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ENERGY SAVING AND RENEWABLE ENERGY PRODUCTION FOR A MORE SUSTAINABLE TOBACCO CROP

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INTRODUCTION

- High number of extreme climatic events in the recent years, with many casualties
- Waste of money for loss of production and for repairing the damages

THE CAUSES

- The impact of Human activities on the environment: emissions, fossil resources depletion, improper use of land

THE CONSEQUENCES

- More and more, in recent years EU policy and legislation have been focusing on Climate Change Mitigation, pointing to:
  - Reducing the use of fossil resources (savings)
  - Developing the use of alternative, sustainable, renewable resources

SCENARIO

- Presently: strong increase in energy demand by the developing countries
- If fossil energy should be the only source in the near future, the situation will become unsustainable
- Oil extraction is generally concentrated in areas with unstable politic situation
- There are increasing environmental concerns on some new technologies (oil sands fracking)
- Meetings in Paris and the recent G20-2016 China: all the participating Countries are committed to reduce CO_2 emissions

ACTION PLAN

- Increase energy use efficiency
- Adopt a sustainable mix of renewable and fossil energy production
- Change the habits in order to reduce waste and pollution
- Develop a circular economy attitude

THE FATTORIA AUTONOMA TABACCHI – ITALY
MODEL FOR TOBACCO SUSTAINABLE ENERGY

RENEWABLE ENERGY SYSTEM OF PRODUCTION
(Units at facilities of the Growers' Association)

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

Photovoltaics

9 curing units of the cooperatives + Factory + curing units belonging to the growers:
for a total production of 12,067,800 kW/year

Anaerobic Digestion Plants for Biogas

- *3 units for a production of 21,968,000 kW/year;*
- *34 curing units running with hot water (engine and exhausted pipe cooling):*

500.000 kg of cured tobacco

Chopped wood

3 combustion plants supplying heat and power to 162 curing units :

17,474,600 kWh = 1,800,000 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*

Analysis of FAT tobacco industry for renewable energy

	Kg
Tobacco VFC: Yearly production	13.770.000

CURING

Data	kg	kWh
Diesel oil	1	11
Diesel oil/Cured tobacco: kg/kg	0,65	7,15
Total kWh/year from Diesel oil		**98.455.500**
Electric Energy: kWh/kg of cured tobacco		1,20
Total Energy kWh/year		**16.524.000**

PROCESSING

Data	Nm^3	kWh
Methane	1	9,70
Methane for Processing tobacco: Nm^3 /kg	0,046	0,45
Total kWh from Methane		6.137.419
Electric Energy kWh/kg of Processed tobacco		0,166
Total Electric Energy: kWh/year		2.281.757
Total Energy kWh/year		**8.419.176**

	kWh
Total kWh of the full chain	**123.398.676**

Renewable Energy Contribution vs. Total

	kWh	%
Energy Yearly production from Photovoltaic	12.067.800	9,78%
Energy Yearly production from Anaerobic Digestion	21.968.000	17,80%
Energy Yearly production from chopped wood, included hot water	17.474.600	14,16%
Total Energy from renewable energy	**51.510.400**	**41,74%**
Total Energy from fossil sources	71.888.276	58,26%
Total required energy to cure and process tobacco	**123.398.676**	100,00%

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**

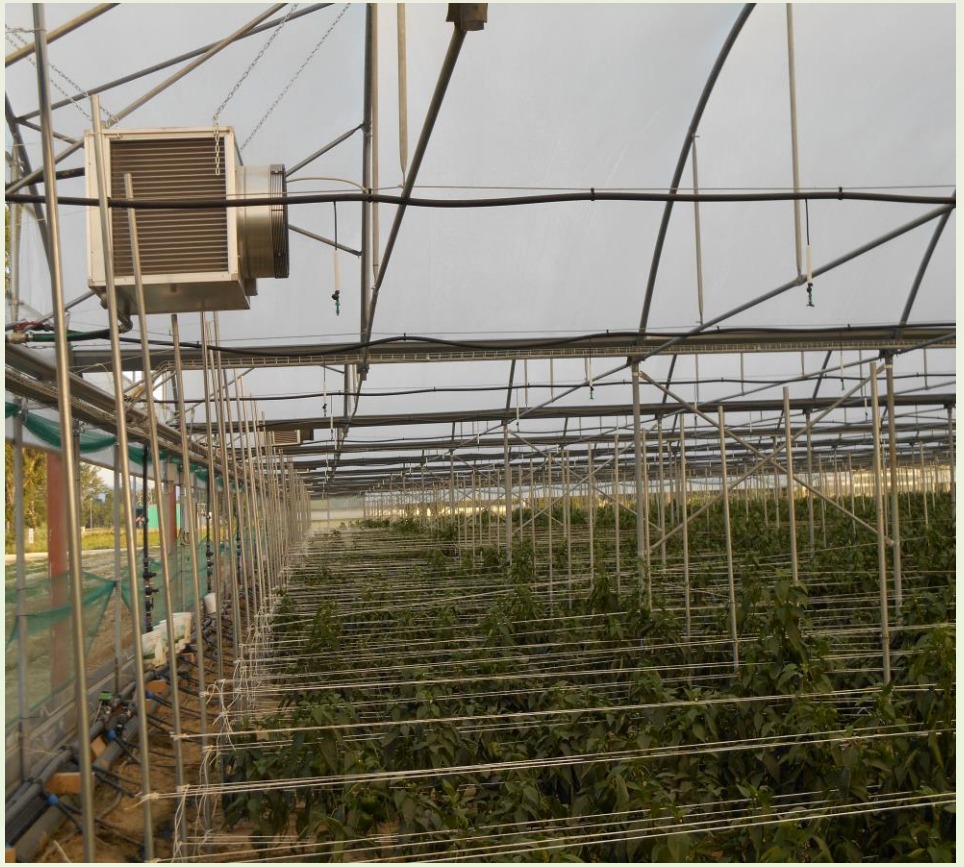
Further Benefits of Anaerobic Digestion

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

Filtered, liquid digested material
is applied in fertigation to field tomato and organic tobacco

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***



2016 Results of Vegetables Production
e.g. Bell Pepper

- *Greenhouse Area: 3,200 sq.m*
- *Bell pepper cumulative yield: 40,000 kg*
- ***Gross Income: roughly 40,000.00 €***

Carbon Footprint

Renewable Energy improves Tobacco environmental footprint by reducing fossil fuel CO_2 emissions:

Activity	Source	Units	Quantity	CO_2: kg/units	Total Potential CO_2: T/Y
Curing	Diesel oil	kg	8,950,500	3.17	28,373
	Electric Energy	kWh	16,524,000	0.531*	8,774
Processing	Methane	Nm^3	632,724	2.75	1,740
	Electric Energy	kWh	2,281,757	0.531*	1,212
				Total	**40,009**

* Avg.Italian Emission: kg of CO_2/Kwh (www.sunearthtools.com)

	CO_2 T/Y
Not produced due to Renewable Energy	**16.701**

Thank You for Your attention!

Questions?

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