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## Relationship Between Production Systems and Environmental Impacts in a Buffer Zone: Case Study in the south-eastern Periphery of Amazonia, Maranhão State, Brazil

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### Abstract

This paper presents preliminary results on a socio-environmental study on agricultural and pasture landuse systems in the buffer-zone of the native Indian territory ‘Alto Turiagu’ in Zé Doca county, Maranhão State, Brazil. This territory, inhabited by 1500 Indians, represents one of the last remaining areas of mature rainforest in the region which is seriously endangered by illegal wood extraction and pasture expansion. Research is part of activities of a newly developing research programme on sustainable landuse, located in the south-eastern periphery of Amazonia and composed of the M.Sc.-course in Agroecology of Maranhão State University and the Embrapa Mid-North Agriculture. Research aims at a better understanding of the relationships between landuse systems and the resulting environmental impacts. For this purpose, we applied a socioeconomic questionnaire on 15 families collecting information on plant and animal production systems, landuse and family income and farmers’ expectations during the agricultural year spanning from August 2005 to July 2006. We calculated the relative technical efficiencies of production units and processed data with Data Envelopment Analysis (DEA). We relate individual benefits with the associated types of environmental impacts in this buffer-zone which historically suffered from deforestation and repeated burns. Results demonstrate that the production systems significantly impact the predominating vegetation cover. We furthermore identify a reduction in the relative technical efficiency of the production units associated with an increase in income derived from beef production together with a reduction of income derived from food crop production (upland rice, maize, beans, cassava). In conclusion we recommend a diversification of landuse systems in order to increase the efficiency of landuse.

**Keywords:** Agroecology, ecological economics, landscape ecology, smallholder agriculture, sustainable development