



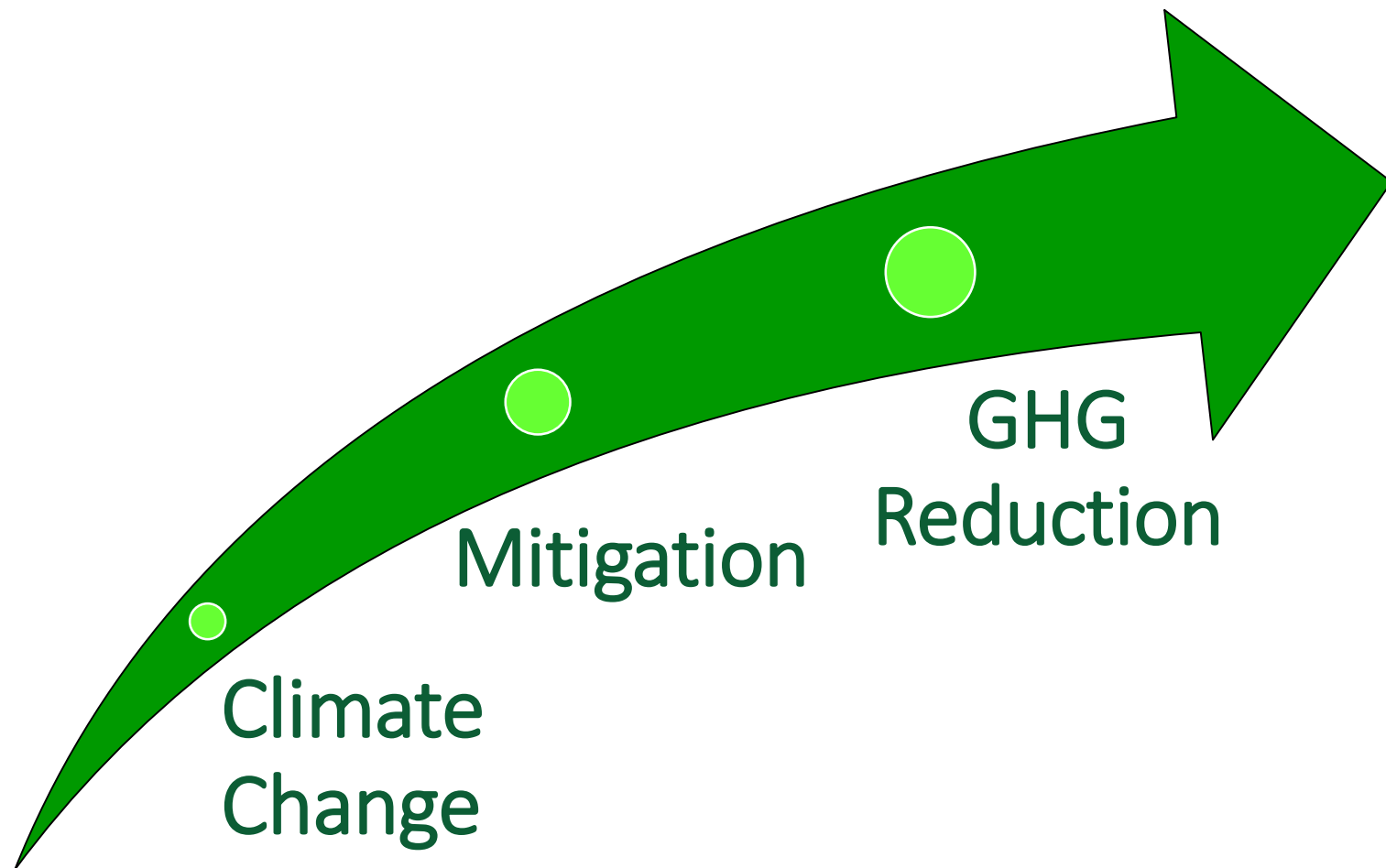
Effects On Soil Green-House Gases (GHG) Fluxes

by

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Miliotou E.

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Reducing greenhouse gas (GHG) emissions is a key aspect of mitigation strategies.

WHY GHG in forest under thinning and soil?



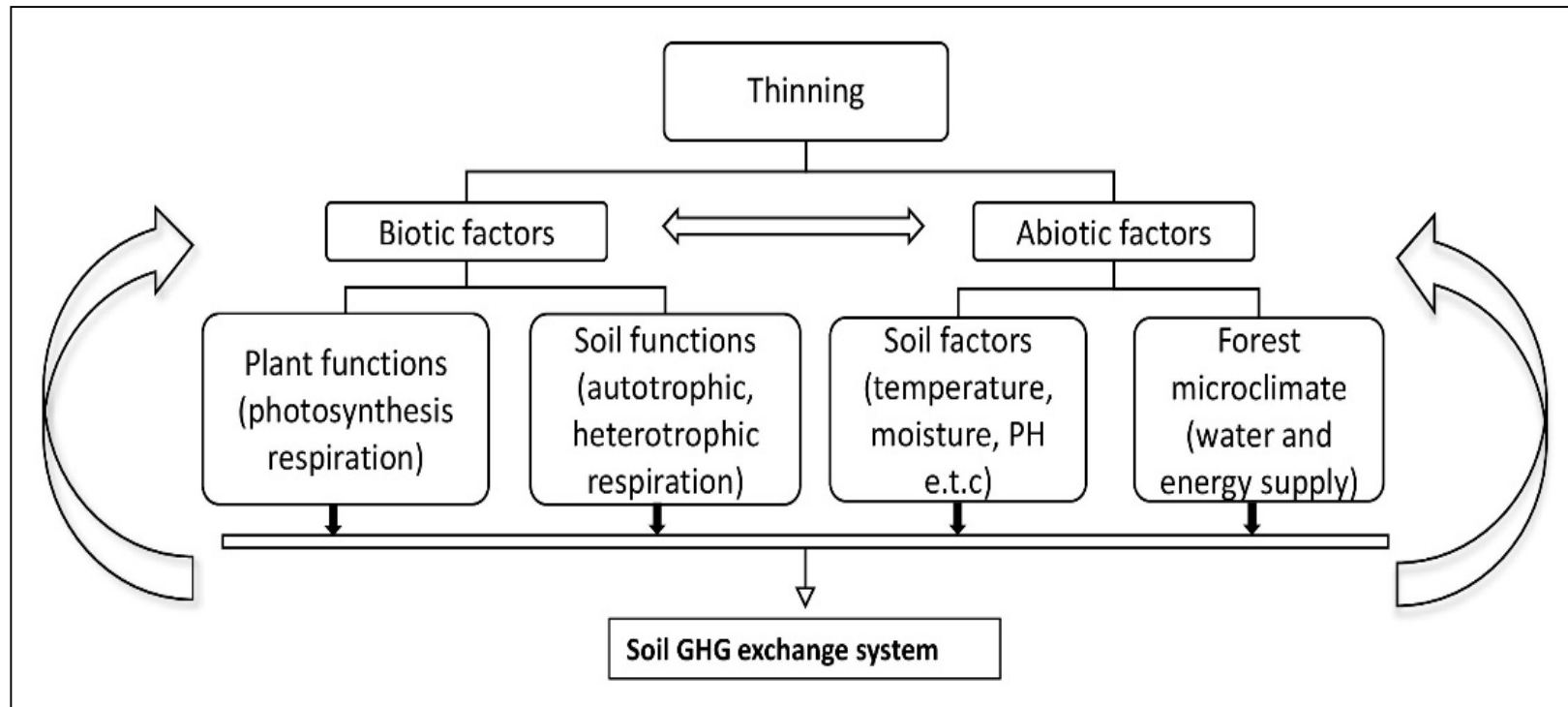
- ✓ In forest ecosystems, climate change mitigation actions are strictly associated with policies related to implementation of forest-management practices such as thinning, aimed at reducing GHG emissions and their climate change mitigation potential.
- ✓ Due to the high participation rate of forest soil to the net exchange of GHG with atmosphere **(about 70% of total GHG emissions)**.
- ✓ **Few data.** Knowledge of the response of thinning implementation on forest soil–atmospheric greenhouse gas (GHG) (CO_2 , CH_4 , N_2O) fluxes exchange system in Mediterranean region is limited because of the high heterogeneity of both soil properties and forest biomass.



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Forest thinning effects on GHG emissions driven by alteration of biotic and abiotic factors.





Methodology:
Closed static chamber
method

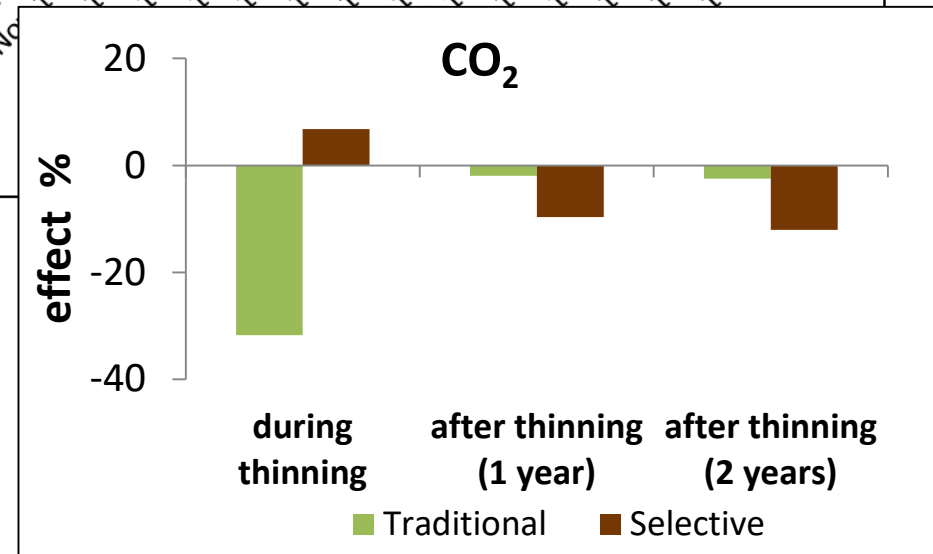
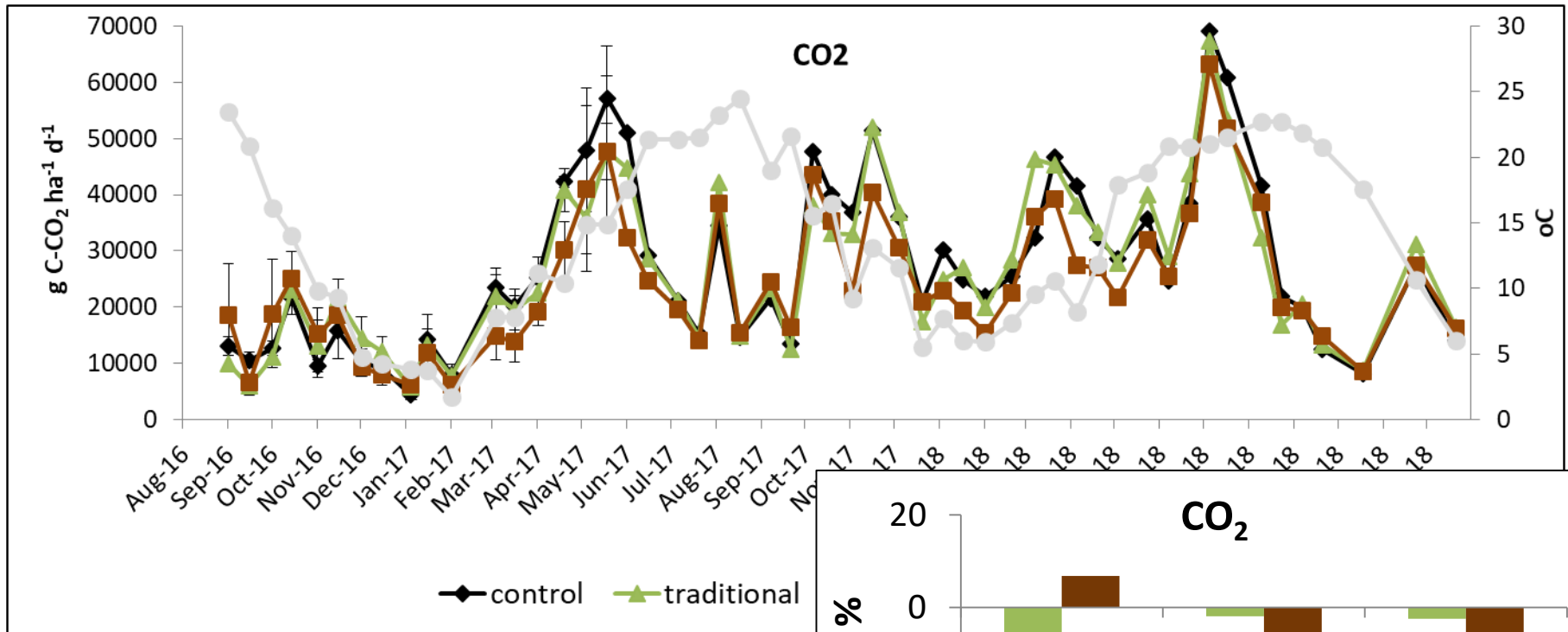


Time:
Twice per month
(or bi-monthly)

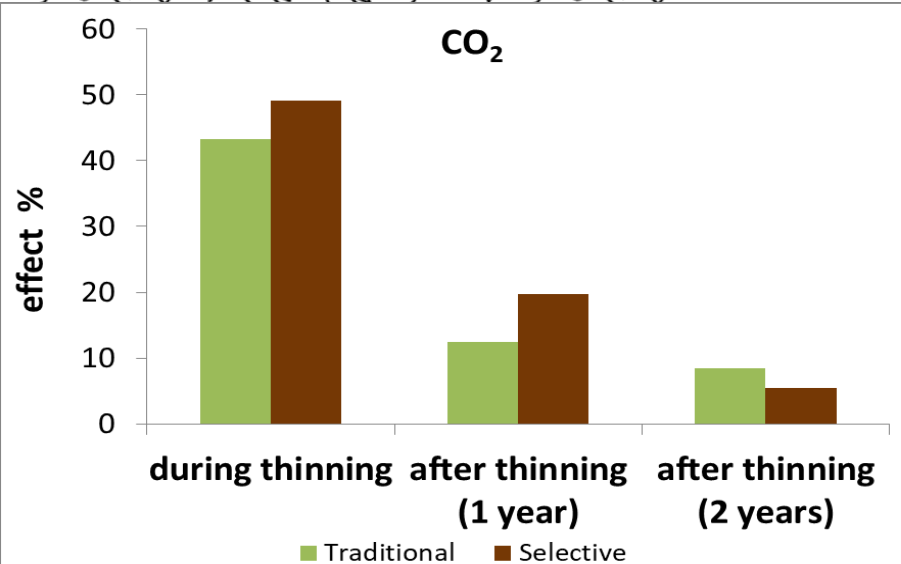
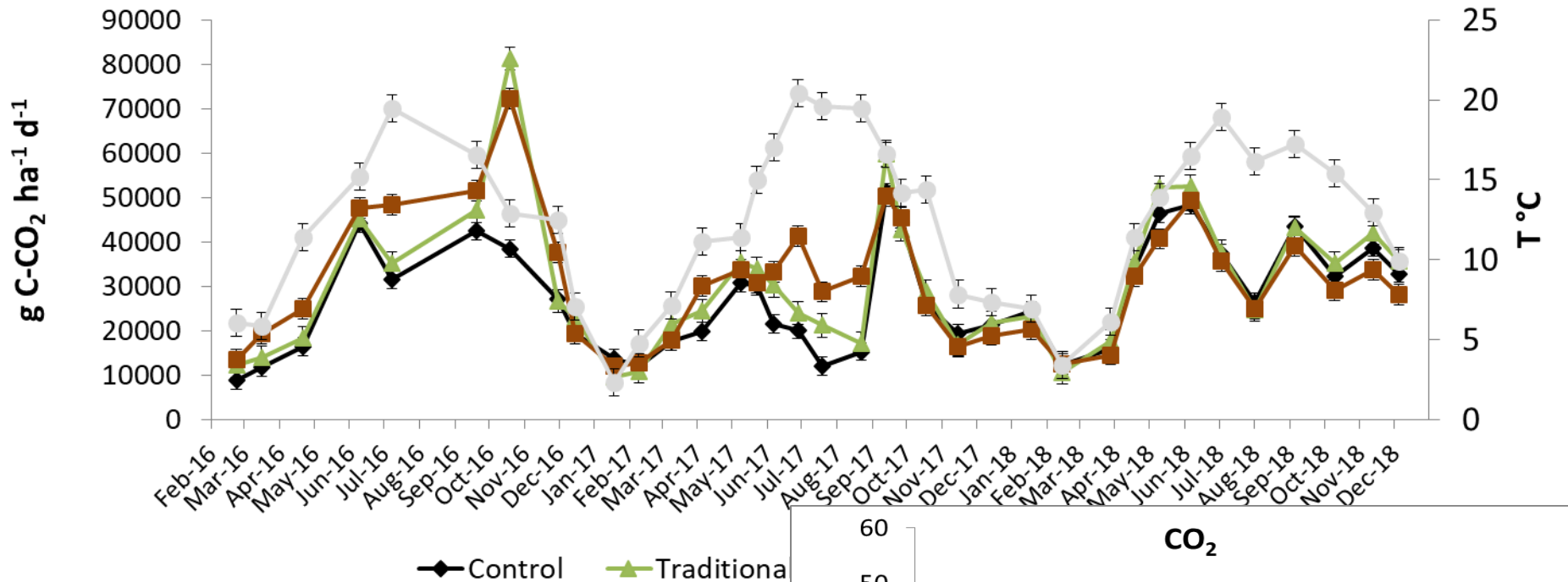


Localization:
Eighteen collars in subplots in
each site (Greece-Italy)

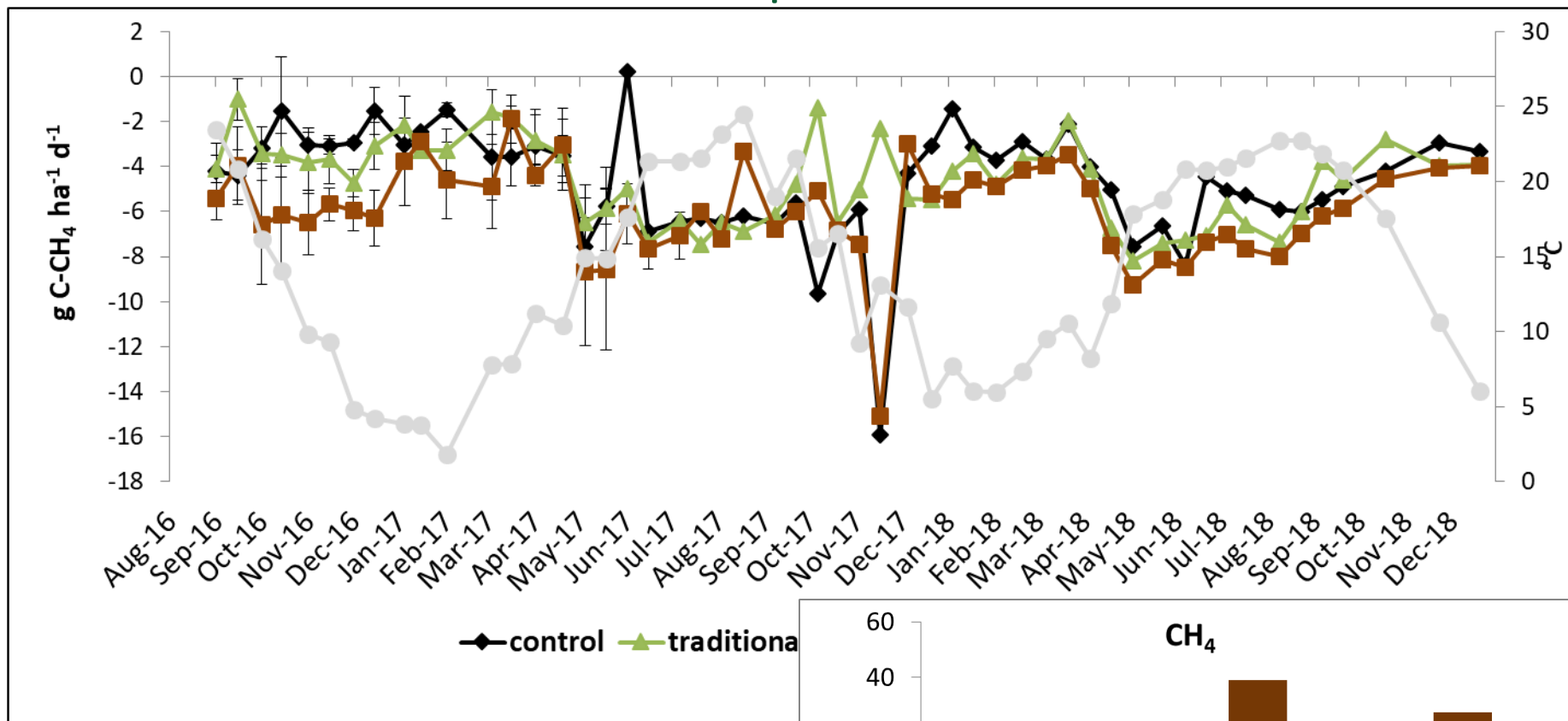
Greece-CO₂ and Tsoil



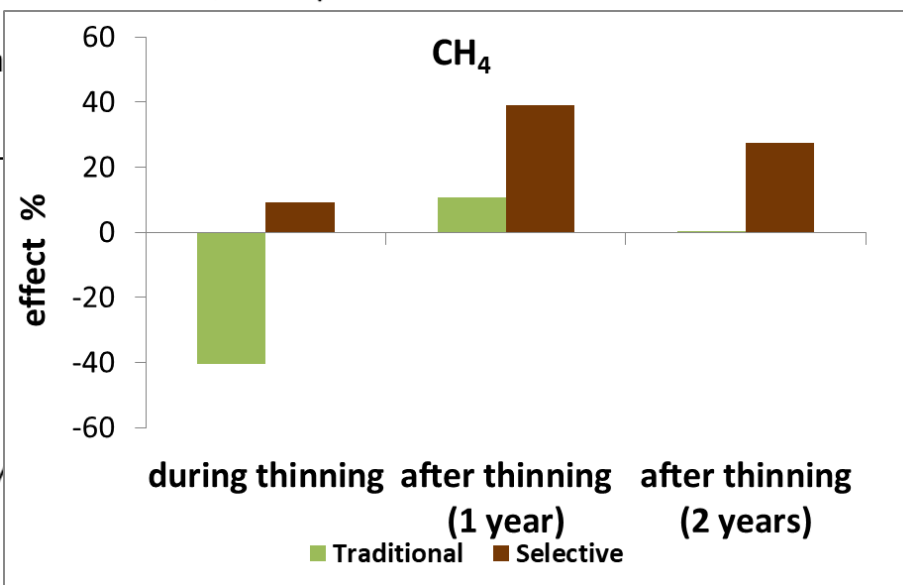
Italy-CO₂ and T_{soil}



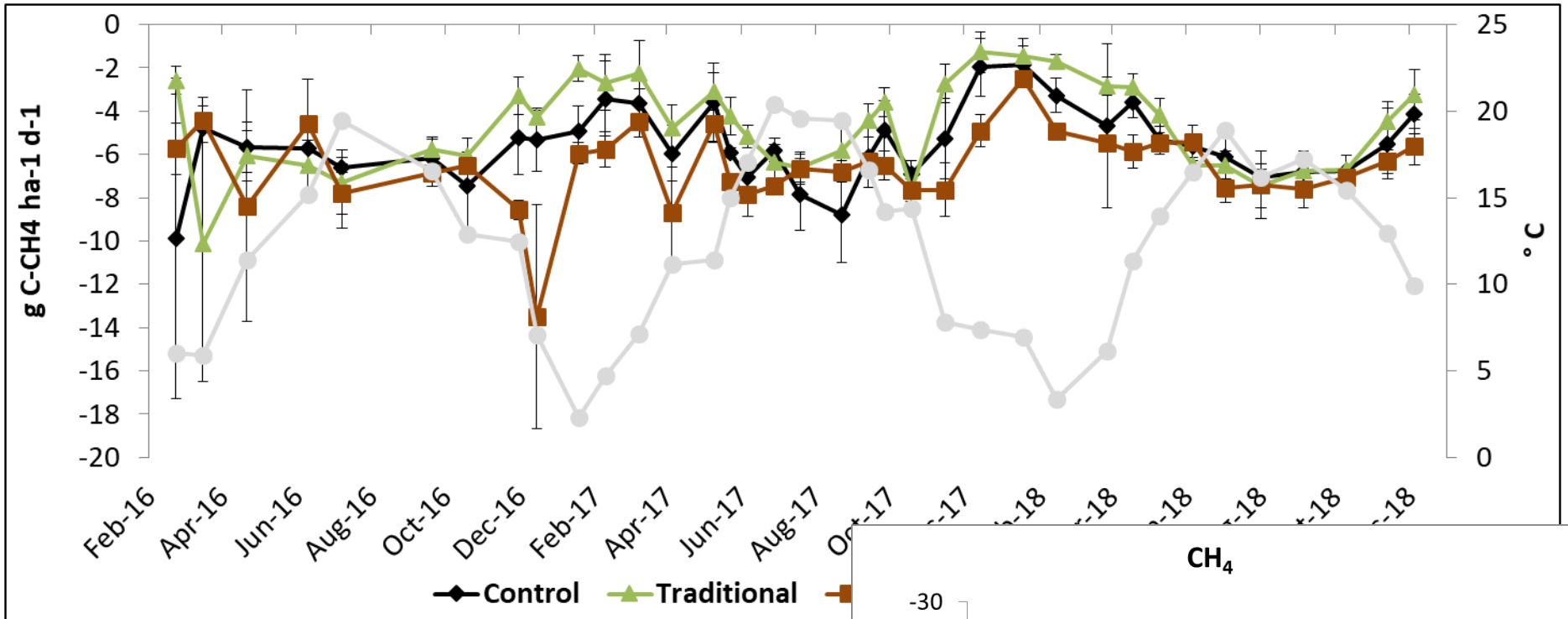
Greece-CH₄ and Tsoil



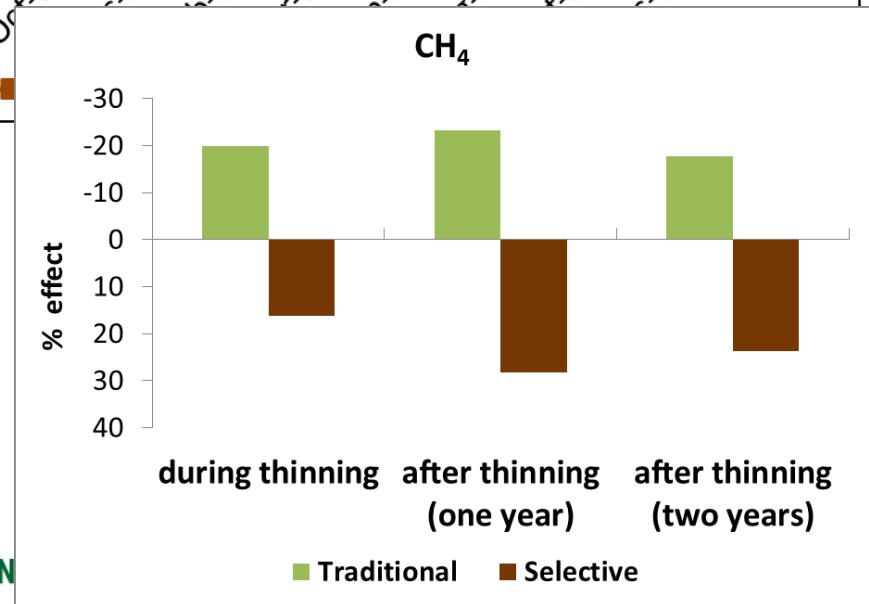
CH₄ uptake!!!



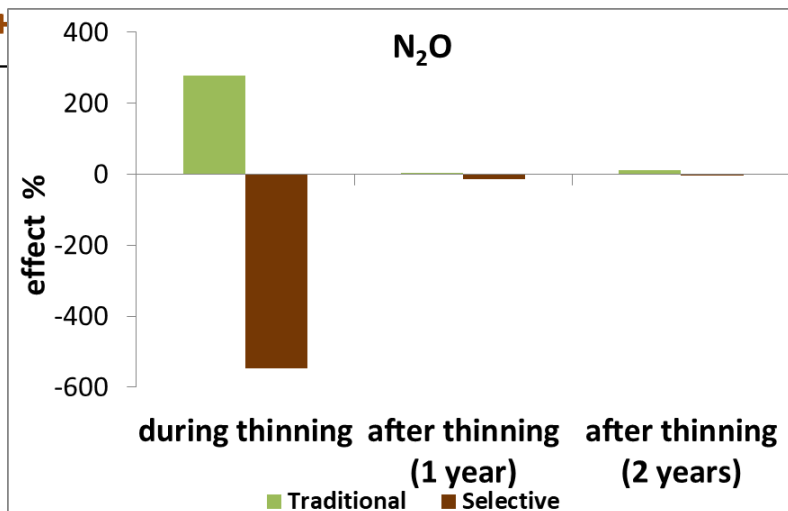
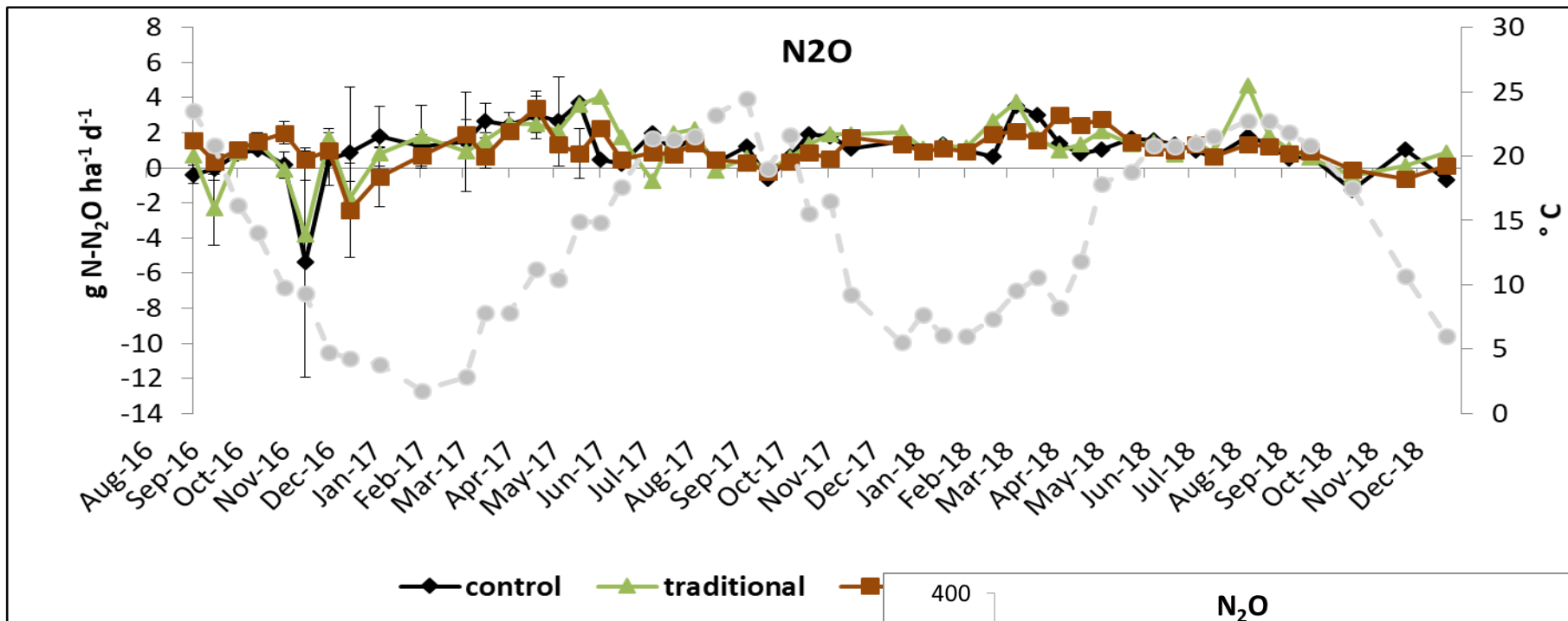
Italy-CH₄ and Tsoil



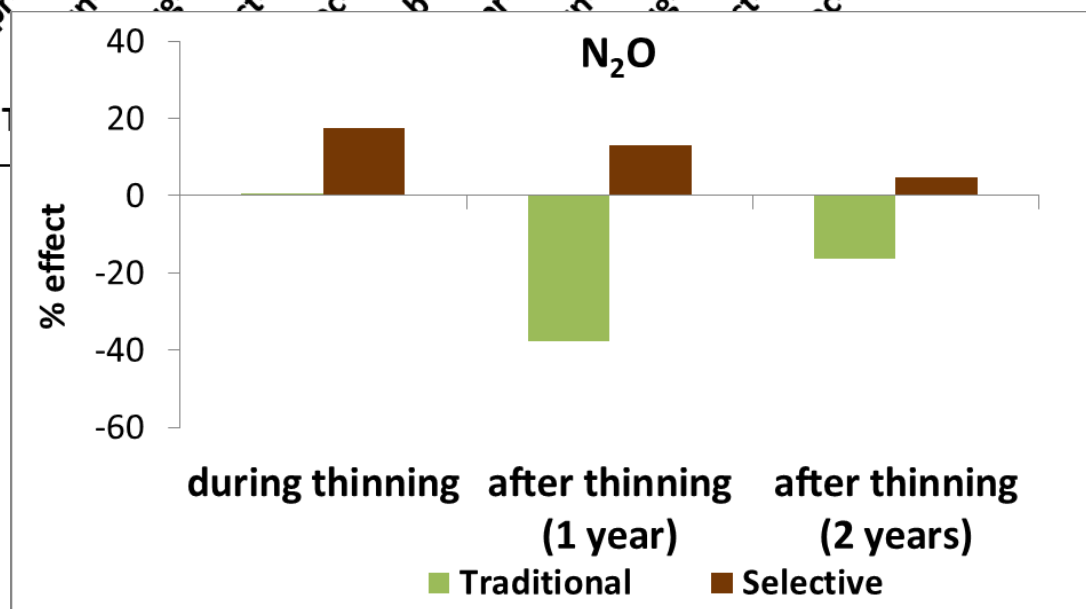
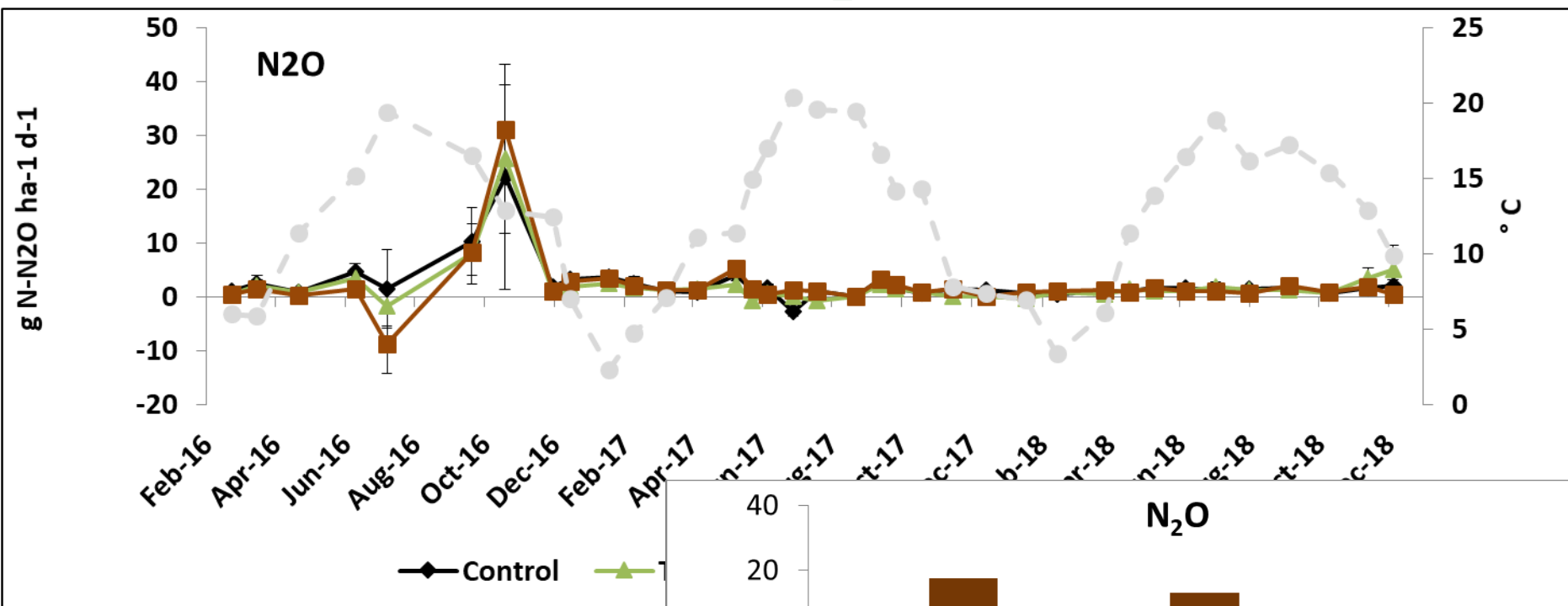
CH₄ uptake!!!



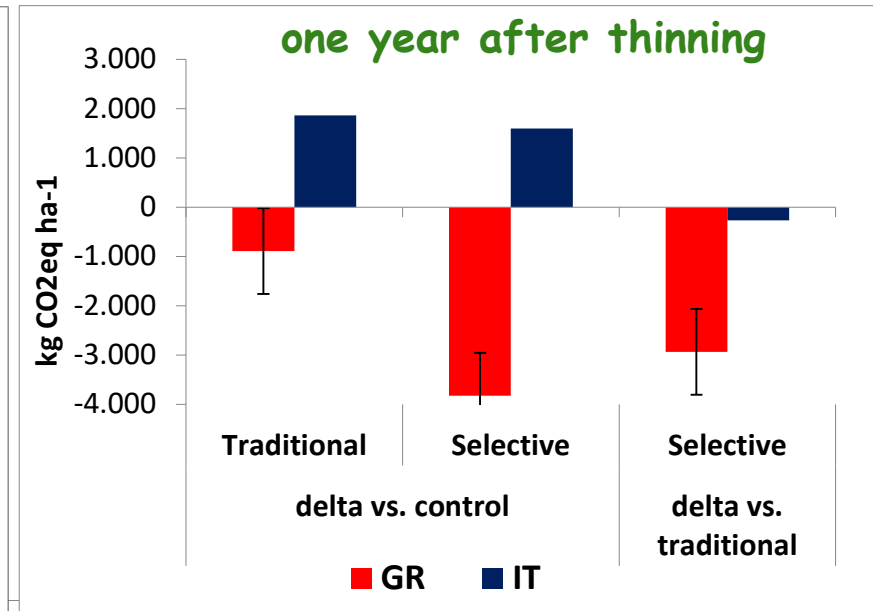
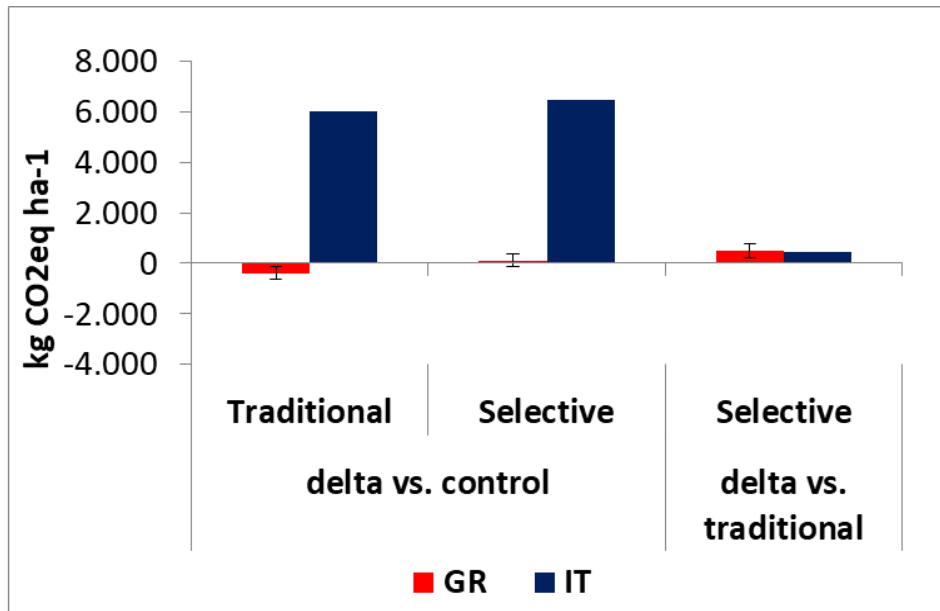
Greece: N₂O -Tsoil



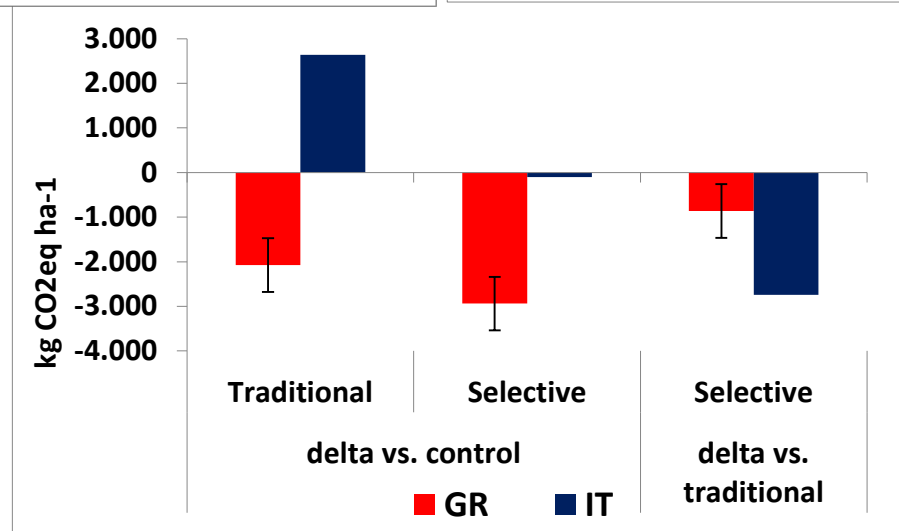
Italy: N₂O -Tsoil



$$\text{GWP (CO}_2\text{eq)} = \text{CO}_2 + 34 \text{ CH}_4 + 298 \text{ N}_2\text{O}$$



2 years after thinning



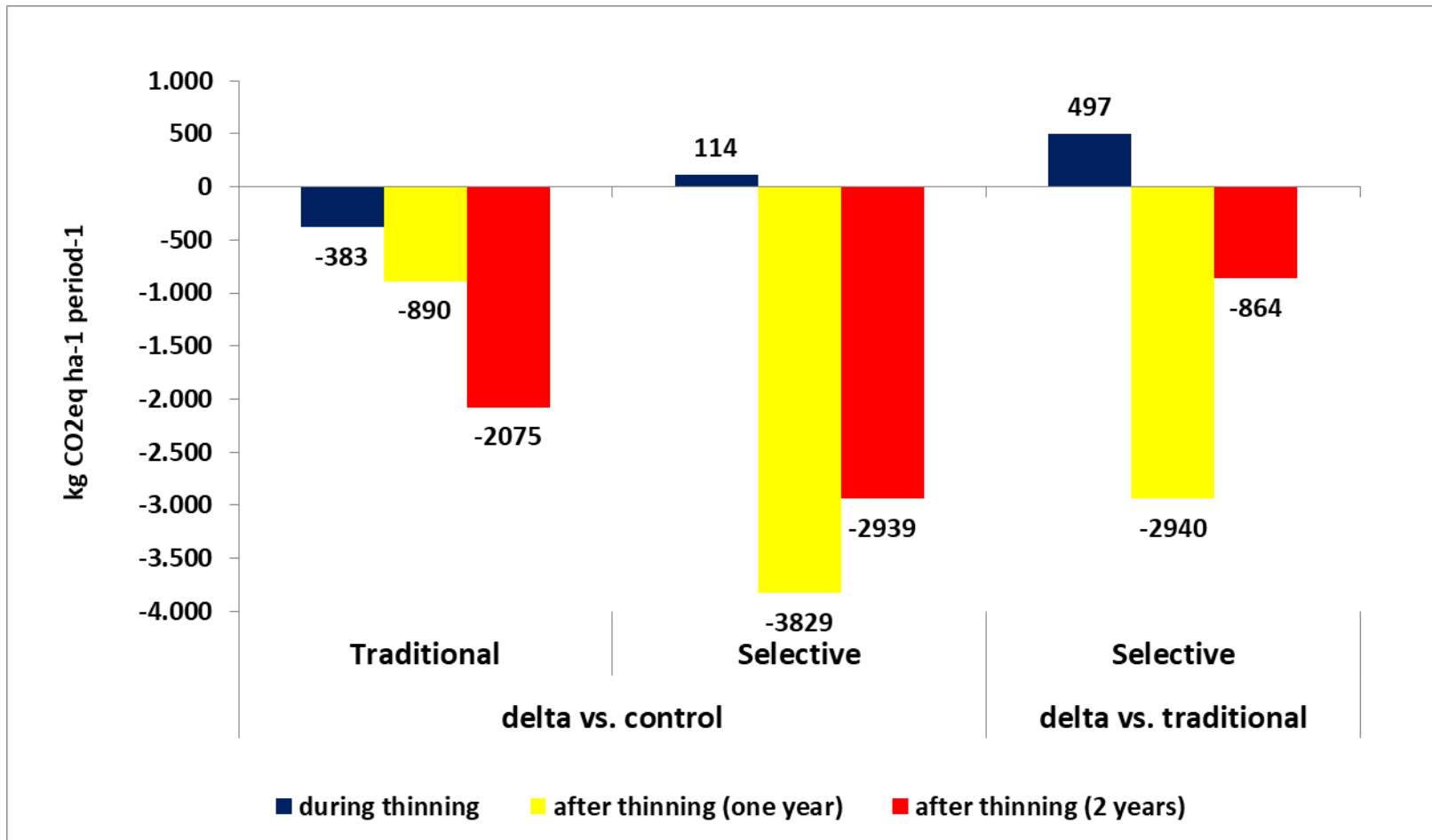
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GWP delta among treatments

kg CO₂eq ha⁻¹ period⁻¹

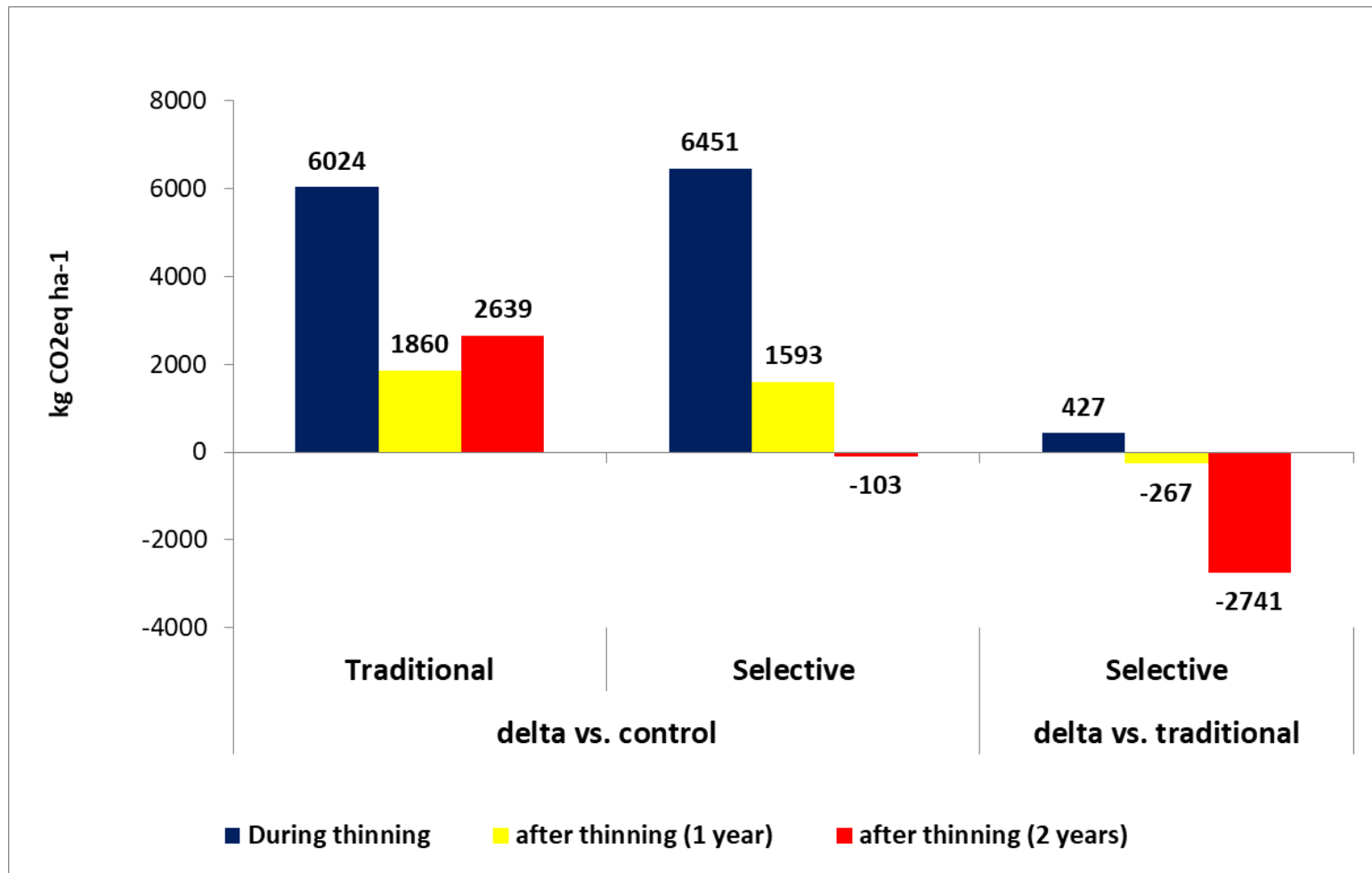
Greece



GWP delta among treatments

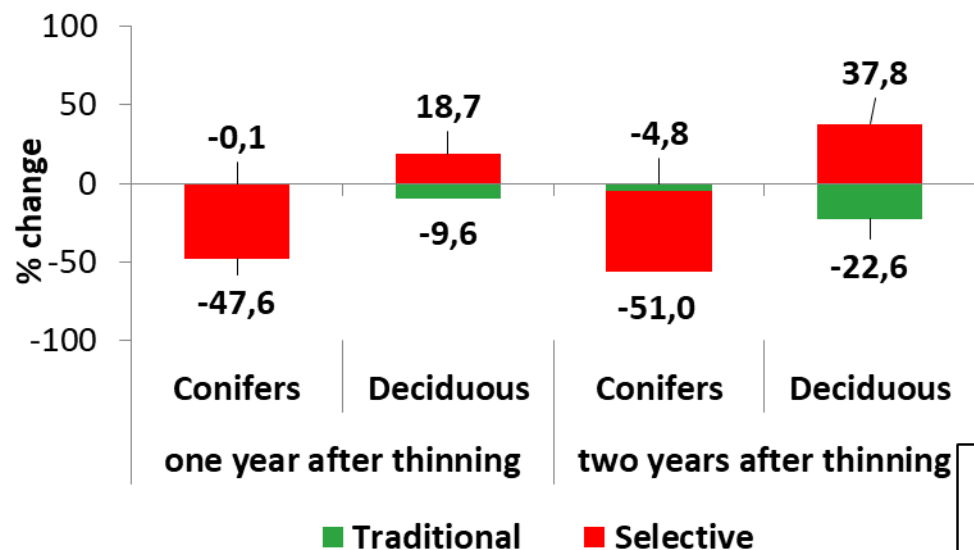
Italy

kg CO₂eq ha⁻¹ period⁻¹

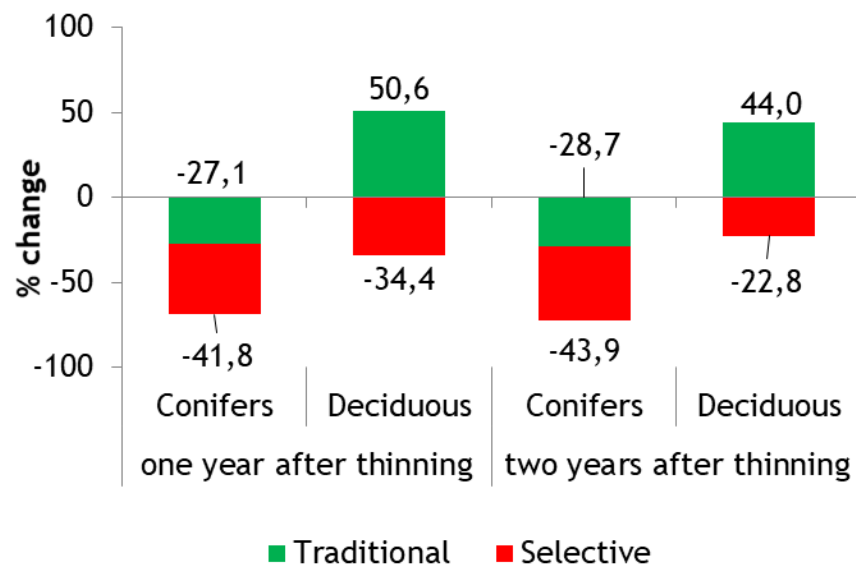


Greece

Litterfall



Italy



Correlation litterfall fractions - GHG emissions from forest soil

Greece

1 year after thinning

Pine twigs

0.891**

g CH₄-C ha⁻¹ d⁻¹

Deciduous
Twigs

-0.835*

Pine Bark

0.834*

2 years after thinning

Deciduous Twigs

-0.790*

Deciduous Leaves

-0.739*

Correlation is significant at the 0.01 level (2-tailed).**

Correlation is significant at the 0.05 level (2-tailed).*



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CONCLUSIONS

- ✓ The effect of thinning on CO₂ emissions was related to the timing of logging operations. It was more evident at Monte Morello site (3 months) with a strong peak of CO₂ emissions caused by logging operations and organic matter inputs, whereas at Xanthi site (one month) the impacts of logging interventions were lighter.
- ✓ This effect disappeared after few months after thinning operations and for the following two years, with final values of CO₂ emissions lower in **Selective** thinning than Control in both sites.
- ✓ Although not significant, the reduction of CO₂ emissions was possibly related to an indirect effect of both soil heterotrophic and autotrophic respiration and soil environmental factors alteration caused by thinning.
- ✓ Increased CH₄ uptake occurred in both thinning treatments in both sites **with the greatest increase being detected in the more intensive thinning treatment.**



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CONCLUSIONS

- ✓ N₂O fluxes were characterized by low emissions with seasonal peaks independent of treatments.
- ✓ The GHG variation in this study was largely driven by changes in soil environmental factors. Soil temperature resulted the dominant factor controlling CO₂ and CH₄ efflux, whereas soil moisture was related with N₂O variability under wetter climatic conditions.
- ✓ In both sites **broadleaves increased under selective thinning whereas** coniferous decreased, in line with the project objective to favor broadleaves native species.
- ✓ Regarding GWP, CO₂ was the dominant GHG in all treatments.
- ✓ Reduction of GWP was observed with both thinning treatments, markedly in selective thinning, **giving some initial evidence that high intensity thinning in both peri urban forest in Greece and in Italy is a potential management option for global change mitigation.**



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THANK YOU!!!



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