



Ecological transition, production cost and investments

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Tobacco leaf flue-curing process consumes large amounts of energy.

Curing tobacco (Flue cured tobacco) is a process that **requires a lot of energy**. In the world's four largest tobacco producers, **China, Brazil, India and Africa**, **firewood and coal** are the **main fuels used** in curing.

Monitoring since 2007 has shown **no reduction** in the destruction/degradation **of woody biomass for the curing**

The support by **digital technologies** and land surface monitoring systems record that the **situation has not improved**

- **Tobacco curing** has accelerated **the deforestation rate** and other environmental-related problems such as **soil erosion, flooding and hydrology**, reduced natural habitat for biodiversity **and climate change**.
- Tobacco production accounts for **5 percent of Africa's total deforestation, 20 percent in Malawi and 12 percent in Southern Africa**
- In **Kuria District** (Kenya) there are about 17,500 tobacco farmers. *Wood loss* due to tobacco processing amounts to about 210,000 trees annually, only 75,000 tree seedlings are supplied to farmers - **64%**. Most of all these trees are planted and they are **not taken care**, thus, tobacco processing **is accelerating deforestation**.

- In **China** most curing barns adopt **coal** as the heat source, **low efficiency** (only about 20%) and severe **air pollution**. At present, coal is the main heat source of curing barn, occupied above **70%** of the market share in China
- Most small scale tobacco growers in **Zimbabwe** rely on **wood** - fuelled old conventional barns. These traditional barns are known to be inefficient with specific wood to dried tobacco ratio of **11 kg/kg** respectively
- In **Kenya and Malawi** **8 kg** of fuel wood is required to cure a kilogram of tobacco
- in **Tanzania** **14 kg** of fuel wood is required to cure a kilogram of tobacco

Can the renewable energy be as an alternative source for energy management in tobacco?

The answer is:

yes

Below **the investments in renewable energy** in Italy by a Tobacco Producers' Association (**Fattoria Autonoma Tabacco - FAT**) and by the Factory for processing tobacco (**Trasformatori Tabacco Italia-TTI**), in the last 10 years

- Photovoltaics
- Anaerobic digestion for biomethane/hot water
- Chopped wood

Photovoltaics

*8 curing units of the cooperatives + Factory + curing units belonging to the growers:
for a total production of **3.578.800** kW/year*



Chopped wood

2 combustion plants supplying heat and power to 100 curing units :

6.872.224 kWh = 892.497 kg of cured tobacco

- *Chopped wood comes from coppice or maintenance of coniferous woods: for fire prevention → no need of reforestation*
- *Circular economy opportunity with Growers and Farmers*



Anaerobic Digestion Plants for Biogas

- 2 units for a production of **15,760,000** kW/year;
- 34 curing units running with hot water (engine and exhausted pipe cooling): **209.350** kg of cured tobacco



Further Benefits of Anaerobic Digestion

*Exhausted material (liquid and solid) can be used as a manure:
less mineral fertilizers and related depletion of fossil sources*

Exhausted material: Type	Corn Yield: T/ha	Exhausted material %	Digested material T/ha	Total N: %	N: Yearly availability %	N: kg/ha from Digested material
Liquid	51,8	44,6	23,1	0,49	50	57
Solid		13,6	7,0	0,36	50	13
Total	51,8	58,1	30,1	0,46	50	69



Further Benefits of Anaerobic Digestion: hot water

- *Greenhouses for tobacco seedling production can be used during winter time with hot water for vegetable production (e.g. lettuce and bell pepper) →*
EXTRA INCOME FOR THE FARMERS



Renewable Energy Contribution vs. Total

	Kw	%
Photovoltaic Yearly production	3.578.800	11,74%
Yearly Electric Energy production from Biomass	15.768.000	51,73%
Diesel oil (Kw equivalent) for tobacco cured with chopped wood and hot water	8.484.219	27,83%
Total from renewable energy	27.831.019	91,30%
Total from fossil energy	2.652.827	8,70%
Total required energy to cure and process tobacco	30.483.846	100,00%

Energy sources used in Italy for curing tobacco

<i>Energy sources</i>	<i>Energy used for 1 kg of dried tobacco</i>
Methane gas	0,75 m3
Liquid propane gas (LPG)	1,20 litres
Diesel	0,70 litres
Chip wood	2,60 kg
Electric energy	1,10 Kw
Hot water from biogas	100% energy recovery

Investments to reduce the increase in energy costs by the FAT Producers' Organization.

Heat source	Costs increase from 2021 to 2022 €/kg		
	Electricity	Heat source	Total
Liquid propane gas (LPG)	0,33	0,14	0,47
Diesel	0,33	0,34	0,67
Chip wood	0,33	0,10	0,43
Methane gas	0,33	1,03	1,36

Without changing the heat source in may 2022

Heat source	Kg tobacco	% of heat source used	Cost incrise €/kg
Liquid propane gas (LPG)	0	0,00%	0,00
Diesel	475.379	12,77%	0,09
Chip wood	1.014.261	27,24%	0,12
Methane gas	2.233.626	59,99%	0,82
Total	3.723.266	100,00%	1,02

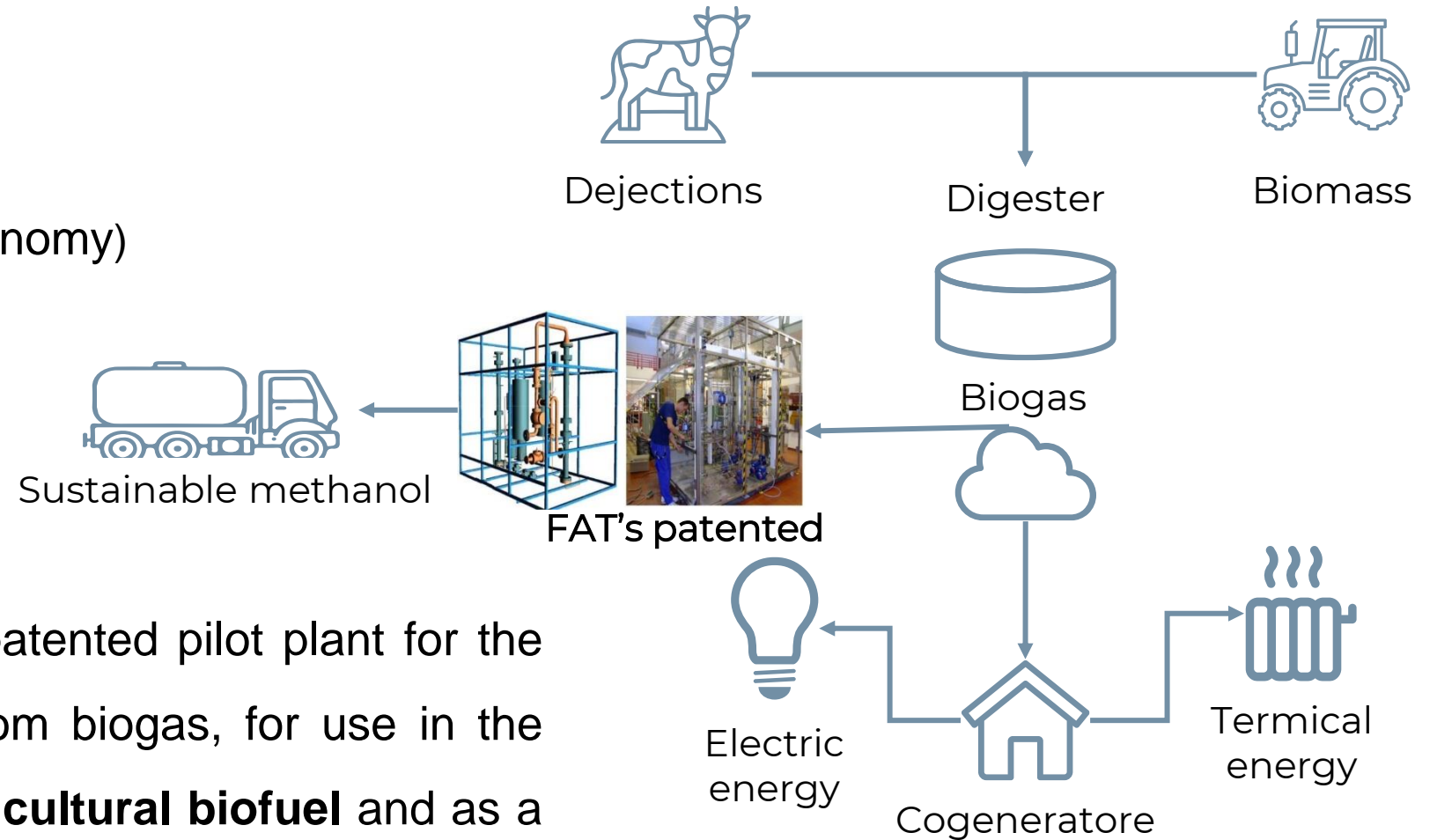
With changing the heat source in may 2022

Heat source	Kg tobacco	% of heat source used	Cost incrise €/kg
Liquid propane gas (LPG)	2.187.078	58,74%	0,28
Diesel	475.379	12,77%	0,09
Chip wood	1.014.261	27,24%	0,12
Methane gas	46.548	1,25%	0,02
Total	3.723.266	100,00%	0,50

Without changing the heat source in may 2022	3.792.368 €
With changing the heat source in may 2022	1.845.868 €
Investments to modify burners from methane to LPG	400.000 €
Total costs saved	1.546.499 €
	€/kg 0,42

Future for the ecological transition and renewable energy

Bio fuel production (circular economy)



Since 2023, **FAT** has built a patented pilot plant for the production of **biomethanol** from biogas, for use in the **chemical industry**, as an **agricultural biofuel** and as a **hydrogen carrier**.

Thank You

for your precious time and attention