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Land Preparation with Mulch Technology in the Eastern Amazon — The Hydrological Perspective

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Abstract

Agriculture in the “zona Bragantina” of Northeastern Brazil has been based on slash-and-burn shifting cultivation for more than 130 years. With the increase of pressure on this agricultural land-use system, management techniques such as mulching and change of cropping system have been proposed as alternatives by the German-Brazilian SHIFT project. The research objective of this sub-project is to determine which changes may occur in the water and nutrient balance at a watershed level with the implementation of mulch- technology.

Mulching in general will decrease nutrient losses to the atmosphere and overland flow, and improve the dry season soil moisture condition. These positive effects are thought to be partially offset by increased leaching and irretrievable loss through groundwater and sub-surface water movement.

Field measurements were performed from August 2000 till July 2002 at two first order tributaries of the Cumaru watershed, located 12 km southeast of the town Igarapé-Açú, and 110 km northeast of Belém, Brazil. Throughout the study period a high-resolution database was assembled. The first watershed was monitored for one year after which the land was prepared with the bush chopper. In the second watershed the traditional system was maintained throughout the entire period. The spatial database contains information on topography (Digital Elevation Model), land use, vegetation, and soils. The hydrological database contains micro-meteorological, soil moisture and runoff data at a 5-minute interval, and daily measurements of groundwater levels at 80 observation wells. Stream, ground, and rain water were sampled at regular intervals and analyzed for all main macronutrients. Infiltration and spatially distributed soil moisture measurements were performed for selected fields within the watershed.

The benefits of mulching over traditional slash-and-burn agriculture are strongest on a field level. Moisture and temperature conditions improve considerably, and nutrient losses due to leaching are minimal. At a watershed level though, the benefits will only be significant with a further land use intensification.

Keywords: Hydrology, mulch, nutrients, secondary vegetation, water