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Title: Agroecology for the restoration of degraded agricultural soils: implementation of dynamic agroforestry systems in family production systems in the semi-arid Andean slopes of Cochabamba, Bolivia.

Summary:

Dynamic agroforestry systems (SAFD) have been implemented as an option for productive systems that at the same time make it possible to reverse the soil degradation processes that prevail throughout the semi-arid productive zone of Cochabamba. In this area, it has been estimated that more than 90% of the soils are degraded by water erosion and conventional agricultural practices. In this context, the promotion of PFES, based on temperate zone fruit trees and companion species, has been initiated. The latter have the role of providing green biomass to be applied as *mulch*, mobilising nutrients and providing greater ecological stability to the system. The PFAS are designed on a case-by-case basis, according to the needs and objectives of each family. They also include, as companion species, species native to each area, so that they can promote biodiversity and grow more autonomously. To evaluate the performance of PFAS as a soil restoration practice, 10 PFAS plots were selected from 4 municipalities, accompanied by 8 controls (conventional systems), which had different characteristics of design, management, location and time of implementation. For this evaluation, 31 edaphic variables were analysed, including physical, chemical and biological variables. Of these, Principal Component Analysis reduced them to 11 variables that explained 62% of the variations. From this new set, ANOVA and t-Student were used to analyse the existence of significant differences between agroforestry and conventional management, based on the 11 most relevant variables. With these variables, a Soil Quality Index (SQI) was constructed as a tool to compare the performance of AFS versus conventional management, and as a proposal to analyse the characteristics of the restoration resulting from the implementation of AFS. As a general conclusion of the individual indicators, it was observed that agroforestry systems improved the most important soil quality indicators, taking conventional systems as a control. Physical (bulk density, porosity, water parameters), chemical (CEC, pH, EC, N_t, P_d) and biological (OM, COA, number of springtails) parameters were statistically superior. From the analysis of the ICS it could be observed that in all municipalities the agroforestry soils were superior to conventional soils. That is, in different altitudinal, climatic, topographic and even socio-economic conditions, the difference was consistent. The results suggest that PFAS can be an alternative to improve the quality of degraded soils. Further research is needed to better understand the extent of these improvements.

Bibliographic references (max 10)