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Learning from the past: Trends and dynamics in livelihoods of Bolivian forest communities

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ABSTRACT

We use social ecological systems theory (SES) to analyse change in forest communities in the northern Bolivian Amazon. SES characterizes interdependent dynamics of social and ecological systems and we hypothesized it to be a useful frame to grasp dynamics of forest communities affected by changes in forest policies, regulations and institutions, as well as economic demands and conservation objectives. We analysed the long-term historical changes since the region became incorporated in the global tropical forest product value chain since the late 19th century and quantitatively analysed changes in 85 forest communities between 1997 and 2009. We collected information on 16 variables related to demographic, productive, and socio-economic characteristics. Results show that forest communities have experienced major changes and have adapted to these changes. Social thresholds, a key concept in SES, are consistent with multiple social economic forces experienced by forest communities. Detrimental feed-back effects of SES can be confronted when innovative exploration mechanisms, such as new productive chains are developed, or the agro-extractive cycles of current productive system are expanded. Competition among households, population growth and more profitable economic opportunities may threaten benign forms of forest products extraction that have persisted through various cycles of internal and external changes.

1. Introduction

Political, economic and social forces affect the livelihoods and resource use of forest dependent communities (Mwangi and Ostrom, 2009; Walker, 2005, p. 80). Such events, occurring at macro and meso levels, may create political, social and economic incentives that promote or supress the sustainability of resource use systems and may induce changes in societies (e.g. Assies, 1997, p. 36; Cronkleton and Pacheco, 2010). There is a necessity to identify the drivers that influence how communities manage and exploit resources (e.g. De Jong et al., 2010; Perz and Almeyda, 2010). However, where such drivers operate, they usually do not operate simultaneously, their impacts are not homogenous, and some of them are cyclical while others are not (Agrawal et al., 2008, p. 1460; Andersson and Ostrom, 2008; Moore, 2011). Therefore, it is

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relevant to assess the influences of such drivers on community development, in order to understand the capabilities of communities to manage natural resources sustainably.

Social–ecological systems theory (SES) is an analytical frame to understand interdependent dynamics of social systems (people and their social and economic attributes) and ecological systems (ecology and natural resource exploitation) (Berkes et al., 2003; Holling, 2001). SES, therefore, is useful to analyse changes of forest dependent communities. An important concept in SES is *resilience*, defined as a system's capacity to reorganize while sustaining functional characteristics, which is similar to adaptation (Walker et al., 2006). Reorganization implies changing productive and organizational structures to absorb external pressures and avoid trespassing any critical thresholds that may lead to undesired irreversible changes (i.e. over-exploitation of natural resources to the point that they collapse) (Renaud *et al.*, 2010). A next important concept is technological or social *thresholds*. These are tipping points when acceptable conditions turn into unacceptable conditions (Christensen and Krogman, 2012) and thus are quite relevant to natural resource dependent communities.

Understanding the responsiveness of communities in a given SES is relevant, because changes may bring benefits and opportunities but also incur costs (Janssen and Scheffer, 2004; Liebowitz and Margolis, 2000, p. 985). Communities with high responsiveness to changes suggest availability of well-developed capacities or networks (horizontal or vertical), and this is consistent with feedback effects in SES (Christensen and Krogman, 2012). When social thresholds are reached investments are required in the forms of explorations of innovative resource use (Chabay et al., 2011; Duit and Galaz, 2008; Lam, 2000; March, 1991). We hypothesize that social adaptability in communities depends on the nature of resources use patterns and the evolution of local social economic relations.

Responses to changes at household level may enrich the understanding of resource use patterns (Assies, 2002). Assies (1997) proposed the concept of the *agro-extractive cycle* to characterize forest dependence of the northern Bolivian natural resource economy. He argued that extraction-based livelihoods in the region are sustainable, but they are strongly influenced by volatile markets, exploitative labour relations, and excessive exploitation of natural resources (Assies, 1997). In such conditions, changing access to markets, demographics, social differentiation and accumulation, in addition to impacts on natural resources may drive changes of resource use (Assies, 2002; Frankenberger et al., 2003; Homma, 1992, 1994). As households enter into a market economy they may alter the nature of agro-extractive cycles (Delacote, 2007; Godoy et al., 2007; Labarta et al., 2008; Sierra et al., 1999; Takasaki et al., 2001, 2011). Therefore, micro level responses to changes may also explain how livelihoods develop new paths of forest use.

There are various interpretations of how forest-incomes may prevent extractive economies to change. One is that rural dwellers use forest-incomes to buffer risks of stable food production and other incomes (Delacote, 2007; Pattanayak and Sills, 2001). Another is that specialization on certain natural resources is conditioned by the configuration of the production factors labour, land and capital. If production factors are abundant or markets are risky, the composition of productive activities are likely to remain stable (Sierra et al., 1999; Takasaki et al., 2011). Such micro economic analyses, however, are based on a household model, but spatio-temporal variations are not taken into account. Spatio-temporal variations are relevant as they better accommodate the natural resource dimension of SES, and may better anticipate diverging tipping points which may be similar to SES thresholds. We use those concepts to describe and analyse cycles and trends of natural resource use in the northern Bolivian Amazon.

Using the SES theory as an analytical frame, this study analyses historical changes since the early 20th century and more detailed changes between 1997 and 2009 among forest communities in the northern Bolivian Amazon region. Important changes over the last decade are devolution of rights to communities, the implementation of a new regulatory forest management regime, a steady increase in the international market price of Brazil nuts, the main commodity produced in the region, and improved road access to communities (Cano, 2012; De Jong, 2004; Ruiz, 2005). The impacts of these major changes and their interactions, on communal resource management and related collective action are rather unclear (Barham and Coomes, 1996; Caldas et al., 2007; Stoian, 2000). No detailed analysis of changing the adaptive capacity of communities in the region has yet been performed. The questions to be answered then are: (1) What changes have shaped forest dependent communities in northern Bolivia?; (2) Which factors have determined trends of resource use in these communities?; (3) To what extent are communities in northern Bolivia able to adapt to changes?; (4) What type of investments on resource use do communities make to adapt to their changing environments?; (5) What is the impact of changes and consequent social and economic adaptations to the ecological system?

2. Materials and methods

We reviewed the history of the northern Bolivian Amazon region, based on published accounts. In section three we present a review of this historical transformation, highlighting economic, demographic and political changes. We conducted an initial qualitative survey in September 2007 to March 2008 in ten communities, holding in-depth interviews with local leaders and community members to obtain information on the history and changes related to forest use, forest condition change, agricultural production and demography in communities.

We conducted quantitative surveys in 85 communities as part of a wider study on livelihoods among the region's forest communities (Zenteno, 2013; Zenteno et al., 2013). To evaluate the changes over the last 12 years, we combined data on 163 settlements from a study carried out by Stoian and Henkemans in 1997 (Stoian, 2000; Stoian and Henkemans, 2000; Henkemans, 2001) with our own data from 2009 (Zenteno, 2013; Zenteno et al., 2013). The Stoian and Henkemans survey focused on communities located at the main rivers, and less so on communities located in the eastern and northern parts of the region. As a result 30 communities matched our own survey. We obtained the necessary information for the