A global prediction of soil C sequestration

Francisco Matus

Introduction

Soil carbon sequestration (SCS) involves the study of fine soil particles (silt+clay) as key stabilizing agents. We hypothesized that a large proportion of the soil organic carbon (SOC) in the silt+clay particles can be better predicted in soils of different latitude, textures, clay mineralogy and land uses. The relationship was examined for the organic C in the clay+silt and the organic C in the bulk soil by performing a meta-analysis of published studies worldwide.

Methods

Soil information

Soil from different latitudes (tropical and temperate), textures, mineralogy (2:1, 1:1 amorphous clay) and land uses (cropping, grassland, forest) from Australia, Canada, Europe, Africa, South America, North America and Mexico are considered.

Soil carbon sequestration

The typical estimation of SCS is the deficit of C in the silt+clay from a maximum C level in this fraction, namely the C saturation (Hassink, 1997; Carter et al. 2003.)

Results

The relationship between the C in the clay+silt (g C kg^{-1}) and the mass proportion of silt+clay (g kg^{-1}) of studied soils is compared to the C saturation for a) particles <63 µm and b) particles <20 µm (Fig. 1A and 1B). However, the C in the clay+silt and SOC (in the bulk soil) was better predictor than scattered least square regression line (Fig. 2 A-E).

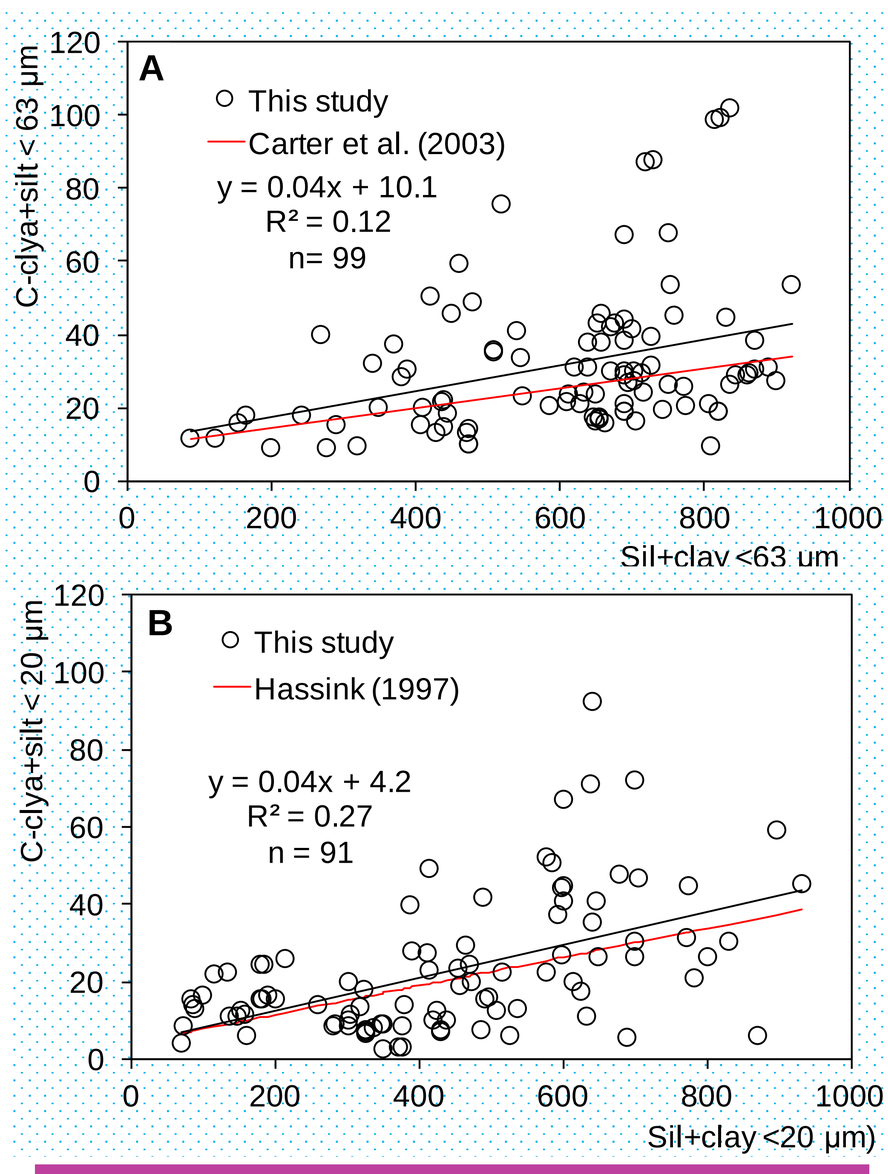

Fig. 1 Relationship between soil texture and C-silt+clay of studied soils. Red line is the C saturation level.

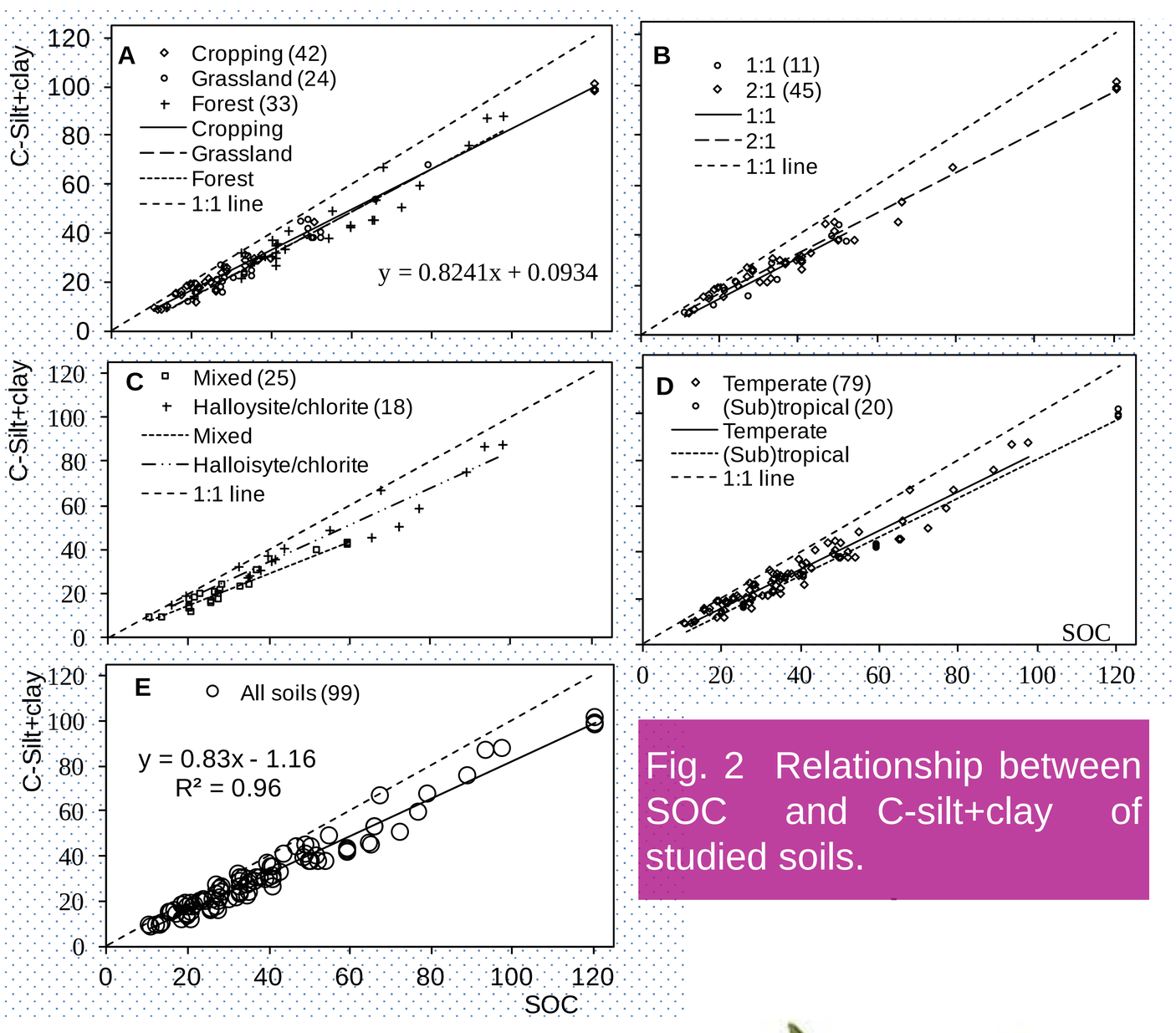

Fig. 2 Relationship between SOC and C-silt+clay of studied soils.

Conclusions

Approximately 83% of SOC will be stabilized in the silt+clay particles, so the maximum C sequestration would be the maximum amount known at each land use managements.

References

Hassink, J. 1997. Plant and Soil 191: 77–87

Carter et al. 2003. Can. J. Soil Sci. 83: 11–23

Acknowledgements

Professor Denis Anger from Soils and Crops Research Centre, Agriculture and Agri-Food Canada.

Project FONDECYT: 1170119 (CONICYT-Chile)

Contacto

Universidad de La Frontera
Chile
(F. Matus) francisco.matus@ufrontera.cl