Ángel Faz, Roque Ortiz, Gregorio García (eds.)

INVITED LECTURES AND ABSTRACTS

Fourth International Conference on Land Degradation

INVITED LECTURES AND ABSTRACTS
Fourth International Conference on Land Degradation

1ª ed. september 2004

I.S.B.N.: 84-95781-42-5
D.L.: MU-1595-2004

Printed in Spain

Produced by
Quaderna Editorial
Telf. 968 343 050 - quaderna@telefonica.net

ECOLOGICAL ENGINEERING IN THE MANAGEMENT OF AN OLIVE ORCHARD ON DEGRADED SOIL

Pastor, J.[1]; Hernández, A.J.[2]

1. Dept.of Environmental Biology, CCMA, CSIC, Madrid. E-mail: jpastor@ccma.csic.es
2. Dept. of Ecology, University of Alcalá (Madrid), E-mail: anaj.hernández@uah.es.

THIS report describes the results obtained in a field experiment performed on an olive orchard, in which the soil is sandy and impoverished. Our study forms part of a project whose main aim is to evaluate ecological management systems directed towards the conservation of soil in semi-arid areas. At the start of our analysis, we noted two critical points: soil erosion and a degraded soil with extremely low levels of organic matter, N and other nutrients. To resolve these problems from a perspective of sustainable agriculture, it was decided to implant or to propitiate the growth of plant covers between rows of trees that would be capable of: controlling soil erosion, adapting to sandy soils and the rainfall regime of the semiarid climate, fixing nitrogen and undergo autoseeding. Further requirements were rapid growth, ease of handling, low cost, and a short phenological cycle, to avoid competition for water during the time of the tree's maximum needs. Species such as subclover would fulfil these requirements. We also evaluated the possibility of managing the growth of the "resident vegetation", or weeds, by carefully cutting them back such that creeping species are able to seed and remain in the soil.

The experimental trial was performed at the "Finca de La Higueruela" (Toledo). Plots (96 x 12 m) were established according to a statistical design that allowed the results of the live covers to be compared with those derived from the use of conventional management methods (tillage). Experimental plots were subjected to the following treatments: 1) non-tillage plus a subclover (and weed) cover; 2) non-tillage plus a weed cover, and 3) tillage, leaving the soil free of weeds all year round. The trials were performed in triplicate as random blocks. The effects of the different management systems were compared by ANOVA.

By managing the plant covers we were able to increase the density of leguminous annual plants. Other benefits were a reduced harmful weed population. It is proposed that the mechanical mowing of weeds should be scheduled for several times a year (because of variations in the phenological cycles of the species). A minimum of two cuttings should be conducted in spring (to allow the improved growth of spontaneous creeping legumes) and sometimes a further cutting should be undertaken in autumn. The management strategy used promoted a persistent substantial subclover cover, as well as the presence and abundance of spontaneous legumes in both types of cover. From the third year onwards, legumes could be considered the dominant species in the plots. The high numbers (16 species) and cover values achieved (in

particular those of the creeping legumes *Ornithopus compressus* and *Biserrula pelecinus*), all point to the technical efficiency and economy of this method to improve the sustainability of the system. Findings indicate a reduced incidence of erosion fissures in the plots with covers, compared to the tilled plots. Moreover, these covers were shown to provide efficient protection against erosion as early as from the first year. During years of normal or high rainfall, these covers showed no significant, or scarce, competition with the trees.

Effects on biochemical soil fertility are starting to emerge, with signs of microbial and enzyme regeneration in plots with covers, compared to the effects of tillage. Final C, N and topsoil nitrate contents were higher for the plant covers than the tillage management system.

Acknowledgements

This study was funded by the Community of Castilla-La Mancha Project 132/RN-21, whose support is gratefully acknowledged.