Changes in soil properties under two different management systems in the Western Amazon

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The Amazon basin is the largest tropical forest in the world. In addition to Brazil, the Amazon forest spreads out through Venezuela, Bolivia, Suriname, Guiana, Colombia, Peru, Ecuador, and Paraguay. The potential cultivable area is about 450 million hectares, and about 60% of the total area of the Amazon forest is located in Brazil. The region requires development of sustainable agriculture systems for the welfare of the local population. The main components of sustainable farming could be pasture, food and plantation crops.

The anthropic activities largely consist of deforestation to extract valuable wood and then burning the remaining plant cover to introduce annual or perennial crops or to form pasture. The impacts of deforestation include loss of biodiversity, reduced water cycling (and rainfall), and contributions to global warming. Various studies have shown that these changes affect the soil's C and N content, with a temporary reduction of acidity in the surface layer, increased exchangeable cations and reduced exchangeable acidity.

Upland soils in Amazon basin are often highly weathered and, therefore, possess low plant-available nutrient contents. Soil fertility is principally maintained by geochemical, biochemical and biogeochemical processes. Within these processes, the soil microbial biomass is responsible for many of the cycles and transformations of nutrients in soils.

The aim of this work was to evaluate the changes in soil fertility, in the form of nitrogen (N) mineral, and microbial activity, as indicators of the dynamic of carbon (C) with two extractants [irradiation extraction (IE) and IRGA methods], N and phosphorus (P) in an upland soil area containing a dystrophic Yellow Latosol (Xanthic Ferralsol) in the Western Amazon (Brazil) submitted to succession of two plant cover (citrus or pasture) and management. The study was carried out in two chronosequences: primary forest followed by citrus plantations, and primary forest followed by pasture.

The results showed that pasture has greater capacity to accumulate organic C and total N than either primary forest or citrus plantation. Removing forest to introduce pasture or citrus plantations influences the soil fertility and microbial biomass of C, N and P in the soil. Under the edaphoclimatic conditions, the irradiation extraction and IRGA methods all proved efficient in determining the soil microbial C activity. In addition, regardless of the depth of soil, the predominant of $N\text{-}NH4^{+}$.

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