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ENVIRONMENTAL BIOLOGY

DATA ANALYSIS

EFFECT OF MINIMUM TILLAGE AND NO-TILLAGE ON CARBON STOCKS IN SPANISH AGRICULTURAL SOILS

BACKGROUND

Soil tillage practices are of particular importance in relation to soil carbon, because they affect carbon dynamics directly and indirectly. Long-term tillage can reduce the carbon stock up to 20-50% (Lopez-Fando & Pardo, 2011). Also, continuous and intense or excessive tillage can cause a loss of soil organic carbon, leading to an increase in erosion and degradation of the soil structure. Causing damage to the soil biota, compaction of the structure, crusting and loss of fertility (Soldevilla-Martinez et al., 2013).

On the other hand, conservation agriculture, "no-tillage", reduces the negative effect of the impact of tillage and has been confirmed to have a great potential to convert carbon-emitting soils into sink soils, capturing atmospheric carbon .

Soil organic carbon is considered an indicator of soil quality due to its agronomic and ecological functions. (Carbonell-Bojollo et al., 2015).

OBJECTIVES

Be able to determine if the agricultural practice of no tillage or reduced tillage has a positive or negative influence on carbon stocks in Spanish soils..

How do other variables affect carbon stocks in Spanish soils such as the average annual precipitation, the average annual temperature, the percentage of clay in the soil, the years of implementation and the climate?

What role do Spanish soils play in this carbon sequestration in the context of climate change.

METHODOLOGY

Data collection: Carbon stocks T/ha in the first 40cm

The database

Meta-analysis

Simple linear regression

Anova test

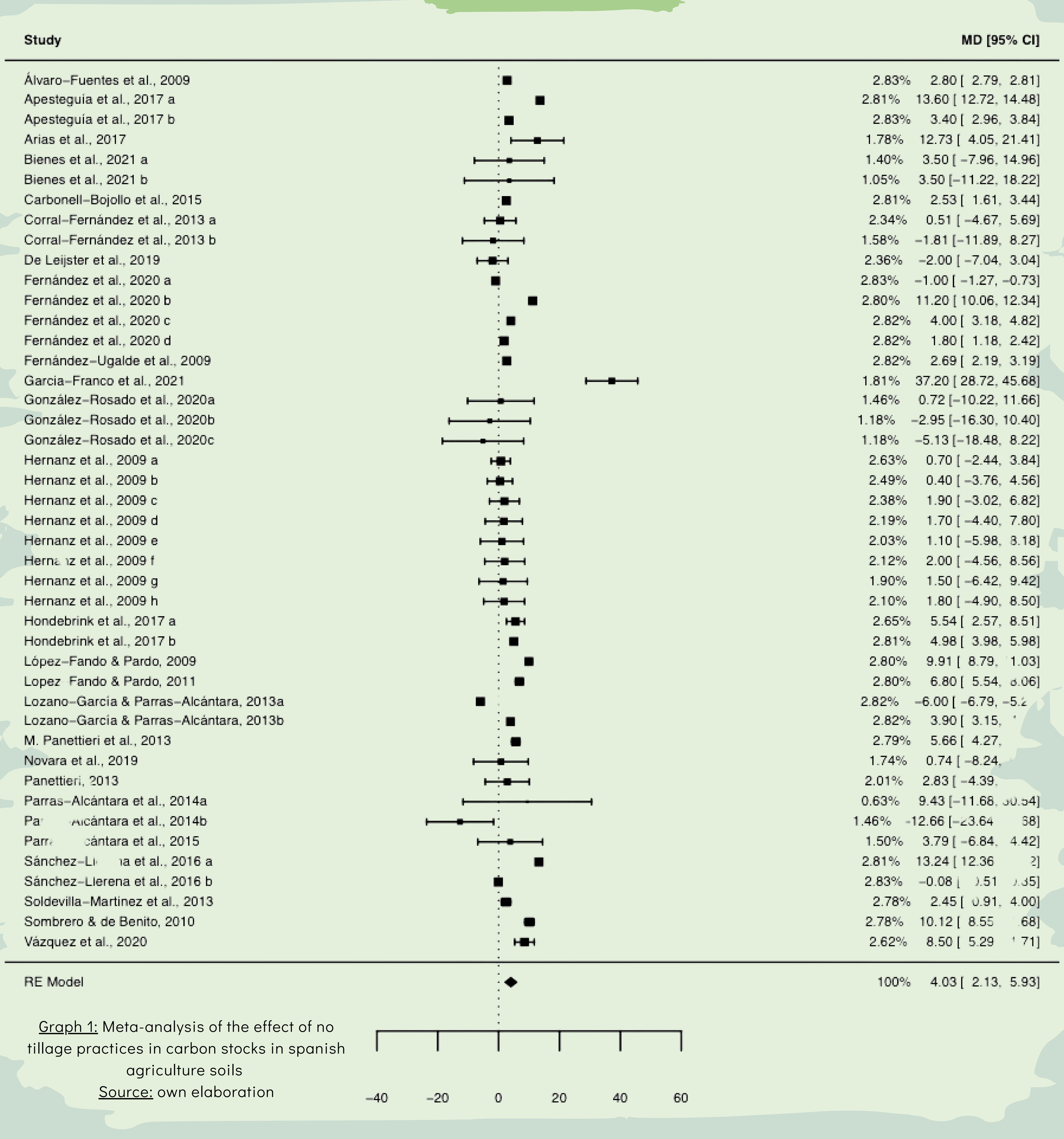
HYPOTHESES

NULL HYPOTHESIS: THE TYPE OF NO-TILL DOES NOT CAUSE ANY EFFECT ON THE ORGANIC CARBON STOCK OF THE SOIL.

ALTERNATIVE HYPOTHESIS: THE NO-TILLAGE IS RELATED TO THE ORGANIC CARBON STOCK OF THE SOIL. IT IS EXPECTED TO OBTAIN A POSITIVE RELATIONSHIP, AN INCREASE IN THE ORGANIC CARBON CONTENT OF THE SOIL IN NO-TILLAGE PRACTICES.

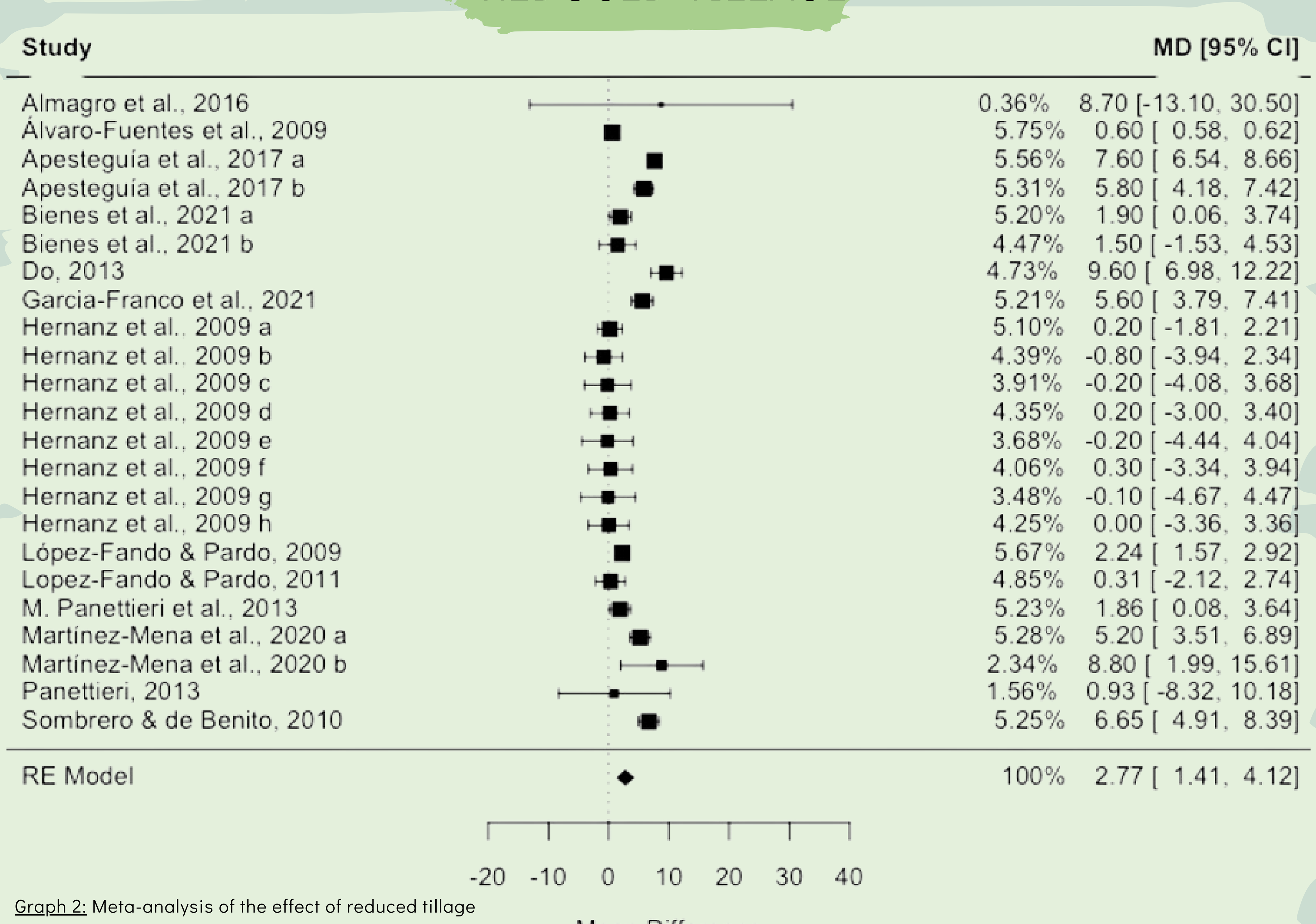
RESULTS

NO TILLAGE



Graph 1: Meta-analysis of the effect of no tillage practices in carbon stocks in spanish agriculture soils
Source: own elaboration

REDUCED TILLAGE

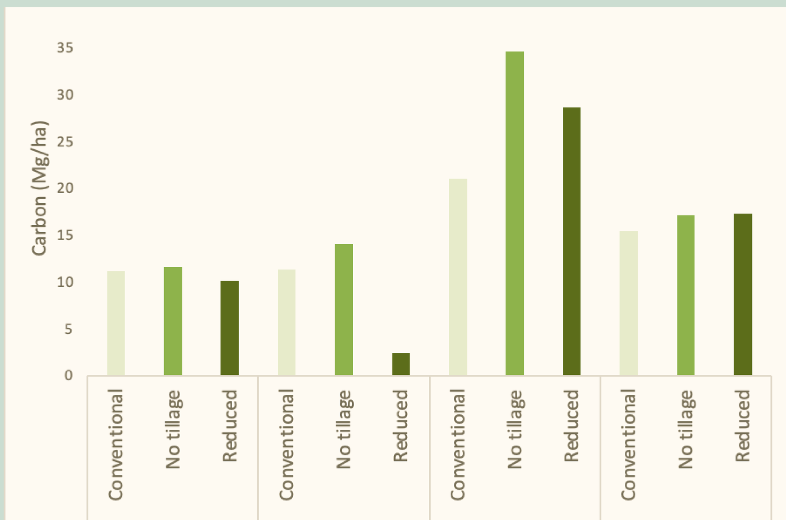


Graph 2: Meta-analysis of the effect of reduced tillage practices in carbon stocks in spanish agriculture soils
Source: own elaboration

	No tillage	Reduced tillage	Conventional tillage	
	p-value	**p-value**	**p-value**	**Anova**
Precipitation	0,84	0,86	0,98	no significance
Temperature	0,26	0,35	0,14	no significance
% Clay	0,9	0,11	0,74	no significance
Years	0,08	0,37	0,09	no significance

Table 1: p-values of simple regression and anova test between climatic variables and carbon stocks in spanish agriculture soils.
Source: own elaboration

CLIMATE



Graph 3: Bar diagram showing the carbon stock of the soil in each type of tillage according to the climate.
Source: own elaboration

GRAPHICS

DISCUSSION

No-tillage or minimal tillage agricultural practices have been linked to soil carbon content with significant results.

Also, we can see the need to include more factors in the model, since the results show heterogeneity. It is a process where more factors are involved than just the type of tillage.

As we saw in other factors; no significant results have been extracted. Probably because agricultural management practices interfere a lot, for example the addition of organic matter periodically or not (López et al., 2012).

CONCLUSIONS

Focus on climate role and include more types of it to have greater scientific rigor.

Hypothetical scenario, in which no-till is applied to all spanish crop fields (50 million hectares). 201.5 million Tonnes of Carbon would be captured from the atmosphere. In 2020, in Spain 274,7429 million Tonnes of CO_2 were emitted. Therefore, the potential of Spanish agricultural land is vital for reducing emissions.

BIBLIOGRAPHY