MAY VINEYARD FLOOR MANAGEMENT AFFECTS INDICATORS OF SOIL QUALITY?

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Soil management techniques may influence ***soil vulnerability*** to threat factors such as ***erosion***, ***compaction***, ***loss of organic matter and biodiversity*** and, interacting with pedoclimatic and geo-morphological conditions, may regulate soil fertility. Soil disturbance actions, such as tillage, may affect edaphic community, but this topic has been very poorly studied in vineyards.

The ***objective of the study*** was to evaluate the impact of soil chemical-physical features and floor management practices on soil ***biological quality*** in vineyards of ***Langhe*** (North-West Italy). The ***steep slopes*** (10-20 %) and the high vulnerability to soil erosion cause severe limitations to the soil use, increasing the spread of viticulture. Erosion effects and landslides are increased in this area as a consequence of climate changes. The fragility of this land is amplified by many factors including the not always suitable cultivation techniques.

Langhe area is now in the **World Heritage List** of **UNESCO**

Characterization of the sites: soil classification, estimation of erosion, description of used floor management techniques (Table 1), chemical-physical analysis, estimation of width and coverage of the summer grass cover and of soil compaction (by bulk density measure) (Figure 1), soil biological quality, by respiration and microbial carbon analysis and qCO2 (Figure 2), and microarthropod assessment as BSQ-ar (Figure 3).

*Table 1. **Slope**, **soil order** and **texture** (USDA, Soil taxonomy); estimated soil **erosion** (Wieschmeier equation);*

soil permanently covered by grass			soil tilled in autumn	
Sites	Slope ( )	Soil order	Soil Texture	Soil erosion ($t \cdot ha^{-1} \cdot year^{-1}$)
271	3	Inceptisol	Loam	4
273	14	Inceptisol	Loam	**22**
283	13	Inceptisol	Silty loam	8
288	8	Inceptisol	Silty clay loam	7
290	14	Entisol	Silty clay loam	3
291	20	Inceptisol	Loam	8
292	19	Inceptisol	Loam	**77**
293	10	Inceptisol	Silty clay loam	**44**
295	18	Entisol	Clay loam	**43**
296	10	Alfisol	Clay loam	7
272	5	Entisol	Silty loam	**46**
274	5	Entisol	Silty loam	2
284	13	Inceptisol	Silty loam	**27**
285	16	Entisol	Silty loam	13
286	17	Entisol	Silty loam	2
287	12	Entisol	Silty loam	**31**
289	12	Entisol	Silty loam	**20**
294	20	Entisol	Loam	2
297	20	Entisol	Silty clay loam	**24**

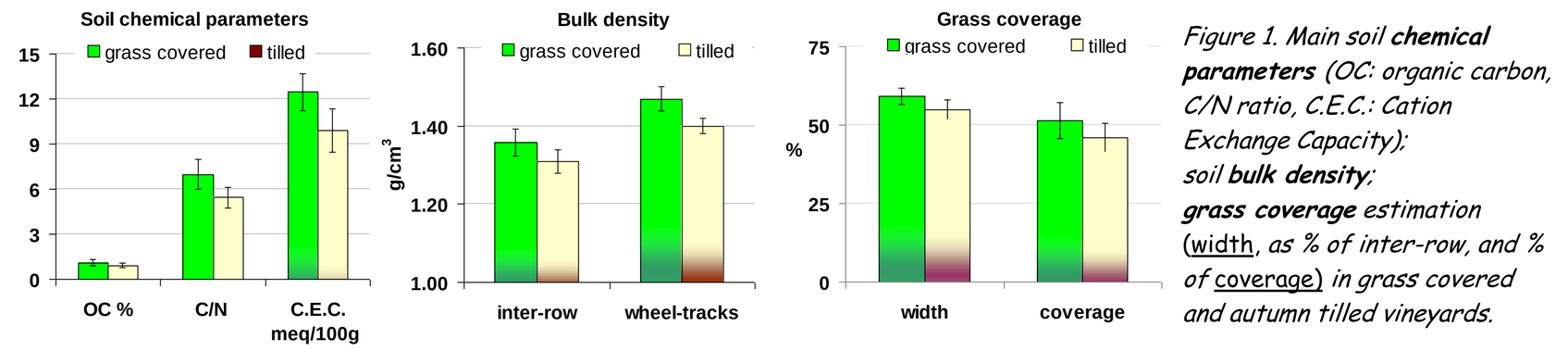

*Figure 1. Main soil **chemical parameters** (OC: organic carbon, C/N ratio, C.E.C.: Cation Exchange Capacity); soil **bulk density**; **grass coverage** estimation (width, as % of inter-row, and % of coverage) in grass covered and autumn tilled vineyards.*

Many sites present high values of estimated erosion (> 16 t ha^{-1} $year^{-1}$) (Table 1). However, in choosing the floor management technique, growers do not take into account factors increasing soil propensity to erosion, i.e. soil texture and land slope.

As expected, in **tilled soils** the bulk density was lower both on the middle of the row and on the wheel tracks; nevertheless, even in case of permanent **grass coverage**, the soil compaction was well under the level that may negatively impact on the root growth (1.55 g cm^{-3} for fine soil) (Figure 1).

For that reason, annual tillage in order to loosen and aerate soil is not justify taking into account its impact on erosion, especially on steep slopes and on fine texture soils.

Floor management technique did not influence the ***soil microbial biomass*** and ***activity*** but it seems that seasonal weather may influence the development and activity of the edaphic community.

Low values of qCO_2 indicated a higher efficiency of microbial population in 2013, i.e. microbial biomass requires less substrate to obtain equal energy, reducing the rate of organic matter mineralization.

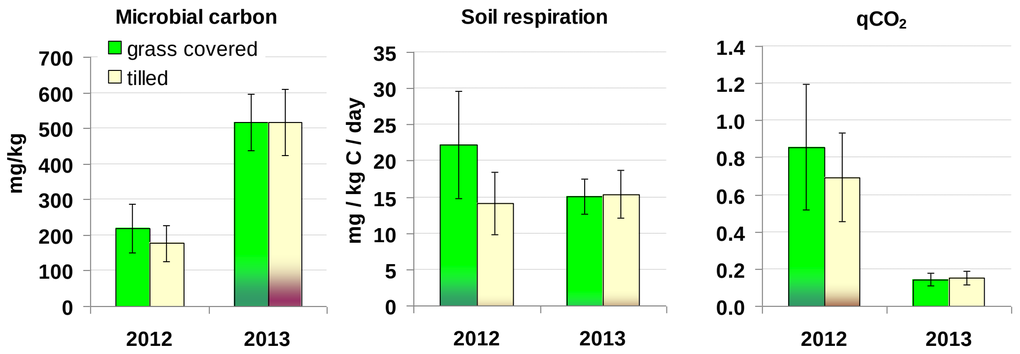

*Figure 2. **Biological fertility indices:** microbial carbon; soil respiration; qCO2 (soil respiration/microbial carbon*100/24).*

Eu-edaphic microarthropods are adapted to deep soil life. Higher is the number of eu-edaphic groups, higher is BSQ-ar value and soil quality.

Contrary to the expected, tilled soils held a higher number of eu-edaphic groups (Figure 3a, b) if compared to grass covered soils.

It was confirmed the impact of seasonal weather (water content, in particular) on the behaviour of the edaphic community (Figure 3c).

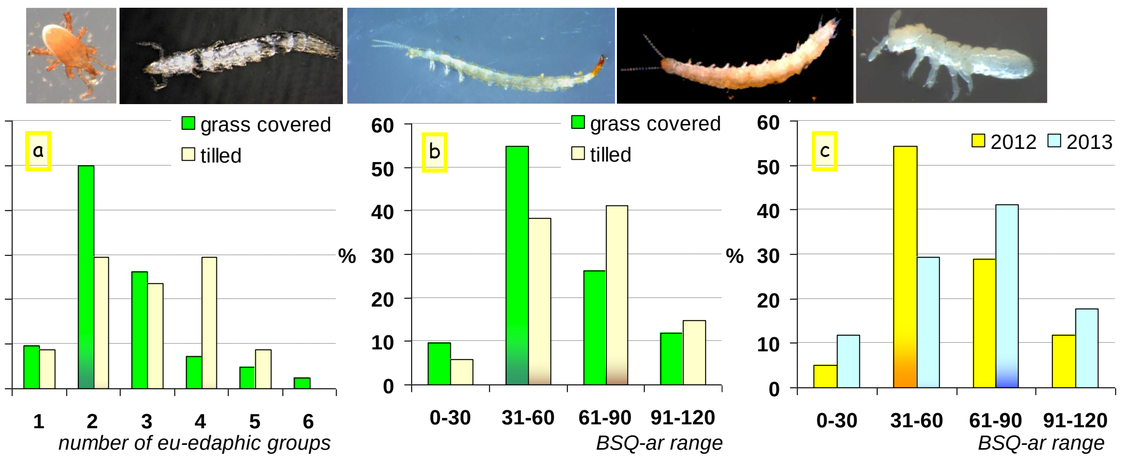

*Figure 3. Percentages of soil samples holding the number of indicated **eu-edaphic groups** (a); percentages of soil samples insert in the chosen **BSQ-ar ranges** depending on management techniques (b) or season (c)*

Autumn tillage is the most diffused floor management practice in Langhe; inter-row natural grass cover is becoming increasingly widespread in the area.

The lack of robust evidence of interaction between cultivation practices and soil quality could be due to the not correct application of these techniques.

It is clear that more efficient practices in protecting soil from threats need to be widely spread, especially in vulnerable areas; for this aim major and deeper information would allowed farmers to be aware in choosing and applying soil management techniques.

… please, refer to the text in the Symposium Proceedings for literature