



AN EXAMPLE OF SUSTAINABILITY: FATTORIA AUTONOMA TABACCHI FOR A MORE SUSTAINABLE TOBACCO CROP

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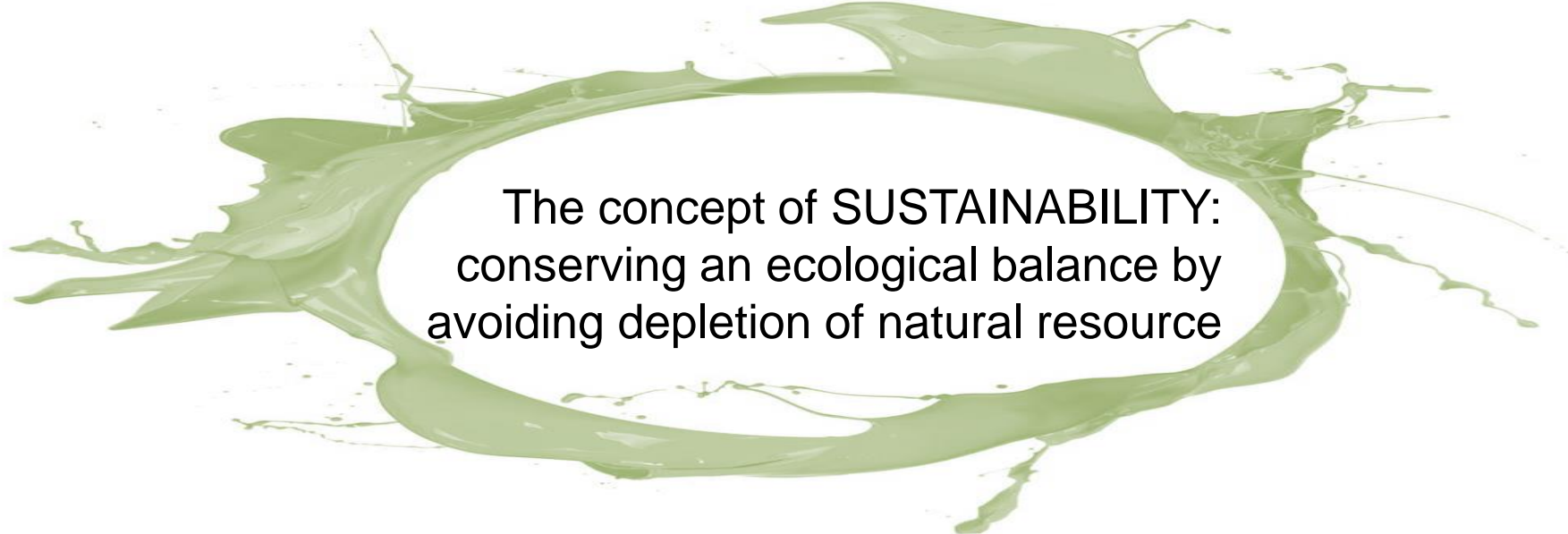
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ACTION PLAN

- Increase energy use efficiency
- Adopt a sustainable mix of renewable and fossil energy production
- Invest in best use of water: remote sensing & wise application
- Change the habits in order to reduce waste and pollution



The concept of SUSTAINABILITY:
conserving an ecological balance by
avoiding depletion of natural resource



THE FATTORIA AUTONOMA TABACCHI – ITALY MODEL FOR TOBACCO SUSTAINABLE ENERGY

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

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

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%

Photovoltaics

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



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*



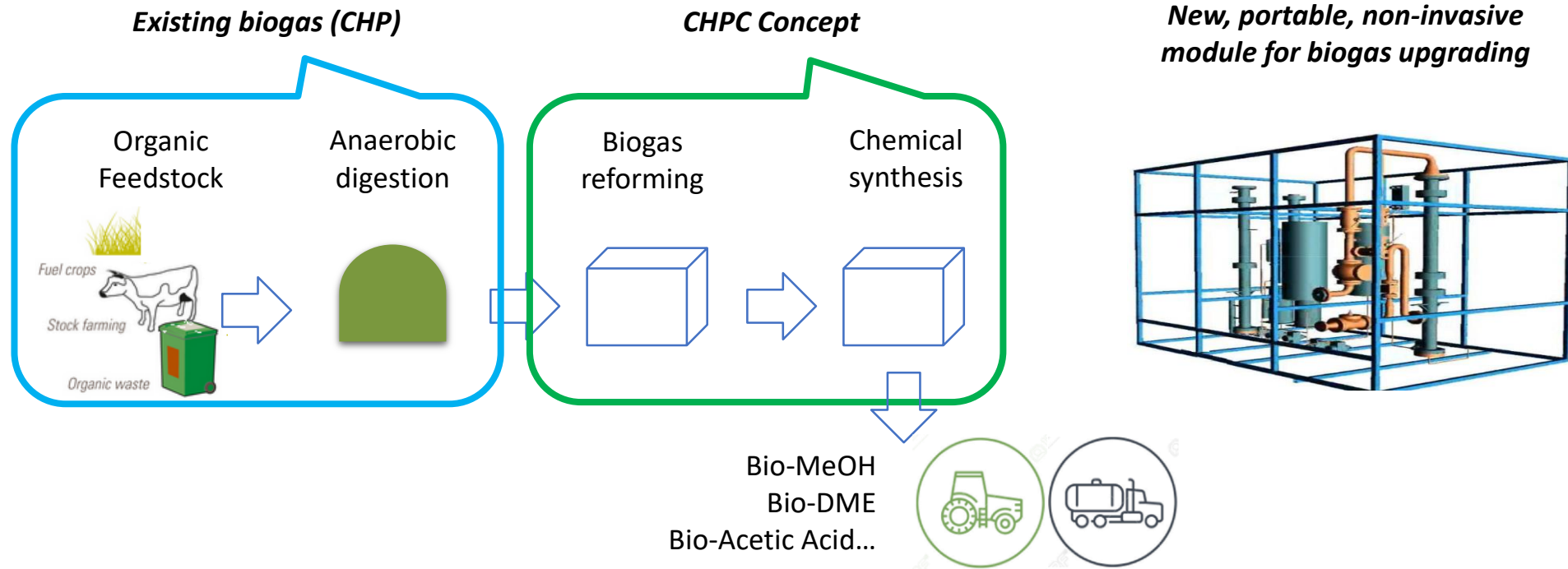
Anaerobic Digestion Plants for Biogas

- *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

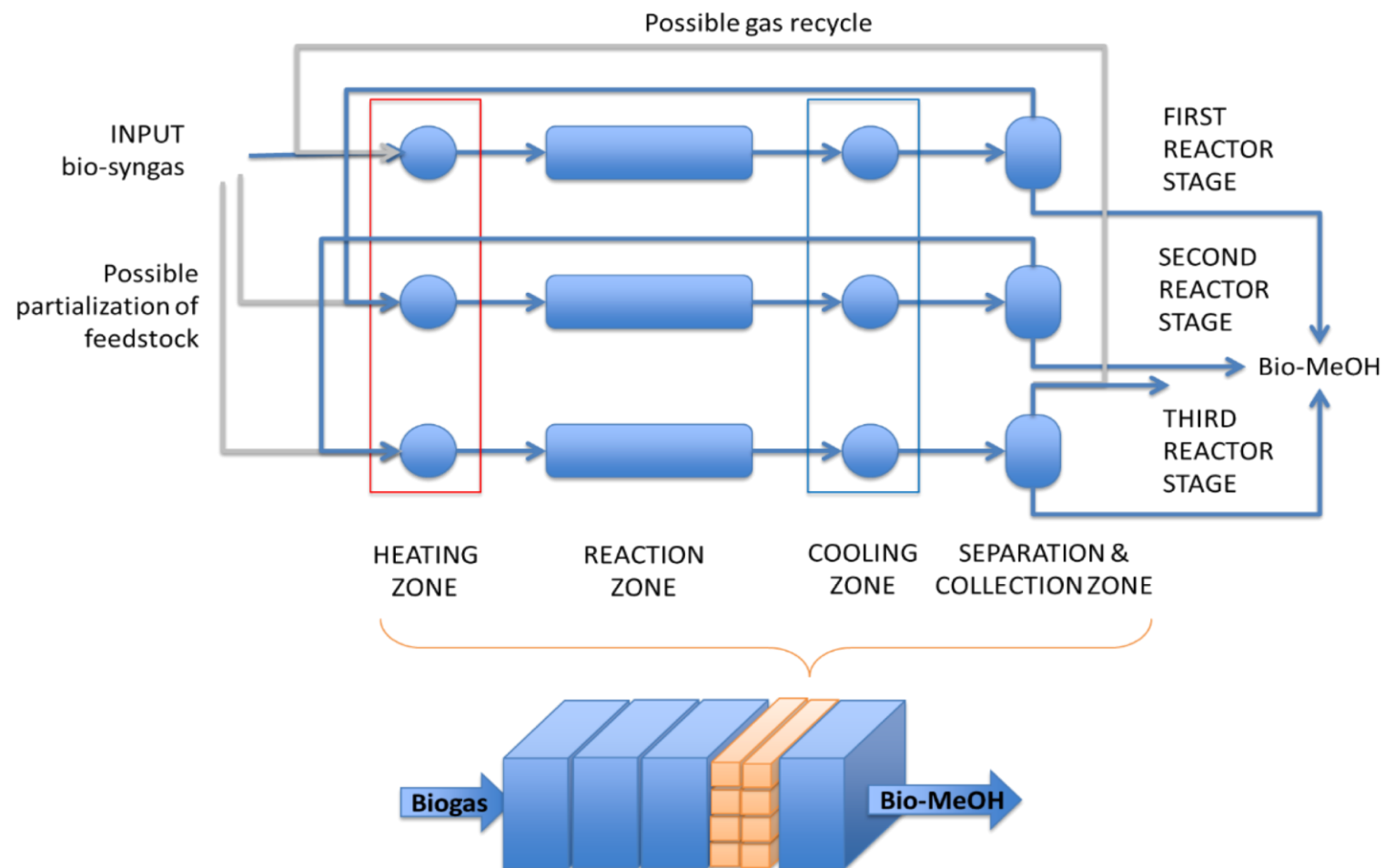


The BIG SQUID™ module

BioGaS-to-liQUID (BIG SQUID™)



Advances (Priority: 102017000073797, June 2017)



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**



INFRARED THERMOMETERS

- They can be used to measure a crop's surface temperature remotely
- This surface temperature can be correlated to plant water stress assuming that, as a crop transpires, the evaporated water cools the leaves below that of air temperature
- However, as the crop becomes water stressed, transpiration will decrease, determining an increase of leaf temperature (Jackson, 1982)



PCE 300 IRT (www.pce-italia.it)

MILLI G., MIELE S., BARGIACCHI E., 2012. *Infrared thermometers to tune tobacco irrigation at farm level*. CORESTA Congress, Sapporo, Sept. 23-26, 2012, AP18.

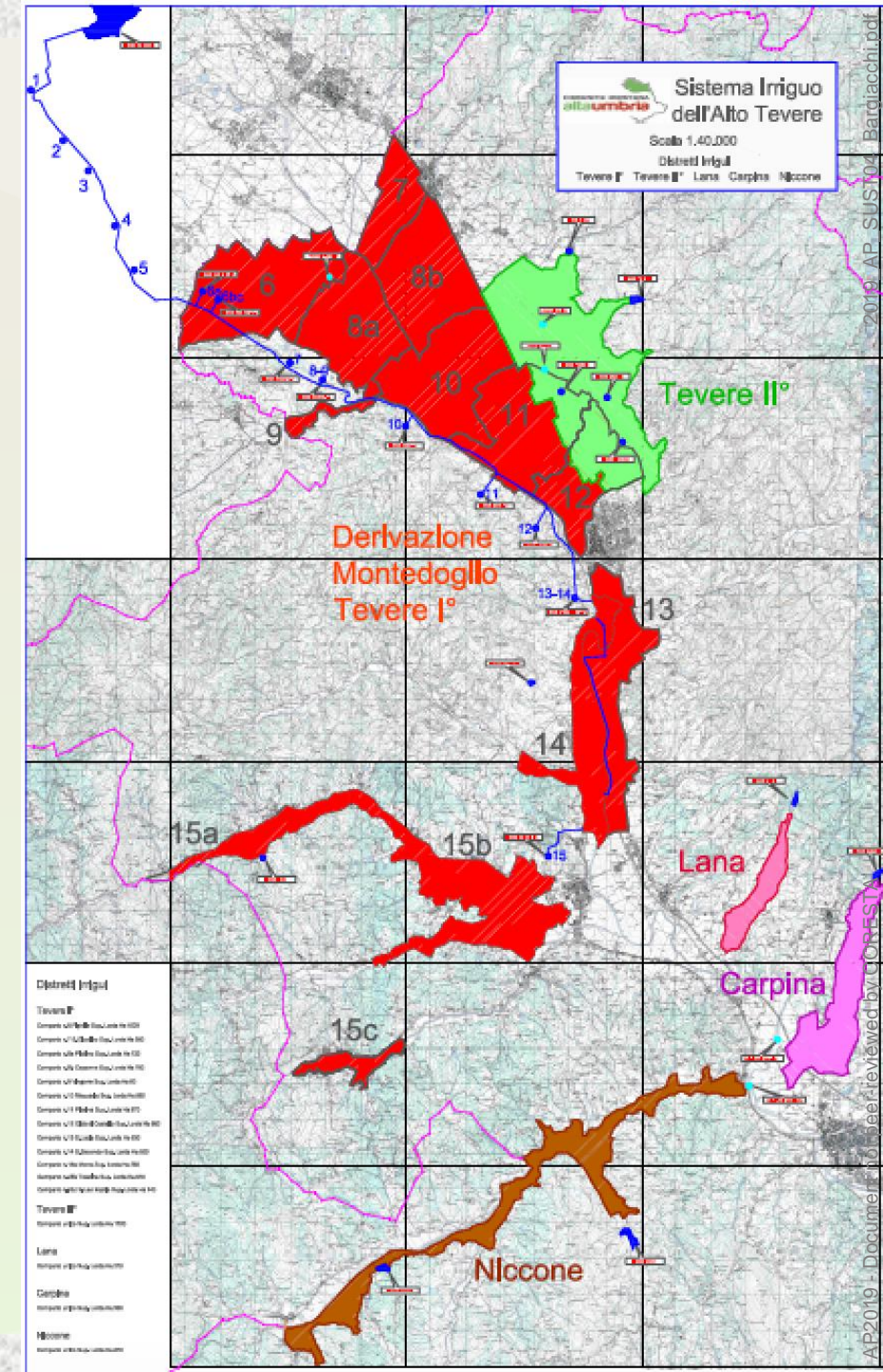
INFRARED THERMOMETERS

CONCLUSIONS OF CALIBRATION TESTS 2010-2011

- ◆ Indirectly, measuring leaf temperatures, as compared to air temperatures, the water status of the soil can be determined, thence when it is necessary to begin irrigation.
- ◆ IRT measurements of leaves in full sun, carried out at noon or soon after (11:00-16:00 solar time), are in good correlation with Tensiometers, and can be used to determine best time for irrigation, on a field basis.
- ◆ This technique is relatively unexpensive, easy, user's friendly for growers, and avoids empiricism in the irrigation technique, therefore leading to a better water use efficiency.

MIDAR Project in progress

- To determine by remote sensing water stress and cross-checked with proximal sensing
- Best time to irrigate
- Best techniques: microirrigation
- Control of the water use by agriculture in the area



Miscellanea

- 1) BURLA G., MILLI G., MIELE S., BARGIACCHI E., 2013. *Evolution in tobacco crop agrochemical use over the last 30 years to reduce leaf residues, and environmental impact*. CORESTA 2013 Agro-Phyto Meeting, Brufa di Perugia
- 2) MILLI G., MIELE S., BARGIACCHI E., ROMANI A., 2013. *Approaching the first station on the way to certified organic tobacco: (almost) chemical-free tobacco*. CORESTA 2013 Agro-Phyto Meeting, Brufa di Perugia
- 3) MILLI G., MIELE S., BARGIACCHI E., ROMANI A., 2013. *Effects of legume cover crops on soil characteristics and Virginia bright tobacco fertilization*. CORESTA 2013 Agro-Phyto Meeting, Brufa di Perugia
- 4) MIELE S., BARGIACCHI E., MILLI G., 2013. *A biobed to recover and detoxify polluted external washings of ag equipment used for tobacco treatments*. CORESTA 2013 Agro-Phyto Meeting, Brufa di Perugia, web-Proc.
- 5) CAMPO M., ROMANI A., MIELE S., BARGIACCHI E., 2013. *A non-invasive optical method for quality control of maturing and cured tobacco leaves*. CORESTA 2013 Agro-Phyto Meeting, Brufa di Perugia
- 6) MILLI G., BARGIACCHI E., MIELE S. , 2014. *Comparative tests among nematode agrochemicals and alternative products on Virginia Bright tobacco*. CORESTA Congress Quebec (Canada) Oct. 10-17, 2014, presentation AP07, CORESTA web.
- 7) MIELE S., TEGLI S., GARCIA IZQUIERDO C., CERBONESCHI M., BARGIACCHI E., 2019. *Hydrolysable tannins in agriculture*. In: *Tannins - Structural Properties, Biological Properties and Current Knowledge*. DOI: <http://dx.doi.org/10.5772/intechopen.86610>.



**Thank You for Your
attention!**