Soil density and carbon sequestration changes in *Prunus* silvopastoral systems

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INTRODUCTION

Silvopastoral systems have been considered a good tool for C sequestration by taking up atmospheric CO_2 and storing it in the tree, understory and soil. The effect of animal presence on C sequestration in silvopastoral systems has to be evaluated as they could increase or depress C sequestration depending on stocking rates and the effect on soil organic matter mineralisation mainly caused by faeces. Also soil fractions have been known to influence C storage

OBJECTIVE

To evaluate the effects of livestock grazing at two different stocking rates compared silvopastures with no grazing on the amount of C stored in the whole soil and three differently sized soil fractions (250–2000 µm, 53–250 µm, < 53 µm) at four soil depths (0–25, 25–50, 50–75, and 75–100 cm)

MATERIALS AND METHODS

EXPERIMENT DESING

- 13 year-old *Prunus avium* L. afforestation
- Randomized blocks (2 treatments and 2 replicates)
- 4 experimental units of 1 ha

TREATMENTS

(1) Light stocking rate (LS; 4 sheep ha^{-1})

(2) Heavy stocking rate (HS; 8 sheep ha^{-1})

(3) No grazing (NG)

SAMPLE COLLECTION: soil samples in January 2011

ANALYSIS IN THE LABORATORY: soil density, root biomass and amount of C stored in the soil

STATISTICAL ANALYSIS: ANOVA and LSD

RESULTS

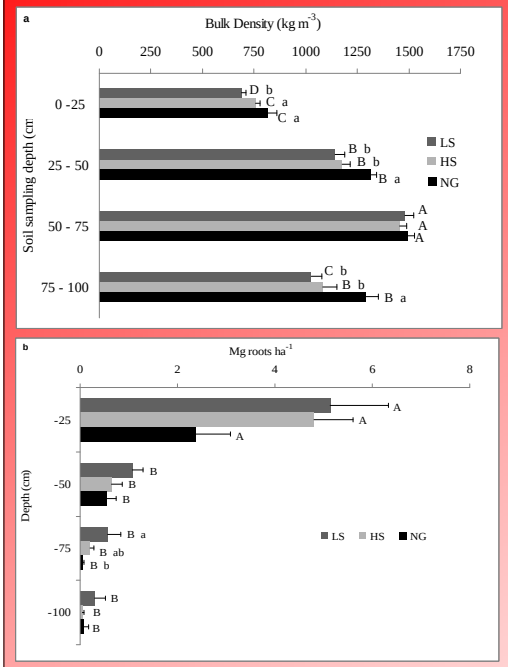

Figure 1. Soil bulk density (a) and soil roots (b). Different uppercase letters indicate significant differences between soil depths within the same treatment, while different lowercase letters indicate differences between treatments within a specified depth

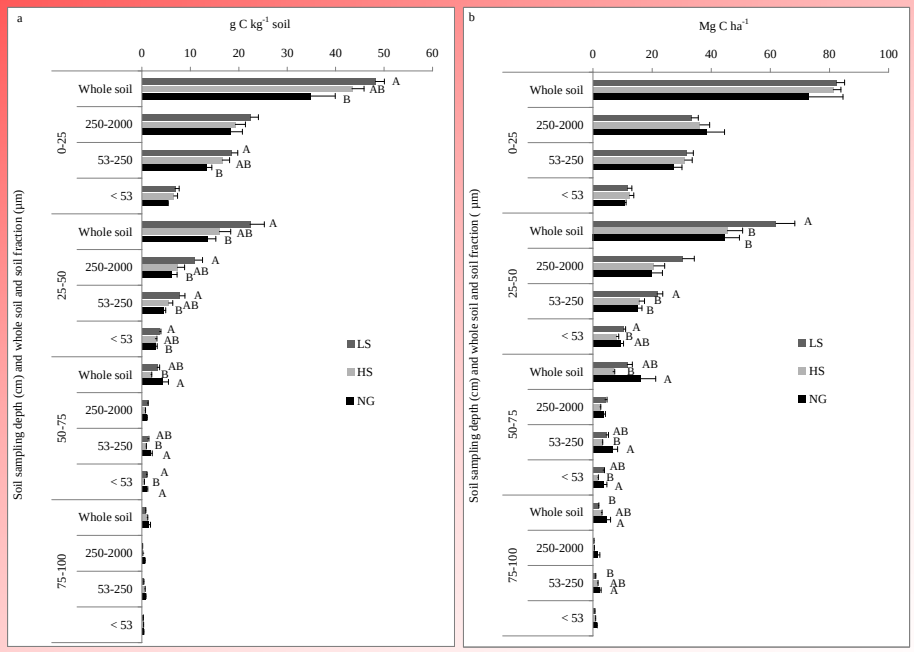

Figure 2. Soil C concentration (g C kg^{-1}) (a), C storage per hectare (Mg C ha^{-1}) (b) in the whole soil and in the three soil fractions (250–2000 µm, 53–250 µm, and <53 µm) at four soil depths (0–25, 25–50, 50–75, and 75–100 cm) with three treatments (LS: light stocking rate, HS: heavy stocking rate, NG: no grazing) . Different uppercase letters indicate significant differences between treatments in the whole soil and in the same soil fraction within a specific soil depth

CONCLUSIONS: the major soil C storage was found in the first 50 cm of soil and it was linked with macroaggregates and occurred in LS treatment due to the greater presence of root biomass and organic matter addition by animal excreta than in NG. In the deeper soil layers, the major soil C storage was related to microaggregates and was enhanced by NG treatment due to higher soil bulk density and the indirect effect of the greater presence of roots in LS treatment than in NG