SOIL SURFACE CONDITIONS AFFECTING WIND EROSION IN FALLOW LANDS OF SEMIARID ARAGON (NE SPAIN)

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INTRODUCTION

Long fallowing (16-17 months), in the traditional cereal-fallow rotation, may favour soil losses by wind erosion in agricultural soils of Central Aragon (NE Spain). Previous field studies have shown that this hazard could be enhanced in the region under given soil management conditions (*López et al. 1998. Soil Tillage Res. 45, 91-105; Sterk et al. 1999. Land Degrad. Develop. 10, 545-554*). A survey of soil surface characteristics associated with current fallow management practices was carried out to assess the risk of wind erosion in semiarid Aragon.

MATERIALS AND METHODS

A total of 67 fallow fields covering the main rainfed farming areas in semiarid Aragón (annual precipitation <400 mm) were randomly selected and characterised following primary tillage operations implemented at the end of winter (Fig. 1). The Wind Erosion Equation (*Woodruff and Siddoway. 1965. Soil Sci. Soc. Amer. Proc. 29, 602-608.*) was used to predict soil losses during the most critical period of fallow (February-April).The equation is defined as follows:

$$E = f(I, K, C, L, V)$$

where E is the annual soil loss (Mg ha^{-1}), I the soil erodibility factor (Mg ha^{-1} yr^{-1}), K the soil ridge roughness factor, C the climatic factor, L the unsheltered mean travel distance of wind across a field (m) and V the equivalent vegetative cover (Mg ha^{-1}).

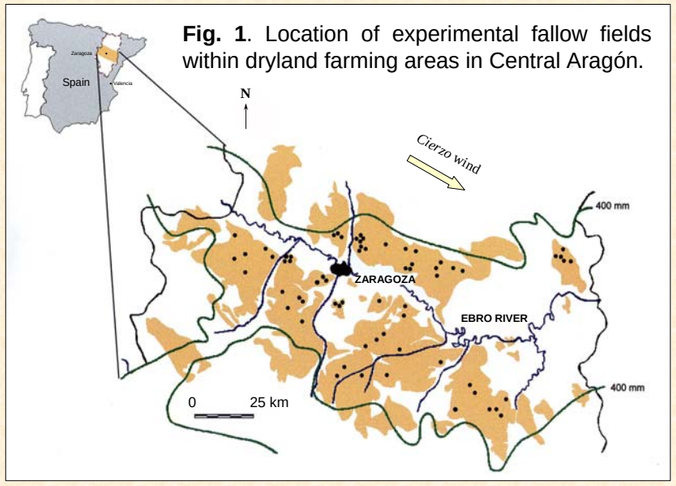

Fig. 1. Location of experimental fallow fields within dryland farming areas in Central Aragón.

RESULTS

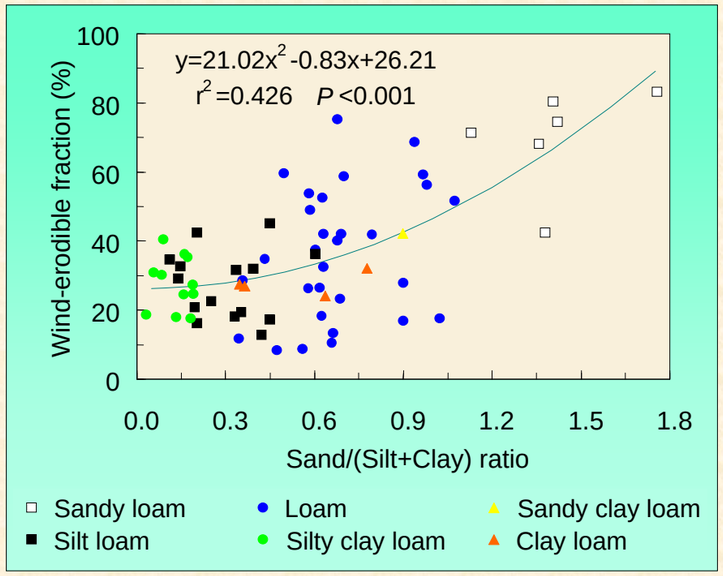

Fig. 2. Wind-erodible fraction (aggregates <0.84 mm in diameter) of soil surface (0-2.5 cm) as function of soil texture.

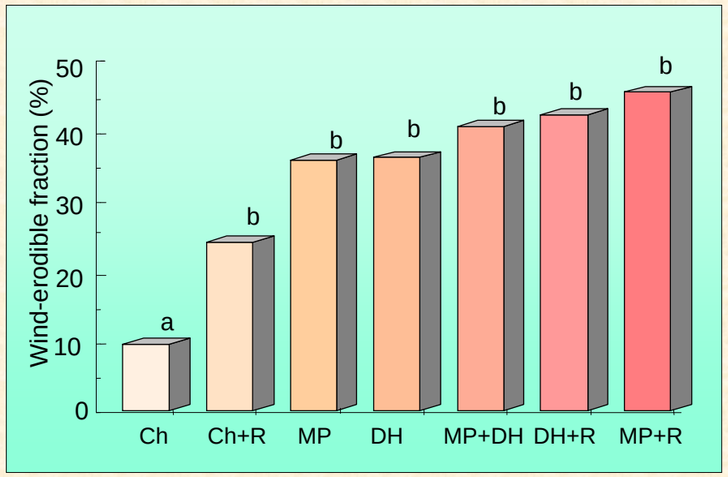

Fig. 3. Wind-erodible fraction of soil surface (0-2.5 cm) as affected by tillage (Ch, chisel plough; MP, mouldboard plough; DH, disk harrow; and R, roller). Different letters indicate significant differences at P <0.05.

- Soil texture and soil tillage were the main factors affecting soil erodibility. The highest erodibility corresponded to soils with a sandy loam texture and traditionally tilled with mouldboard plough.
- Farmers in the area do not take into account tillage orientation since only in 20% of the fields ridges were oriented perpendicularly to the dominant *Cierzo* wind direction. Likewise, field surfaces were, in general, large, with L reaching 1000 m in some cases.
- Predicted wind erosion during the February-April period was high to very high in 30% of the fallow fields surveyed in the study area (from 22 to 141 Mg ha^{-1}) and moderate in 28% (5-19 Mg ha^{-1}).

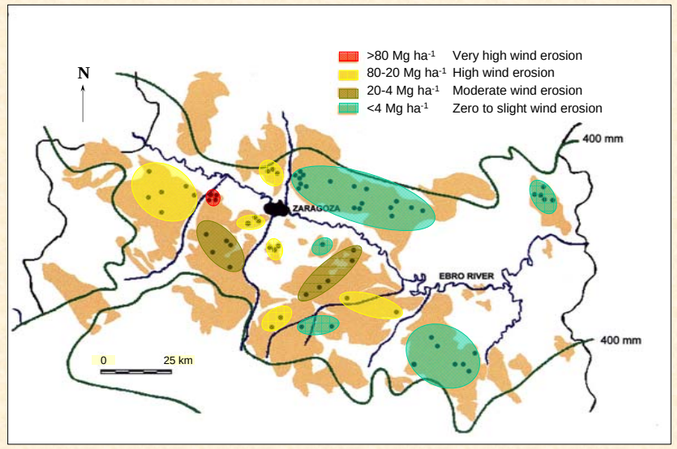

Fig. 4. Predicted wind erosion in fallow lands of semiarid Aragon for the February-April period.

CONCLUSIONS

In fallow lands of semiarid Aragón, reduced tillage with chisel plough can be an effective practice for wind erosion control by reducing the wind-erodible fraction of the soil and maintaining both crop residues and ridge roughness on the surface. Complementary management practices, such as tilling perpendicularly to wind direction and reducing the large, unsheltered area of the field, with barriers or stripcropping, are also recommendable to maintain tolerable rates of wind erosion.

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