Introduction

Soil tillage and management concepts are basic operations in viticulture because both interventions may shift the viticultural ecosystem to a stable, sustainable system or if the worst comes to the worst it will partly loose its productivity and will get harmful for surrounding environments through erosion events and nutrient losses into neighboring water bodies.

Material and Methods

Testplots: “Geisenheimer Mäuerchen” (49.96867 °N; 7.949713 °E; 110 m a.s.l.). Slope: 4.5°. Soil: clayey loess derived loam. Seven years after planting (1965) with Riesling/5C, the trial was implemented with 4 replicates for every tillage system (fig. 1) and finished after 20 years.

Results

Permanent grass cover reduces significantly soil pH (fig. 2) in the layer 0-30 cm. Other treatments are non-significant. In addition, PG reduces inorganic P (fig. 3) and soluble/exchangeable potassium (fig. 3a). New nutrient equilibria will be installed. They will improve growth of grapevines and reduce physiological disorders like “bunch stem necrosis”.

Permanent grass and natural grass sod increase soil carbon content significantly against all other treatments (fig. 4). Highest capacity is found in PG. Soil fertility measured with glucosidase and phosphatase activity is also significantly increased (fig. 5 and 6).

Outcomes

Installation of PG and NG in vineyards offer an opportunity to improve soil nutrient balances and higher micronutrient availability (not shown), thus improving the overall nutritional status of grapevines. Soil fertility indicators are always on top in PG and NG.

During the test period of 20 years, PG stored in an average of ≈3.3 t CO₂ x ha⁻¹ x a⁻¹. Neither the control plot nor the tilled ones could significantly increase the soil’s C-stock. PG and also variations of it are promising tools to store atmospheric CO₂ to help in order to overcome partly problems of upcoming climate change.

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