

Weed Pressure and Soil Fertility in Intensified Slash-and-Burn Cropping Systems in the Eastern Amazon Region

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Abstract: Reconciling biodiversity and sustainable agriculture is a major challenge. In Brazil, environmental protection laws, including a ban on the use of fire, have been introduced to reduce deforestation in the Amazon region. These laws are very constraining for smallholder farmers for whom slash-and-burn is the most viable cropping system. These farmers are now responsible for most of the deforestation occurring in the Amazon region. The environmental regulation and the increasing land pressure result in a reduction of the fallow period in smallholder production systems, leading to a decrease in yields of cassava and other crops.

While the soil can recover during the fallow period, loss of soil fertility and the associated decrease in crop productivity is common after several cycles of slash-and-burn. Besides the dynamics in soil fertility, recent studies also put forward that reduced fallow periods may result in increased weed pressure. Since most of the farmers' labour time is dedicated to weeding, an increased weed pressure has important implications for the operation of the farms.

We conducted an agronomic diagnosis to better understand which factors are responsible for the decrease of cassava productivity when reducing the fallow period. The underlying objective was to explore options for alternative practices to slash-and-burn. Our study was conducted in Paragominas, in the Brazilian eastern Amazon region. We selected 37 slash-and-burn cassava fields representing a gradient in swidden-fallow cycle length. For each field, management data were collected during the cropping cycle and the labour time dedicated to weeding during the season was assessed. In addition, soil samples were taken in five subplots (5x5 m²) in all the fields, and bulk density, total nitrogen, organic carbon, texture, available phosphorus and pH were assessed. Cassava yields in the subplots were assessed by destructive harvesting.

Cassava fresh matter yields were on average of 8.32 T/ha, and ranged from 1.54 to 23.6 T/ha. We found no relationships between yield and land-use history, labour for weeding or soil organic carbon. However, there was a clear effect of land-use history on soil fertility and weed pressure. The total amount of labour dedicated to weeding increased by 12 man days/ha per year for each additional cultivation-fallow cycle in a ten years' time window. Time spent on weeding the field during the cropping season decreased with the period of the fallow before burning. Our results emphasise the importance of the weed pressure in the slash-and-burn systems. Reducing the cultivation-fallow cycle length will increase the build-up of weed populations and put pressure on the farmer's workload, which is important to take into consideration when considering for alternatives to slash-and-burn. Future work will focus on identification of factors explaining yield variability.

Keywords: Slash-And-Burn, Weed Pressure, Land-Use, Soil Fertility, Cassava, Alternative Practices, Brazil, Amazon



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ABSTRACT BOOK



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