

## **Linkages between household lifecycles and land-use change**

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A theory of the role of household life cycles (HLC) has emerged to explain observed patterns of land cover and land use change in the Amazon basin (Walker and Homma 1996; McCracken et al. 1999; Perz 2001; Walker 2003). This theory, based in part on the Russian economist, Chayanov, addresses links between a household's evolving family structure and land use (Chayanov 1925). Given that households change over time in terms of working experience, the availability of family labor, the accumulation of assets, and consumption preferences, patterns of land use also change. This link between the evolution of household structure and evolving land use, with implications for changes in land cover, has been a focus of researchers attempting to provide farm level descriptions of tropical deforestation, particularly in forest frontiers.

The HLC scenario starts with migration of a young household to lands beyond the extensive margin of agriculture, typically to a frontier that has been made accessible by government infrastructure investment. The assumption generally made is that the colonist household is poor, and contains high internal dependency, namely young children not yet ready to add their labor power to the farming venture. Given factor constraints, the subsistence needs of the household, and the associated risk of jumping into commercial as opposed to food production, the household relies on time tested annuals (e.g., rice, maize, and beans) and the system of shifting cultivation, which provides for their consumption needs but little else.

Over time, the household members age, gaining farming experience and knowledge of local conditions. The children become teenagers, adding their productive power to the household workforce. The decline in household dependency mitigates risk aversion, and the household stands ready to exploit new opportunities by diverting resources away from food production to the development of commercial crops. The implication for land cover depends on location, but in the Amazon basin this shift in farming activity involves the adoption of both perennial crops (e.g., coffee, cocoa) and cattle pasture. Since ranching is land demanding, the overwhelming landscape effect is conversion to pasture, although secondary regrowth can accumulate given (1) the retiring of lands deemed unproductive; (2) the reduction in household labor with household aging; and (3) farm abandonment due to failure or out-migration. It is important to note the role played by household expectations in the evolution of its farming system. In particular, the spark to initial migration is the hope that the land occupied will one day be integrated into a national system of land use. Thus, the push to developing a commercial system is founded on the expectation that someday its products will be marketable.

Although empirical research has not demonstrated the general validity of the household life cycle (HLC) in explaining tropical deforestation, it has established links between household demographic characteristics and agricultural strategies. Family size (Rudel and Horowitz 1993; Pichón 1997), number of male workers (Sydenstricker and Vosti 1993; Walker et al. 2002), and internal household dependency (Walker et al. 2002) impact either levels of deforestation or crop choices. Other attributes also plays roles, such as level of household wealth (Alston, Libecap, and Schneider 1993, 1996; Pichón 1997; Walker et al. 2002), and length of residence on the

holding (Godoy, Wilkie, and Franks 1997; Pichón 1997; Godoy et al. 1998; Walker et al. 2002). Finally, it must be pointed out that traditional market factors, namely transportation costs, have significant impacts on household-level land cover (Ozorio de Almeida and Campari 1995; Godoy, Wilkie, and Franks 1997; Pichón 1997; Walker et al. 2002).

HLC theory conveniently organizes a number of empirical observations about colonist farmers and land cover and land use change in tropical frontiers, especially in the Amazon basin. Nevertheless, a number of issues – empirical, interpretative, and theoretical -- remain open to interrogation. Several of these are discussed below.

### Empirical Issues

Perhaps the most significant empirical issue involves demographic processes mostly overlooked in HLC statements. Clearly, migration affects the composition of household labor, although the narrative statement of the model takes the household as a closed system. This closure also affects time domain. Specifically, generational dynamics can and do extend land cover processes at property level, since children of frontier migrants often stay and start their own families, continuing to work the property as their parents grow old and infirm.

A second empirical issue is the more widespread applicability of HLC beyond Latin America, and specifically the Amazon basin. Does HLC theory provide a robust description of joint household/landcover dynamics in other regions of significant tropical forest cover, like Africa, Southeast Asia, and Central America? Or, is HLC theory of more limited applicability, and if so, why? In a related vein, is HLC theory applicable to populations other than colonists, such as long-standing residents of forest regions who often possess some indigenous ancestry?

### Interpretative Issues

Although HLC theory potentially provides an explanation for tropical deforestation at micro-scale, the factors precipitating migration in the first place emerge by the interplay of social and economic forces at macro-scale. Thus, if HLC is invoked in providing an explanation of tropical deforestation, it must be embedded in the political economy of the push factors leading to frontier migration. Applied thoughtlessly, HLC theory represents a recrudescence of neo-Malthusian thinking that privileges the role of population factors in environmental change, but at micro-scale.

### Theoretical Issues

Demographic shortcomings mentioned as empirical issues also possess theoretical dimensions, particularly the generational dynamics alluded to. Under what conditions, and why, do children remain on-farm to create their own families?

Of fundamental import to the edifice of HLC theory is the extent to which observed trajectories of household and land cover actually result from the causal linkages as described, whereby changes in household labor force and dependency drive farming system switches. In fact, the movement from annual to commercial crops (e.g., pasture and/or perennials) could be largely autonomous, a farming strategy practiced independently of household attributes. Empirical evidence suggests that farm change may be “too fast” to be explained by dependency dynamics and the attenuating of risk aversion (Aldrich et al. In press.). More empirical research is needed to address this basic issue.

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