production costs
+ €/t transport to consumer
= €/t MINIMUM



COMPETITORS

olive pomace+pits (110 €/t)
grape marc (79 €/t)
wood pellets (160-170 €/t)
wood chips (70- 100 €/t)
almond shell (80-130 €/t)

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Example: Spanish case Biomass assessment vs market analysis

AVAILABLE RESOURCES	LHV db (MJ/kg)	Ash content (w-% db)	Ash fusion temperature (°C)	N (w-% db)	Cl (w-% db)
cereal straw	17,0-19,0	4,4-7,0	800-900	0,3-0,8	0,03-0,05
maize stalks	16,6-17,5	11,0-17,0	1250	0,7-0,9	-
Wood ISO 17225-2 B	≥ 16,5	≤ 2,0	To declare	≤ 1,0	≤ 0,03



Mixture with wood is required? Possible?

Agro-Pellets ISO 17225-6 A	> 14,1	< 5,0	To declare	< 1,5	< 0,2
Agro-Pellets ISO 17225-6 B	> 13,2	< 10,0	To declare	< 2,0	< 0,3

Source: MixBioPells Initiators Handbook,
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EVALUATION OF THE BOUNDARY CONDITIONS



Raw material to be procured
Biomass market to enter

EVALUATION OF THE COMPANY

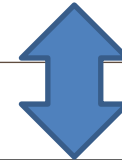


Evaluation of existing equipment
Analysis of company organization

ESSENTIAL INITIAL QUESTION: do the agro-industry want to start this new activity just to supply their own thermal consumption?

- Idle period
- Compatible equipment (drier and/or pelletiser) with available resources

How much can it be theoretically produced? t/yr



How many tons per hour can the equipment work with the possible raw materials?

What is the opinion of the manager? Set different possible scenarios

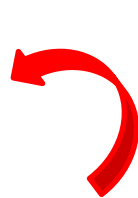
What is the cost of production (€/h) ?

What is the maintenance needed for the equipment with the possible raw material (€/t) ?
Devices+hours

Any investment needed ?

- Idle period ?
- Compatible equipment (drier and/or pelletiser) with available resources ?

Vertical driers used for grain:



Compatible with granulated product and chips
Impossible for herbaceous

Compatible with granulated product: olive pits, almond shell, etc.
Difficult with chips. Impossible for herbaceous

- Idle period ?
- Compatible equipment (drier and/or pelletiser) with available resources ?

Horizontal driers:



Compatible with all types of formats: granulated, chips and herbaceous

- Idle period ?
- Compatible equipment (drier and/or pelletiser) with available resources ?

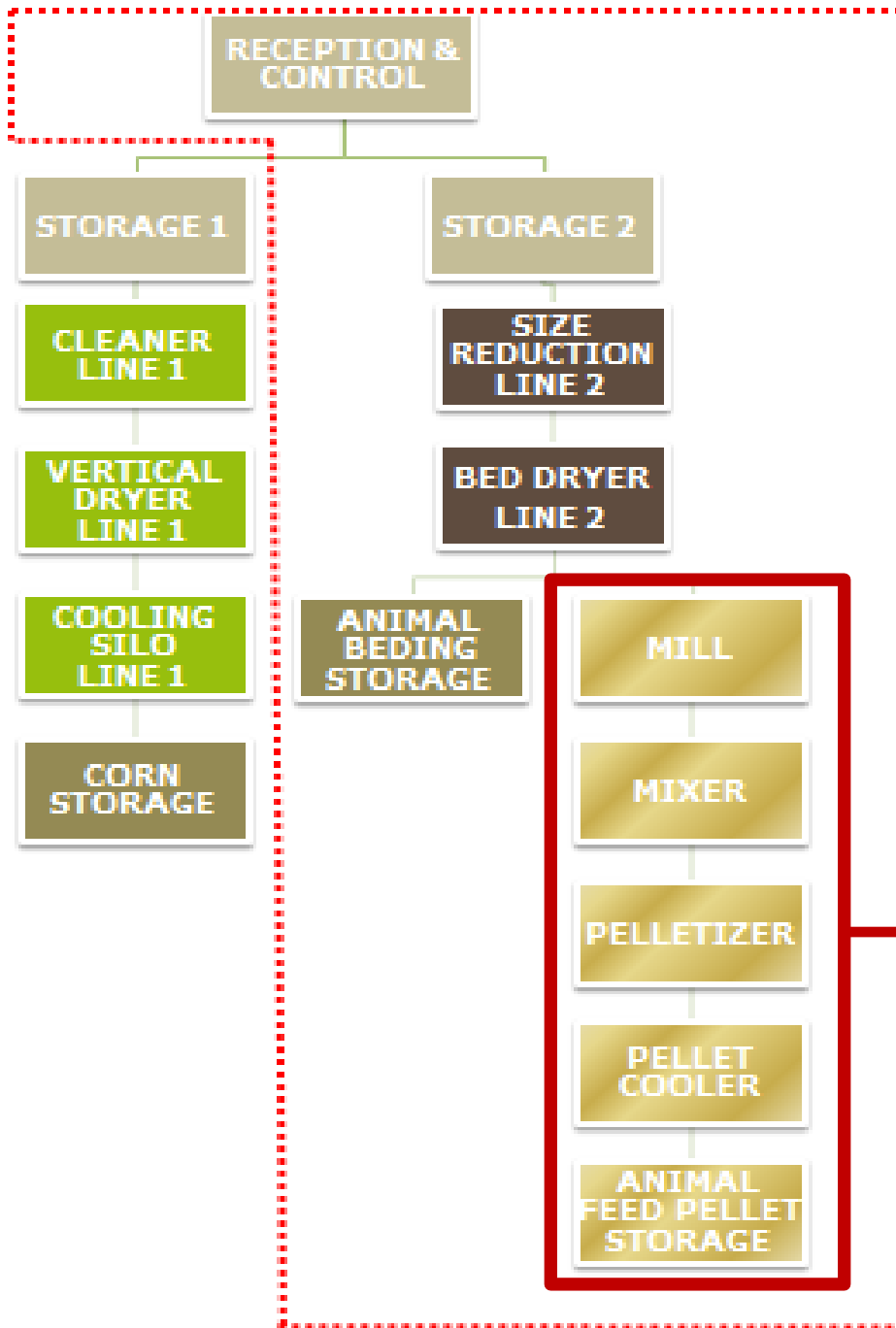
Pelletiser:



Design for herbaceous but compatible with woody resources but...normally production is lower with wood!

Example: Tschiggerl Agrar GmbH





association "Heu & Pellets"

Example: Austrian case

Dryer	
Months of production	Oct-Nov
Maximum capacity	1 t/h
Current capacity	50 t/yr

Pelletiser	
Months of production	All the year
Maximum capacity	5 t/h
Current capacity	800 t/yr

Equipment underused !!!

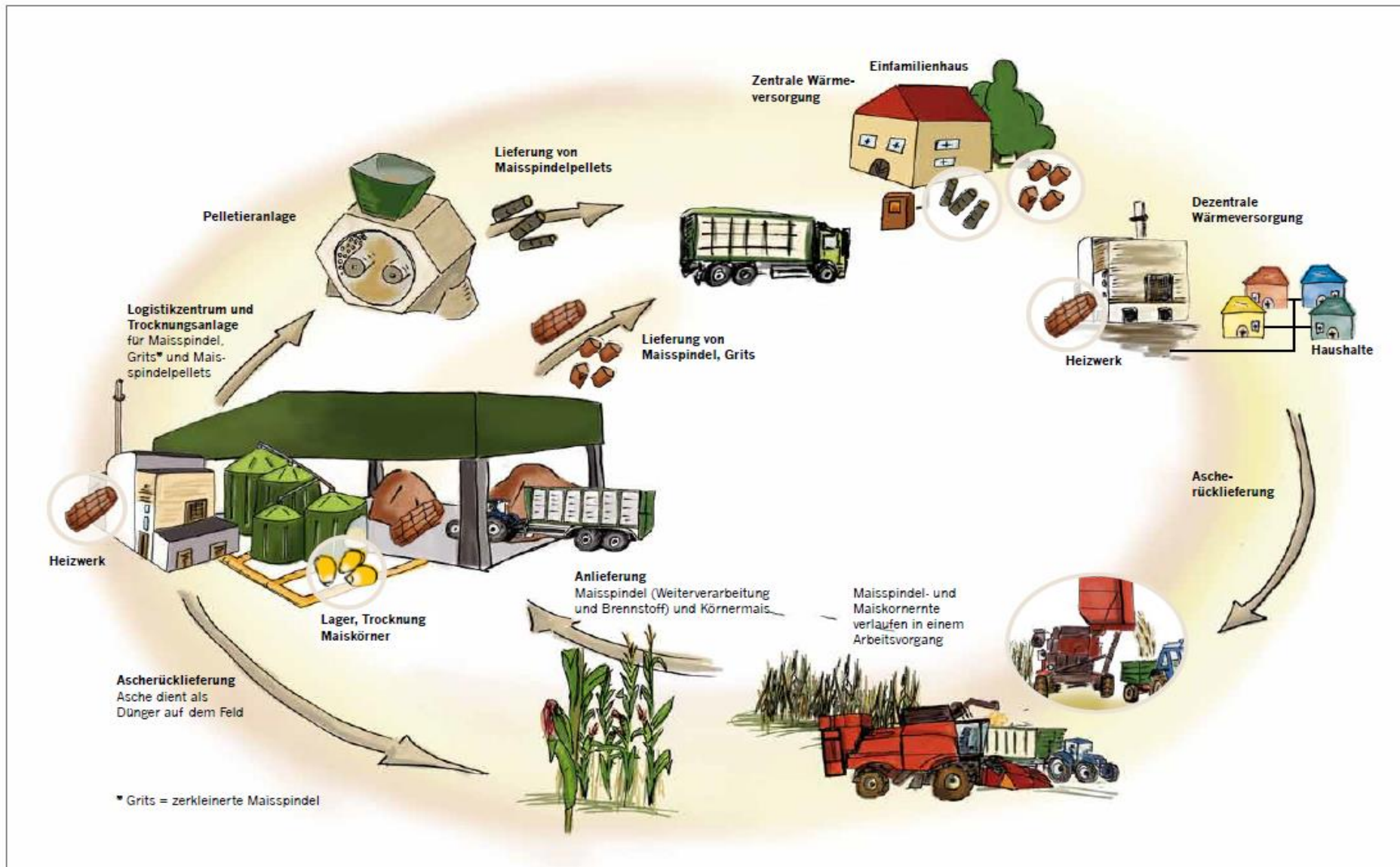
No investment required !!!

A new person is going to be contracted for the business line?

How many hours for the new business line?

Which will be the cost of this personnel associated to the new business line?

What knowledge and qualification is needed?



Possible Agro-Fuels of Tschiggerl



- Handbook
- Resources report
- feasibility studies
- business models
- training material



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

Handbook for agro-industries interested in starting a new activity
as biomass logistic centre: the basic demand of information



<http://www.sucellog.eu/en/publications-reports.html>

<http://www.sucellog.eu/de/publications-reports-de.html>

- **How to make an feasibility study**
- **Feasibility study Tschiggerl**
- **Building a logistic centre**
- **Diagnosis & Auditing of agro-industries**

SAFE THE DATE: 20th May 2016
9:30 – 11:30

Thank you for your attention !!



Co-funded by the Intelligent Energy Europe
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