

## Chapter 3

# HOUSEHOLD DEMOGRAPHIC STRUCTURE AND ITS RELATIONSHIP TO DEFORESTATION IN THE AMAZON BASIN

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### Abstract

The greatest challenge to theory in human ecology has been how to define the unit of study so that it can be reasonably well studied, while at the same time not losing sight of the larger whole or ecosystem within which human beings interact with their biophysical surroundings. Some relevant theoretical approaches used to address particular questions include those aiming at explaining patterns of agriculture intensification (e.g., Boserupian and Von-Thunenian models), and household development cycles (e.g., Chayanovian models). In this project we ask what the role of household demographic structure on observed rates of deforestation might be. The study of human impacts on land cover can follow any number of approaches. What we have found most useful is to take a multi-scaled approach that examines at each level of aggregation both biophysical and socioeconomic variables. We have used a variety of methods of data collection and mined a variety of data sources: time-series Landsat satellite data; survey research; stratified random sampling of properties; registering property boundaries onto satellite image time series in a geographic information system; carried out soil and vegetation stand sampling with precise coordinates using GPS; examined the reproductive histories of women and their decisions using survey research at the household level; and obtained time series price data and other economic statistical time-series. A key goal of this study was to understand whether trajectories of deforestation could be better understood knowing the age and general structure of households through time, rather than just in aggregate number.

We think that our study does show the technical feasibility of examining land use and land cover change at the level of households and properties—and that the insights are worth the effort and investment required to achieve it.

**Keywords:** Population and environment, Amazon, household demographic structure, deforestation, land use, land cover

## 1. INTRODUCTION

Our research on population and the environment evolved from earlier interests some of us have had in government-directed colonization into the Amazon Basin, the process of adaptation by migrants to a new biophysical and social environment, and on trajectories of deforestation (Moran 1976, 1981, 1987, 1990, 1993). Theoretically we have been guided by a set of theories generally referred to as human ecology (Moran 1979, 2000; Moran and Brondizio 2001), and more recently as environmental social science (Moran in preparation). Its antecedents are the work of geographers and anthropologists such as Julian Steward (1955), Robert Netting (1968, 1981), Carl Sauer (1958), William Denevan (1976), Karl Butzer (1980), Roy Rappaport (1967), and others. The greatest challenge to theory in human ecology has been how to define the unit of study so that it can be reasonably well studied, while at the same time not losing sight of the larger whole or ecosystem within which human beings interact with their biophysical surroundings. Several solutions have been offered in the past: the use of a cultural area as the equivalent of a biogeographical area (Kroeber 1939); the use of social organization for subsistence as a core set of variables (Steward 1955); and the ecosystem as a unit of analysis (Rappaport 1967; Moran 1990, for a review of the ecosystem literature). From the onset we realized that no “monolithic” theory could account for human decisions and land use change in the region. However, some relevant theoretical approaches used to address particular questions include those aiming at explaining patterns of agriculture intensification (e.g., Boserupian and Von-Thunenian models), and household development cycles (e.g., Chajanovian models).

In this particular project we were driven to ask what the role of household demographic structure on observed rates of deforestation might be. This question was suggested by earlier work in the region (Moran 1976, 1981) in which it was observed that younger households pursued very different land use strategies than middle aged and aging households. In a frontier region, where labor is generally scarce, the number of working age members might reasonably be inferred to play a key role in how much labor a household can muster for farm work and thus which strategies are likely to be chosen. Yet,

it was also observed that households pursued a more intense process of deforestation at the outset, when they had least labor. The result of these observations in the field, in the course of studying issues of adaptation and trajectories of secondary succession, led to our current project on population and environment.

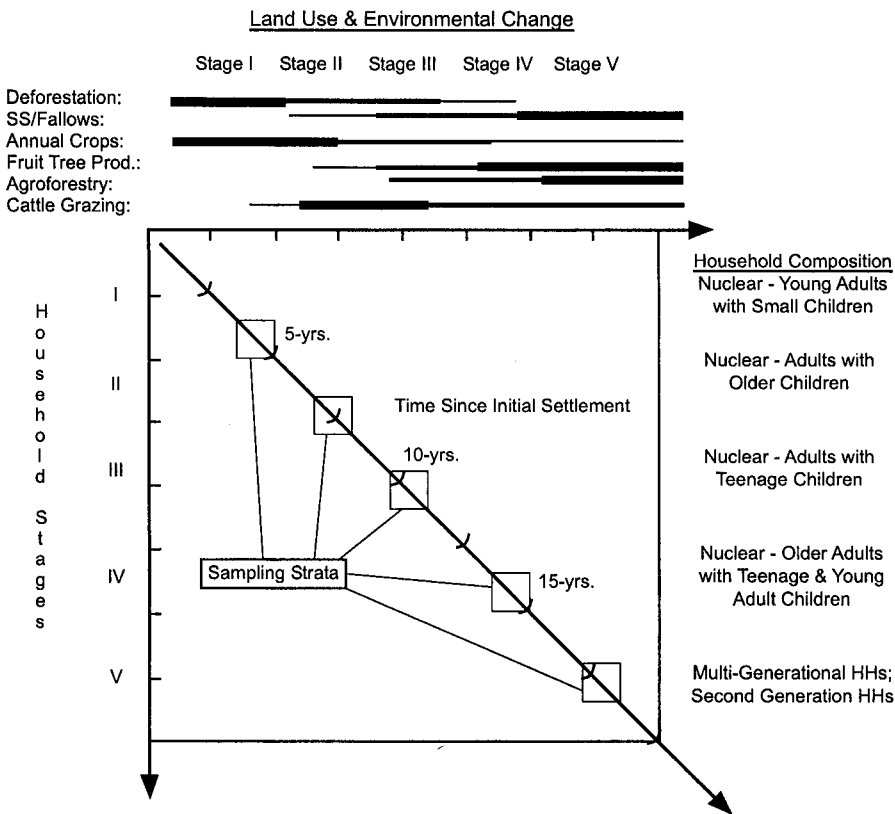


Figure 1. Conceptual model of demographic and environmental change (Brondizio et al. In press)

Figure 1 illustrates the conceptual model that guided this research linking household demographic structure to the deforestation and land use behavior of households. The model posits that there is a developmental cycle (Goody 1962, 1976) resulting from the changing age and gender composition of the household over time. The timing and magnitude of these reproductive decisions are expected to affect how households relate to environment and economy. The model proposes that younger households, with very young children and low supplies of capital, will focus on annual crops in the frontier as a way of building up their capital stock, and as a way to transform

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