APPROACHING THE FIRST STATION ON THE WAY TO CERTIFIED ORGANIC TOBACCO: (ALMOST) CHEMICAL-FREE TOBACCO

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GENERAL RULES OF CERTIFIED ORGANIC FARMING

- A sustainable agriculture with a responsible use of energy, water, soil, organic matter, air
- A biological-based, non GMO-agriculture, with limited use of external inputs
- A farming system targeted to the maintenance and enhancement of soil life, natural soil fertility and biodiversity

WHAT IS A CERTIFIED ORGANIC CROP

- It's a crop produced in a traced and tracked system, according to cropping rules excluding the use of (most of) the chemical inputs.
  - Why "most of"? Because, for example, sulphur, copper sulphate, mined potassium sulphate, etc., are "accepted products"

- Authorization is subdued to repeated controls carried out by domestic control organisms, according to a common EU's validation process

- Reg. (EC) 2007/834 strictly indicates how to operate "organic". Further restrictions can be posed by Regional Agencies for Agriculture or control organisms

HOW TO SWITCH TO CERTIFIED ORGANIC FARMING

- In general, the entire farm shall be managed in compliance with the requirements applicable to organic farming
- In very few cases a holding may be split up in clearly separated units, keeping land, production inputs and products separated for the conventional and organic units
- Switching to organic requires 2-3 years of conversion period. During this period, the grower operates in compliance with the requirements of the organic farming system, but the productions will be labeled only as "**in-conversion products**", not "organic products"

THE RULES IN CASE OF USE OF EXTERNAL INPUTS

- All the external inputs shall be from organic production
  - This includes: seed and transplant seedlings!
- All the external inputs shall be natural or naturally-derived substances
- Mineral nitrogen fertilizers shall not be used
- Only authorized fertilizers and crop protection products shall be used
- The use of biodynamic preparations is allowed

THE SITUATION OF TOBACCO

- Although a progressive trend towards a general reduction in the use of chemical fertilizers and agrochemicals, tobacco still requires **high fossil energy** and agrochemicals inputs

- This intensive use has a negative impact on crop costs, the environment, and the entire tobacco production chain:

  1) at the sites where these agrochemicals are manufactured (energy, pollution)

  2) at the fields where tobacco is cropped (costs, pollution)

  3) during post-harvest processing (residues)

MAJOR CONSTRAINTS TO CERTIFIED ORGANIC TOBACCO

- Higher production costs for burocracy, dedicated farms, expensive external inputs, weed, and sucker control, less consistency in good yield targets
- Questionable availability of certified organic seed
- Non compliance of float-system with the principles of organic agriculture as stated by UE (specific authorization?)
- Problems of correct management for Virginia Bright tobacco of a Nitrogen fertilization fully based on organic fertilizers (= Nitrogen curve release not always matching with crop requirements)
- Problems to control some pests and diseases

WHAT'S ALREADY "ORDINARY" TECHNIQUE (VALID + COST-EFFICIENT)

- Seedbed (float system under greenhouse)
- In the field

WHAT HAS PROVED VALID (BUT PRESENTLY NOT COST-EFFICIENT FOR CONVENTIONAL TOBACCO

- Seedbed (float system under greenhouse)
- In the field

WHAT IS UNDER INVESTIGATION

- Crop protection

SEEDBED:

- Annual change of the used plastic materials: bed & cover films, trays, as prevention measure to limit diseases spreading and avoid chemical disinfection
- Greenhouse protection against insects with nets
- Baits for slugs with ferric phosphate
- Control of Blue mold with Copper derivatives (products authorized also for organic farming)

SEEDBEED:

RHIZOSPHERE BACTERIA/VA MYCORRHIZAL FERTILIZERS/TRICHODERMA SPP.
(Product labeled for organic farming, rates: 0.6 and 1.8 g/m^2)

April 14, 2009

Uneven germination & spiral rooted plants…

May 11, 2009

…But no fertilizers and crop protectants

SEEDBEED:

RHIZOSPHERE BACTERIA/VA MYCORRHIZAL FERTILIZERS/TRICHODERMA SPP.

RESULTS

- Formulation and application technique should be finer-tuned to avoid uneven plant early growth
- However, at transplanting, plant growth and protection were beyond expectations, and comparable to control (chemically fertilized and protected plants)
- Until now, not for conventional tobacco (cost-efficiency)
- Anyway, disease control consistency should be monitored for more cycles before spreading this technique on large areas

IN THE FIELD:

GOOD FARMING PRACTICES TO CONTAIN TOBACCO FERTILIZATION COSTS

- Frequent soil/plant/water/fertilizer tests
- Green manuring
- Efficient fertilizers and application (plant placement) to reduce fertilizer rates
- Use of digested effluent from anaerobic digestion plant

FERTILIZER PLANT PLACEMENT

GRANULE SIZE : 0.8-1.2 mm Ø

TYPICAL PRODUCT: 11.46.0+2 Zn

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SWITCHING TO SOME AUTHORIZED FORMULATION FOR ORGANIC FARMING

USE OF DIGESTED PHASE IN PARTIAL REPLACEMENT OF FOSSIL FERTILIZERS

SILAGE CORN YIELD T/HA	51.8		
DIGESTED PHASE	Liquid	Solid	TOTAL
T/Ha	23.1	7.0	30.1
Total N %	0.40	0.28	
Total P_2O_5 %	0.25	0.16	
Total K_2O %	0.70	0.35	
N kg/ha (50% yearly availability)	46	10	**56**
P_2O_5 kg/ha (50% yearly availability)	29	6	**35**
K_2O kg/ha (50% yearly availability)	81	12	**93**

OPERATION SCHEDULE

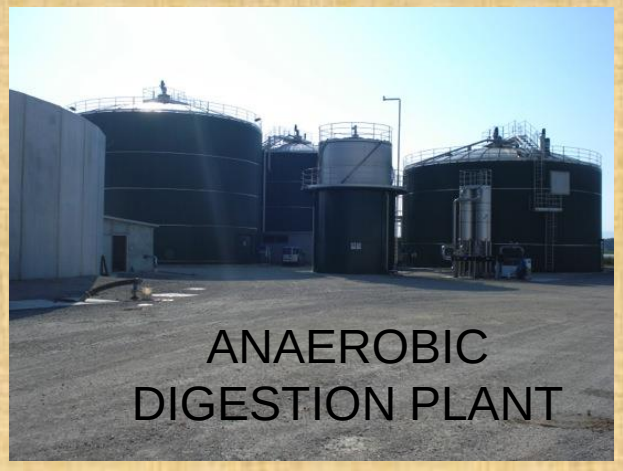
Biomass crop

Harvest of biomass crop

Distribution of solid and liquid waste from biogas

Transplanting

Fertilization of Tobacco with liquid waste



ANAEROBIC DIGESTION PLANT

DIGESTED PHASE IN 2013 FIELD EXPERIMENTS

Date	Quantity		Type	N	P_2O_5	K_2O
June 07-13	Kg/ha	40	Umostart (5/20/0)	2	8	
June 15-13	m^3/ha	10	Liquid Digested Phase	20	12.5	35
June 27-13	Kg/ha	150	Potassium Sulphate			75
Jul 10-13	m^3/ha	15	Liquid Digested Phase	30	19	53
Aug 08-13	m^3/ha	10	Liquid Digested Phase	20	12.5	35
			Total Units	**72**	**52**	**198**

DIGESTED PHASE IN 2013
FIELD EXPERIMENTS (clockwise)

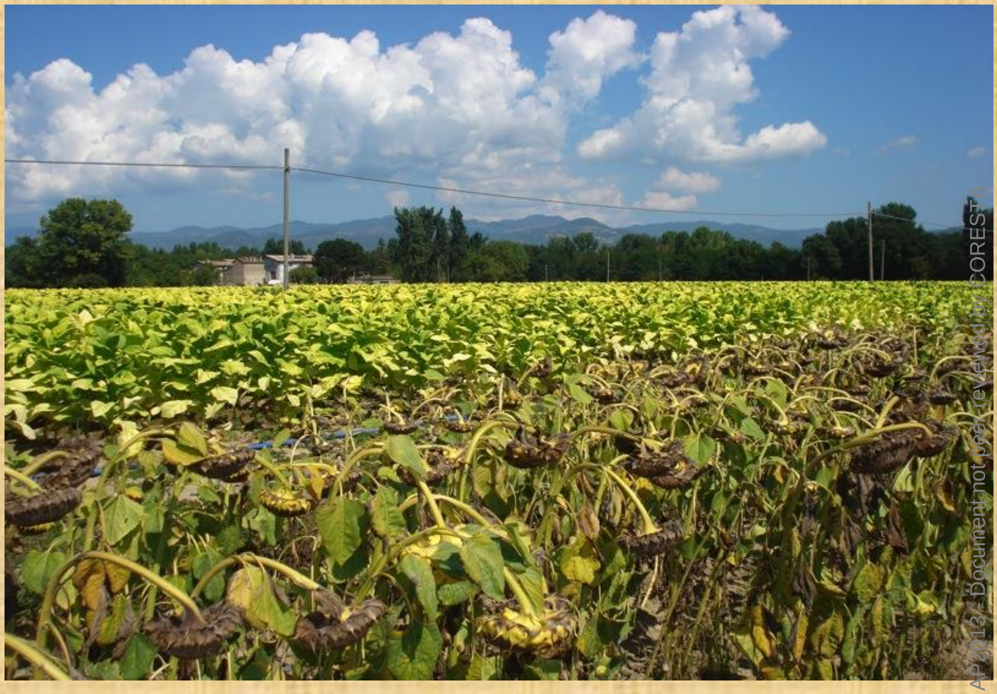
IN THE FIELD:

WEED AND INSECT CONTROL

- Weed: “false sowing” and tillage after transplanting
- Aphids: tobacco fields bordered with sunflower (in 2013, no need of colonization with beneficial insects)
- Flea Beetles:

  Presently no biological control
- Cut worms, bud worms:

  Bacillus Thuringiensis



IN THE FIELD:

NEMATODE CONTROL

- Natural tannin extracts to control nematodes:
  - In transplant water at 4-5% concentration
  - 4 treatments in microirrigation (in total: 30 kg/ha)

Tannins
@2% drench water

Fertilizer 7.20.0
@0.5% drench water

IN THE FIELD:

DISEASE CONTROL

Blue mold

There is no biological product with a real efficacy.

This year, after transplanting, we had a dry season: two treatments with Bion MX were sufficient for Blue Mold control (July 16 & 30)

The research team at INSTM is presently investigating on grapes the use of polyphenols + absorbing clays to control fungal diseases: a possible answer also for tobacco?

ENERGY SAVING

BARLEY: A WINTER CROP FOR BIOMAS PRODUCTION

- Cover crop
- Extra income for farmers (around 500 net €/ha)
- Positive balance between Methane gas production and curing consumption
- Positive balance between Electric Energy production and curing consumption

CROP	Kg/ha	METHANE mc (+)	METHANE mc (-)	ELECTRIC ENERGY Kw (+)	ELECTRIC ENERGY Kw (-)
BARLEY	30.000	23.285		93.130	
TOBACCO	3.000		2.358		3.555
BALANCE		+ 20.927		+ 80.144	

FINAL RESULTS

?

- **L**ugs and **C**utters have been harvested;
- **L**eaf are under curing:
- Harvest will be completed next week
- Yield, quality, Nicotine and Sugars content will be defined sooner

CONCLUSIONS

- Our efforts toward a significant reduction in the use of external chemical input on tobacco are in progress;
- They produced important results for fertilization and some pest control, with better use of natural resources; improvement of tobacco LCA and increased crop cost-efficiency;
- However, switching from a full chemical to a mixed chemical-biological strategy to feed and protect tobacco is **only** the first step toward certified organic tobacco, but it's still far away (market expectation and burocracy);
- Certified organic tobacco has higher production costs and some technical problems not solved yet. We are working on these problems to prepare a trustable roadmap for the growers, but market expectations will make the difference

THANK YOU FOR YOUR ATTENTION