

**Forest Clearing and Soil Degradation**  
*Rethinking the 'Cycle of Abandonment' on the Amazonian Forest Frontier*

**Submission to the:**

**Conference on the Science and Education of Land Use:  
A Transatlantic, Multidisciplinary and Comparative Approach**  
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Luke Jones  
Department of Economics  
University of Tennessee  
Knoxville, TN 37996  
ljones54@utk.edu

and

Jill L. Caviglia-Harris  
Department of Economics and Finance  
Salisbury University  
Salisbury, Maryland 21801-6860  
jlcaviglia-harris@salisbury.edu

Other contributors: Erin O. Sills, co-PI, Department of Forestry, North Carolina State University; Daniel Harris, Geography Department, Salisbury University; Shubhayu Saha, Department of Forestry, North Carolina State University; Suzanne McArdle, Geography Department, East Carolina University; Marcos Pedlowski, Centro de Ciencias do Homen, Universidade Estadual do Norte Fluminense.

**This presentation falls into the following topic areas:**

Socioeconomic, demographic, and other factors of land use change (incl. housing affordability).  
Land use policy making, effectiveness, alternatives, consequences (impacts).

**And uses the following Approaches or Methods:**

Multi-disciplinary/integrated  
Teaching/course curricula  
Database-related and modeling (current, planned, needed)

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**Abstract**

Land use in the Amazon is a topic of global interest since the largest contiguous rainforest in the world is currently being developed for soybean production and small-scale farming. The rural poor have populated much of the Brazilian Amazon in an attempt to escape landlessness and depressed conditions experienced in other regions of the nation. As the soils on these marginal lands are degraded over time from uses in agriculture and pasture, traditional hypotheses of land settlement patterns suggest that households may have the incentive to migrate further into the frontier. The end result of this continued migration would be additional deforestation in regions largely untouched until recently. This paper examines soil degradation resulting from forest clearing by small-scale farmers in Rondônia, Brazil. Using a three-period spatial panel incorporating household observations and classified satellite data, we are able to analyze the impacts of this degradation on household welfare and migration. Our theoretical model builds on the dynamic optimization model of soil conservation to explain why it might be rational for a household with well-defined property rights to degrade land on the lot beyond a sustainable threshold. With data on household characteristics and land use, our empirical models investigate the determinants of land degradation and household migration, specifically addressing the roles of welfare, and agricultural production.

Our empirical methodology includes a two-stage least squares estimation of soil degradation and migration to account for the simultaneity of these household decisions over time. We find soil degradation to be significantly influenced by soil quality, previous pasture level, and absentee ownership. We find household migration to be significantly influenced by soil quality, degraded soil, and the percent of pasture on the lot, along with household characteristics. More importantly, we find that households on a sustainable land use path switch to more unsustainable cattle related methods once a threshold level of income is reached. We expect that as the region's milk market grows, soil degradation and the migration of households will increase at a more rapid rate, likely adding to the further development and deforestation of the surrounding area. Our policy suggestions include a role for projects that consider pasture intensification as a way to mitigate soil degradation.

This paper is the result of National Science Foundation (SES 0452-852) sponsored field-work including undergraduate and graduate students. In line with the conference focus on education, our presentation will include a brief summary of the role of students and curricula within the broad scope of the project; provide a general outline of the continuing panel and household level survey and satellite data collected in 1996, 2000 and 2005; and conclude with the study on soil degradation and household migration. Our presentation will focus on the applied results that are more applicable to an interdisciplinary audience. In addition, this paper meets some of the more general goals of the conference, utilizing an interdisciplinary approach (applying forestry, economics, regional studies and geography) to identify the socioeconomic and biophysical drivers of land use change in the Amazon.