

Litskas et al. Supplementary material.

Table S1. Examples of mitigation actions at farm level to manage carbon and GHG fluxes, identified to be relevant within the EU context. Adopted from [4] Items in italics are actions linked to this research.

Group	Mitigation actions
Land use	Conversion of arable land to grassland to sequester SOC
	Agroforestry
	Wetland/peatland conservation/restoration
	Woodland planting
	<i>Preventing deforestation and removal of farmland trees</i>
	<i>Management of existing woodland, hedgerows, woody buffer strips and farmland trees</i>
Cropland management	Improved crop rotations
	<i>Reduced and minimum tillage</i>
	<i>Leaving crop residues on the soil surface</i>
	<i>Ceasing to burn crop residues and vegetation</i>
	Use of cover/catch crops
Livestock Management	Livestock health management
	Use of sexed semen for breeding dairy replacements
	Choosing breeds with lower methane emissions
	Feed additives for ruminant diets
	Optimized feeding strategies for livestock
Nutrient and Soil management	<i>Soil and nutrient management plans</i>
	Improved nitrogen efficiency
	Biological N fixation in rotations and in grass mixes
	<i>Improved on-farm energy efficiency</i>

Table S2. Soil physicochemical properties in the experimental vineyard. Average values and standard deviation (n=6) are provided for the composite samples collected from a depth of 0-40 cm.

pH	EC ($\mu\text{S cm}^{-1}$)	Clay (%)	Sand (%)	Silt (%)	OM (%)	OC (%)	N%
7.6 (0.1)	441 (166)	42 (4)	30 (2)	28 (3)	5.8 (0.1)	4.08 (0.26)	0.15 (0.01)
C/N	%CaCO ₃	N g kg ⁻¹	Na g kg ⁻¹	K g kg ⁻¹	P g kg ⁻¹	Ca g kg ⁻¹	Mg g kg ⁻¹
27.2 (1.4)	34.9 (2.2)	1.46 (0.11)	0.12 (0.01)	0.57 (0.08)	0.03 (0.02)	1.82 (0.85)	0.13 (0.02)

OM: Organic Matter; OC: Organic Carbon; EC: Electrical Conductivity.

Table S3. Physicochemical properties for the organic material. The average value and standard deviation (n=4) are provided.

pH	EC ($\mu\text{S cm}^{-1}$)	C %	N%	C/N
7.52 (0.09)	2833 (221)	47.58 (0.5)	2.66 (0.31)	17.86 (2.59)

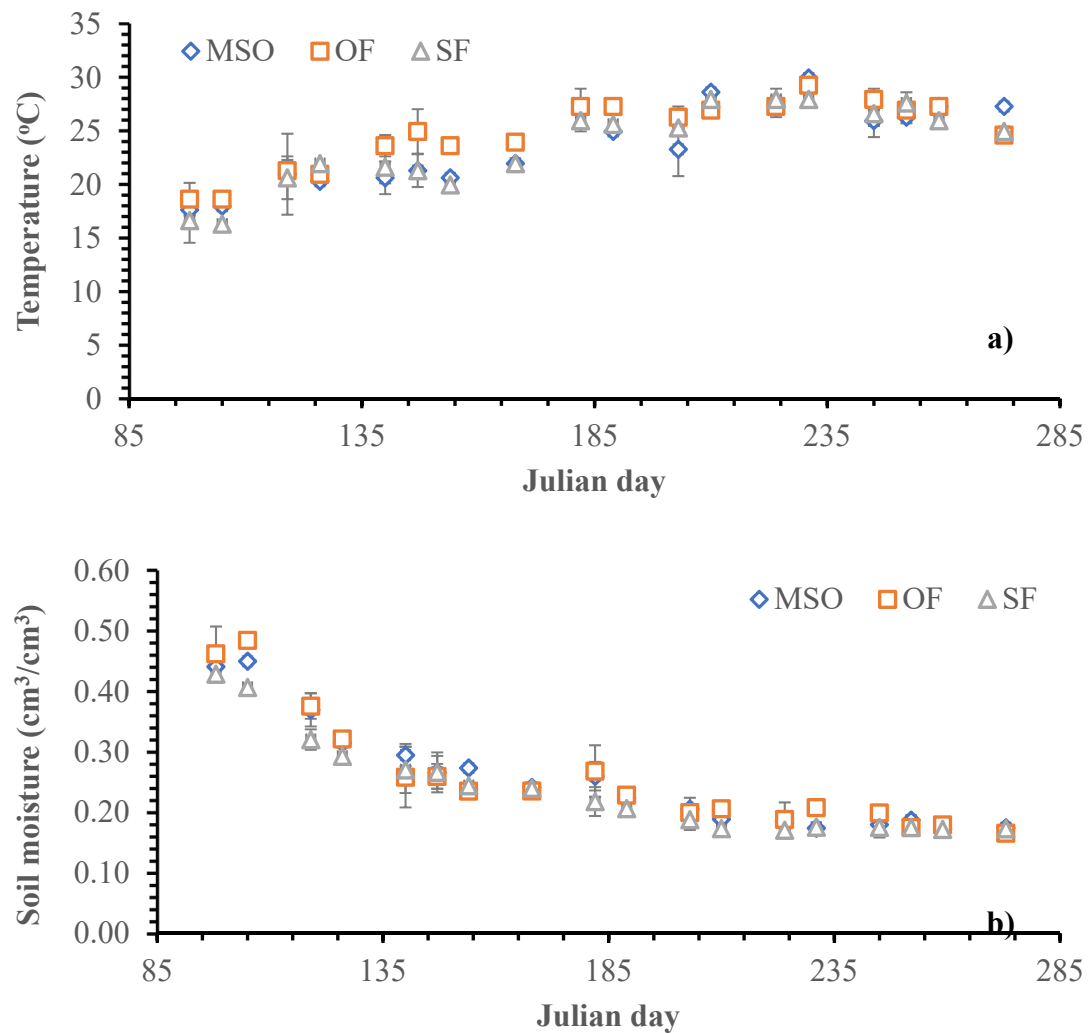


Figure S1. Average (stdev) soil temperature (a) and moisture (b) data for the three treatments (MSO, OF, SF) in the experimental vineyard.

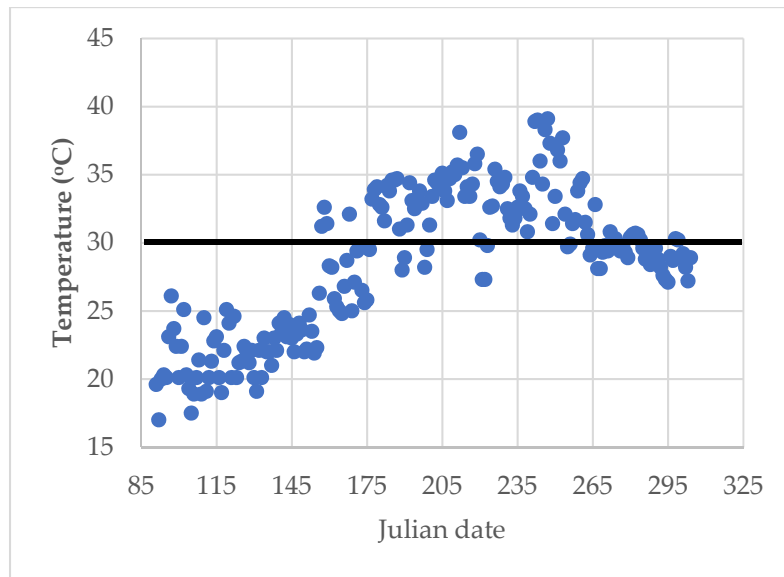
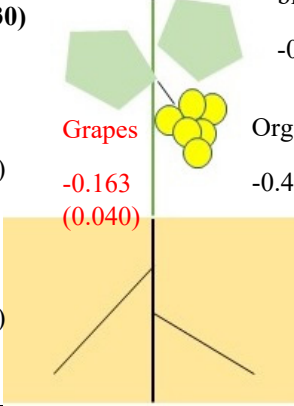
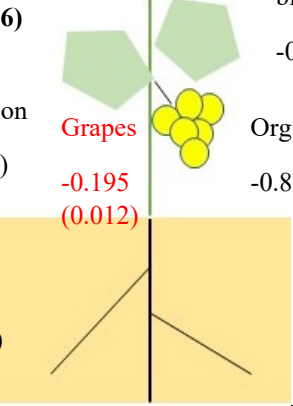


Figure S2. Maximum temperature in the experimental vineyard for the period 1/4/2020-31/10/2020.

Figure S3. Carbon balance in Xynisteri vines (average values in kg C per vine and standard deviation; $n=3$). Berries (grapes; red colour) are not included as they are removed from the system at harvest.

Treatment MSO (mix synth. + org. fertilizer)		Treatment OF (organic fertilizer)		Treatment SF (synthetic fertilizer)	
C balance -0.192 (0.030)		Above ground biomass C -0.483 (0.051)	C balance -0.091 (0.086)		Above ground biomass C -0.563 (0.047)
Soil respiration 0.762 (0.024)	-0.163 (0.040)	Org. fertilizer C -0.433	Soil respiration 1.372 (0.170)	-0.195 (0.012)	Org. fertilizer C -0.866
Roots respiration 0.013 (0.003)		Roots C -0.051 (0.011)	Roots respiration 0.013 (0.003)		Roots C -0.047 (0.010)
Soil C content 20.09 (1.40) kg C (OC measurement at the end of the experiment; per vine and 0.4 m ³ soil vol.)		Soil C content 20.17 (0.98) kg C (OC measurement at the end of the experiment; per vine and 0.4 m ³ soil vol.)		Soil C content 19.59 (1.09) kg C (OC measurement at the end of the experiment; per vine and 0.4 m ³ soil vol.)	

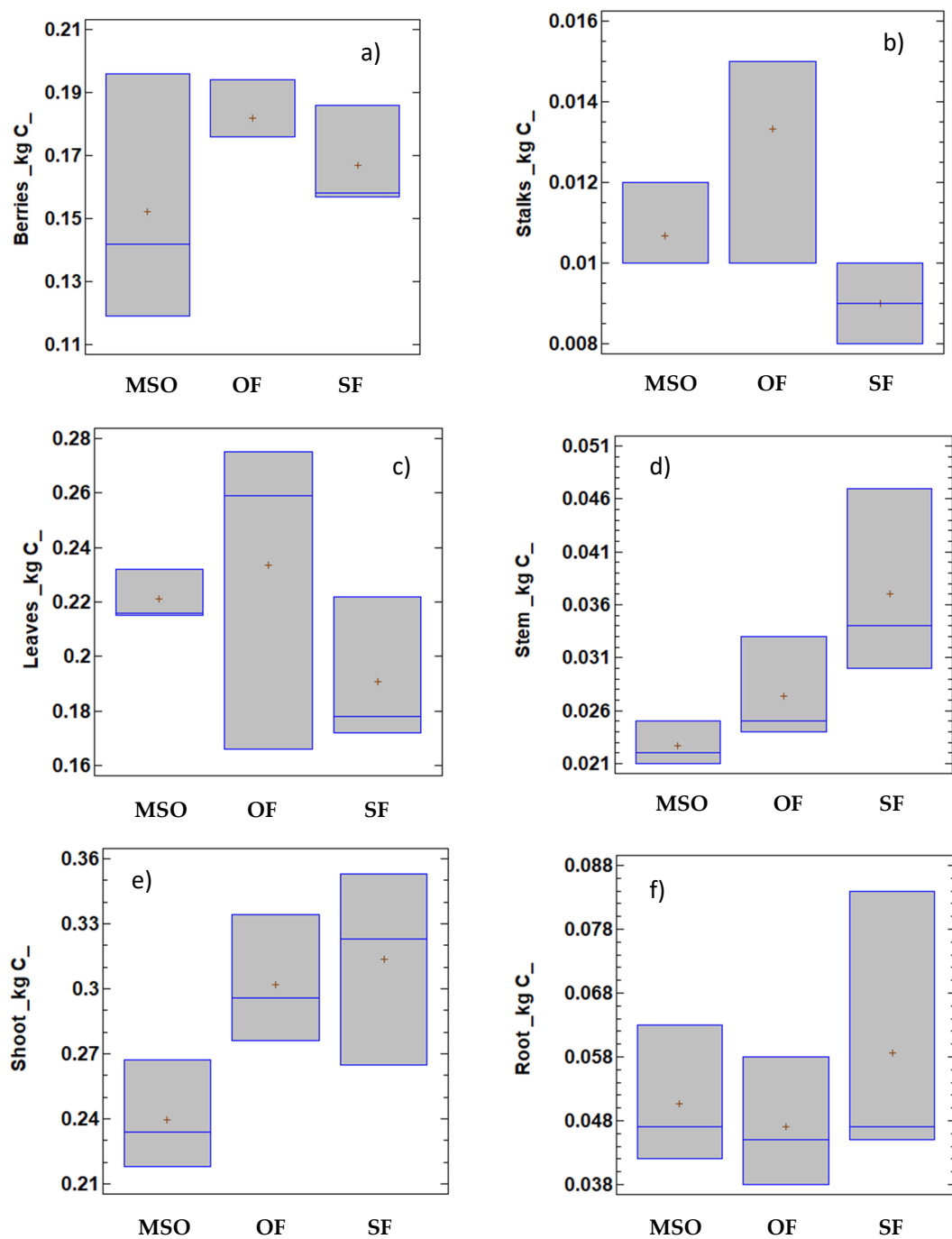


Figure S4. Biomass C (kg C) stored annually per vine and per plant part for the 3 treatments (MSO, OF, SF; see par. 2.3)

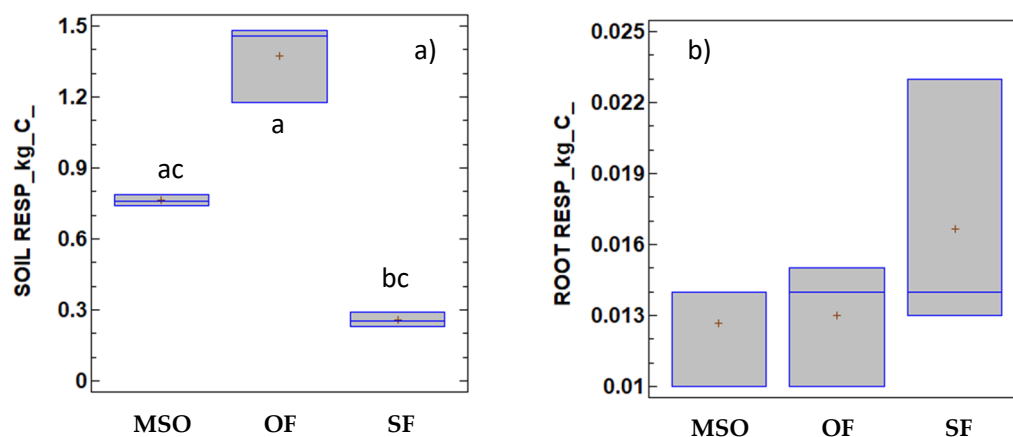


Figure S5. Soil (a) and root (b) respiration (kg C year⁻¹) per vine and treatment. Different letter near the boxplots means statistically significant difference.

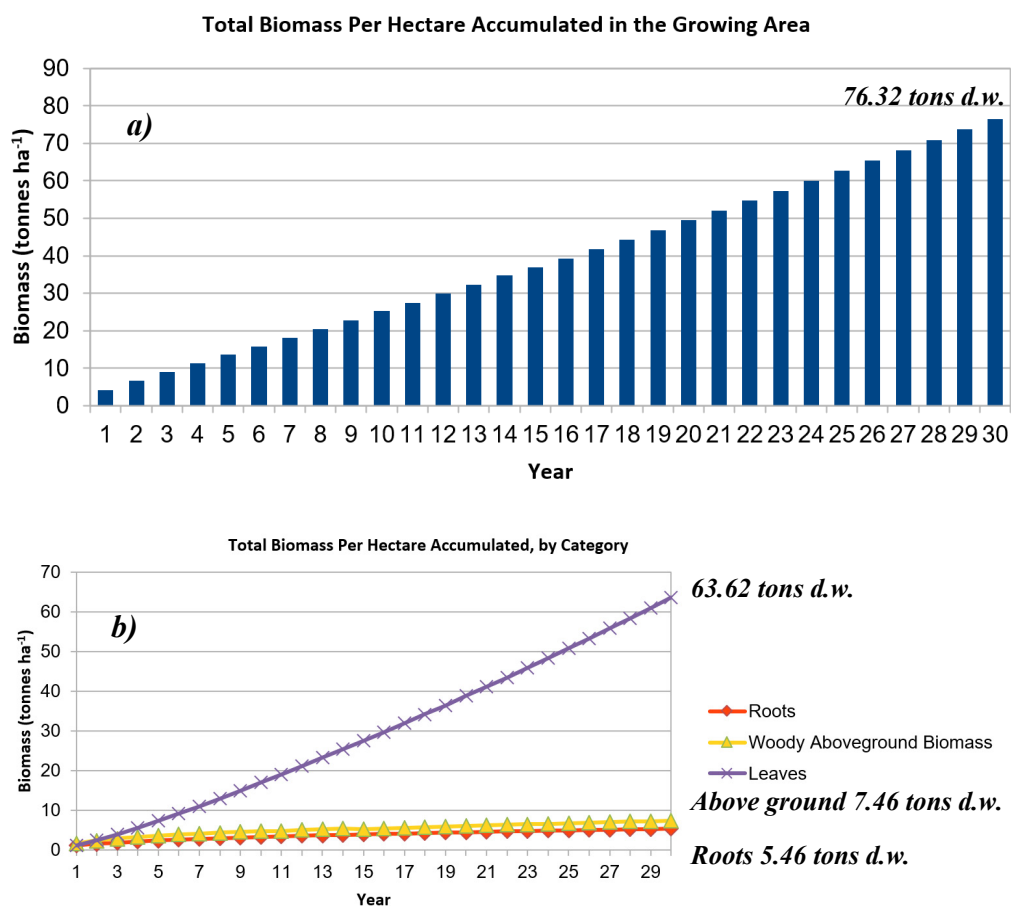


Figure S6. a) Total biomass (grapes excluded). b) Leaf, woody above ground and roots biomass (grapes excluded).

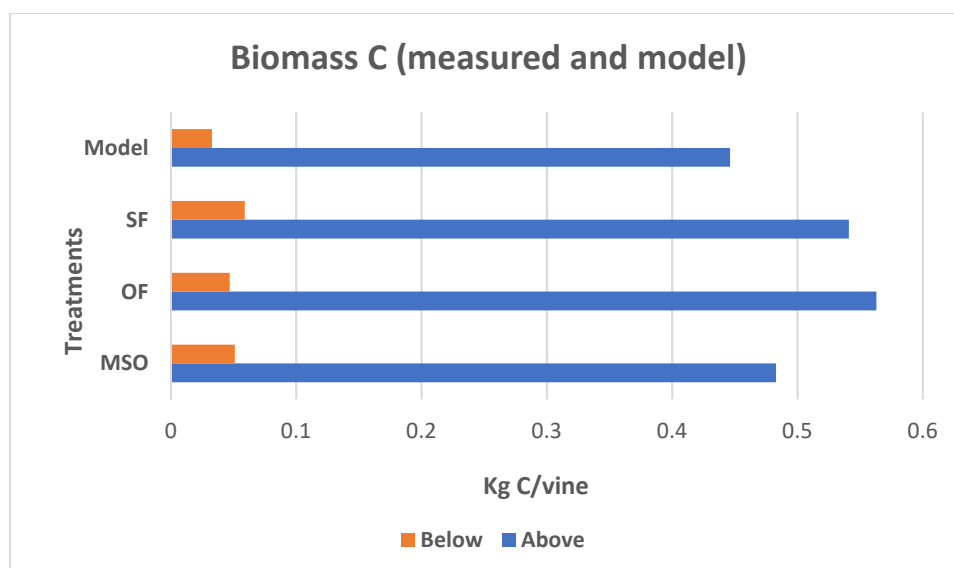


Figure S7. Modelled and measured C for above and below ground biomass. A, B, C are the 3 treatments. Biomass C was assumed to be equal to 50% of the d.w. of the vine parts.

Access to the excel tool used for modelling and described in section 2.6.1 of the manuscript:

https://www.dropbox.com/s/746ry6lf6wrsgfa/Ecowinery_EXPA_160422_New.xlsm?dl=0