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## Impact of Ecological and Conventional Arable Management Systems on Chemical and Biological Soil Quality Indices in Nicaragua

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### Abstract

We measured the activity and soil microbial biomass in volcanic ash soils from 10 sites under ecological farming (no pesticides, shallow ploughing, mulching, organic fertilizers, crop rotation) and 15 sites under conventional farming (pesticides, mineral fertilizers, deep ploughing). Our aim was to determine the effects of management system on soil quality and soil fertility in tropical Nicaragua in relation to soil type. None of these sites was irrigated. Conventional management led to significantly increased amounts of total soil P and a significantly larger biomass C-to-P ratio compared to ecological management. Almost all of the other microbial properties, i.e. soil basal respiration, ergosterol and biomass C were significantly improved by ecological management. Also the biomass C-to-soil C ratio was significantly increased, but not the metabolic quotient  $q\text{CO}_2$  or the ergosterol-to-biomass C ratios, indicating that the positive effects of ecological management were mainly due to increased C input rates. Biomass C, ergosterol, and basal respiration rate were significantly larger at the loamy than at the sandy sites. The same was true for the biomass C-to-soil C ratio, but the ergosterol-to-biomass C ratio and the metabolic quotient  $q\text{CO}_2$  were larger at the sandy sites. Our results demonstrate that ecological management is an important tool for soil conservation and sustainable management of arable land in Nicaragua. However, the decline in total P and the low P availability to soil microorganisms need attention as a precaution against P deficiency. The improvement was greatest at the loamy sites, although the effects of management system were in most cases independent of the soil type. For this reason, ecological management should be preferably promoted on loamy soils.

**Keywords:** Basal respiration, biomass P, ergosterol, P extractable, microbial biomass C, soil C, total P