Environmental Outcomes of Conservation Agriculture in North Italy

Stefano Brenna

ERSAF – Regional Agency for Agriculture and Forests of Lombardy (Italy)

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SUMMARY

- **CONSERVATION AGRICULTURE IN NORTH ITALY**

- **CONSERVATION (CA) vs CONVENTIONAL (CV)**
  Soil Indicators
  Soil Organic Carbon content – SOC stock (t/ha)
  Soil Biological Fertility – IBF index

- **ACTION AND PROJECTS PLANNED**

CONSERVATION AGRICULTURE IN NORTH ITALY

CROPLAND = 4.5 million hectares

CA = 4.5%

AVERAGE SOC STOCK (Po Plain) = 34 – 60 t/ha

(increasing SOC concentration by 0.1 points = CO_2 storage of about 60 million tonnes)

RURAL DEVELOPMENT PLANS (Regions of Veneto and Lombardy) = incentives provided to farmers shifting from CV to CA

CONSERVATION vs CONVENTIONAL

Project AgriCO$_2$ltura - ERSAF

STUDY SITES

Vertisol (WRB, 2006)
Clay = 45-55 %
Sand = 5-10 %
pH = > 8

Rainfall = 650 mm/year

Crops
Winter cereals, maize, sorghum, alfa alfa, soybean
Cover crops = YES
Manure = NOT

Luvisol (WRB, 2006)
Clay = 10-14 %
Sand = 40-60 %
pH = 5.5-5.9

Rainfall = 735 mm/year

Crops
Winter cereals, maize, soybean, forage crops
Cover crops = NOT
Manure = CA: NOT
CV: YES
(2-4 t/ha/year OC)

CONSERVATION vs CONVENTIONAL

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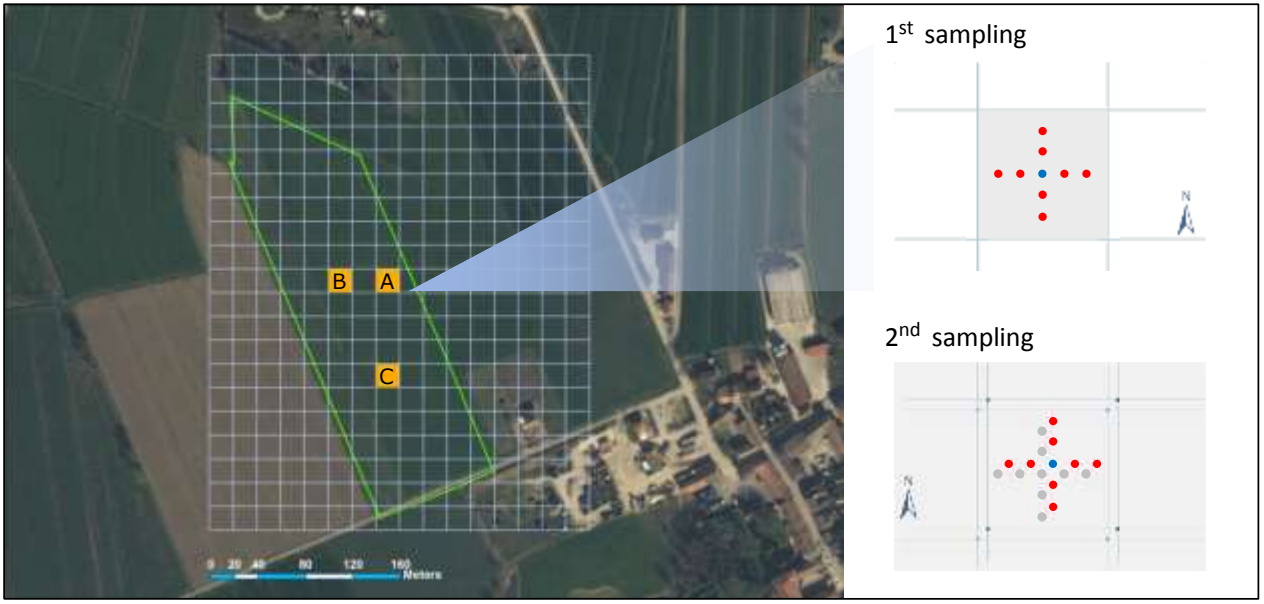
EXPERIMENTAL APPROACH



<u>For each study site</u>

6 text plots (~ 5 ha per plot)

- 3 CA - no till since 10 years
- 3 CV - ploughed

<u>Sampling scheme</u>

6 replications per plot

Composite samples (9 sub samples)

depth = 30 cm

<u>Lab. Analysis</u>

SOC concentration, BD

TOC, microbic and respiration biomass (for IBF computation)

<u>Carbon Balance</u>

Simulation model ARMOSA

CONSERVATION vs CONVENTIONAL

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SOC Stock

SOC stock under conservation and conventional tillage (Dumas)

Soil	Management	Organic Carbon Stock (t/ha)	
		Mineral Soil (30 cm)	Crop residues
Vertisol or Vertic Cambisol, fine	CA practices	63.70 ± 7.75	2.84 ± 1.56
	Conventional tillage	45.34 ± 6.22	
Luvisol, coarse loamy	CA practices	46.20 ± 7.99	4.79 ± 2.56
	Conventional tillage	47.44 ± 7.91	

		1st site	*2nd site*
Soil Map (year 2000)	*SOC stock*	*43.8 t/ha*	*38.1 t/ha*
Carbon balance(*)		*CA>>CV*	*CA>CV*

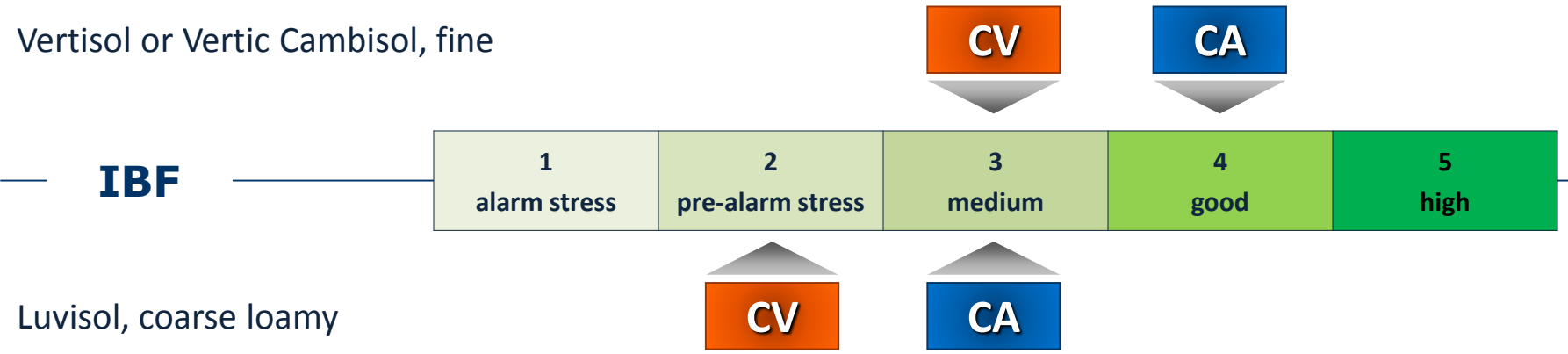
(*) confirmed by modeling analysis (ARMOSA)

CONSERVATION vs CONVENTIONAL

Project AgriCO_2ltura - ERSAF

IBF Index

IBF index under conservation (CA) and conventional tillage (CV)



- developed by CRA (Experimental Institute for Plant Nutrition, Rome) and validated for Mediterranean soils
- parameters considered: TOC, carbon of the microbic biomass, basal and cumulative respiration, metabolic quotient and mineralization quotient
- a score (from 1 to 5) is assigned to each parameter and the algebraic sum of the scores gives the IBF index, as a scale of five classes

….. TOWARDS NEXT PROJECTS

Life+ "HelpSoil" (LIFE12 ENV/IT/000578) - Helping enhanced soil functions and adaptation to climate change by sustainable conservation agriculture techniques

Started in July, 2013, the project is aimed at monitoring indicators of soil ecosystem functions and assessing the capacity of CA practices to restore agro-ecosystems to a more sustainable and productive state, comparing the environmental and agronomic performance of CA and CV management practices in 20 demonstrative farms throughout the whole North Italy

EXPO CO_2 – promoting and testing a carbon emission offset scheme to bring together opportunity for reduction in GHGs emissions and generation of carbon credits by farmers

SOME FINAL REMARKS …… *(1)*

- **CA improves soil functions, can be actually applied even if practices have to be adapted to the local pedoclimatic conditions and farm types**
- **CA can be a more profitable, sustainable and resilient way to manage soils and produce food and feed**
- **at farmers eyes, how to till the soil is usually/often the crucial issue**
- **from environmental point of view, instead, the key factor is the application of all the principles of CA (minimal or no soil disturbance, permanent land cover and crop diversity) together …. and probably crop rotations and cover crops are the most important**
- **Environmental outcomes are still strongly influenced by a relatively poor application of these principles**

SOME FINAL REMARKS …… *(2)*

- **further efforts are needed:**

- **to support strategies for soil protection adapted to any specific local condition, in order to identify viable solutions for farmers and optimize environmental benefits**
- **to contribute to the dissemination of CA practices and convince farmers they are applicable, suitable, able to sustain profitability and create new perspective**

Thank you for attention

http://www.ersaf.lombardia.it
http://www.lifehelpsoil.eu