Dynamics of rural livelihoods and environmental reliance: Empirical evidence from Nepal☆

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ARTICLE INFO

ABSTRACT

Using environmentally augmented panel dataset of 2009 and 2012 from four districts in Nepal, we assess environmental reliance of households in different livelihood strategies and dynamic transition groups. We employ a latent class cluster analysis to determine the optimal number of livelihood clusters and assign individual households to particular cluster; and regression models were used to examine the covariates of change in environmental income and reliance. The analysis identifies six distinct livelihood clusters in terms of asset investment in different livelihood activities. Results show that majority of households persist in the relatively lower remunerative livelihood strategies between 2009 and 2012. Environmental income is important to all livelihood strategies. However, households in the least remunerative strategy and downward transition group have higher environmental reliance. It is also found that households with upward transition are likely to have reduced environmental dependency. Hence, enhancement of poverty reduction strategies in supporting poorer household in asset accumulation and undertake alternative higher remunerative livelihood strategies will eventually reduce the pressure and dependency on environment. Furthermore, conservation policies and natural resource management are critical in the study areas to sustain the increased demands on environmental products and services.

1. Introduction

People living in rural areas in developing countries are highly dependent on environmental resources and services provided by their natural ecosystems, such as water, cultivable land and non-timber forest products. Environmental resources and related income generation activities are an integral part of rural livelihoods (Mamo et al., 2007; Mcelwee, 2008; Shackleton and Shackleton, 2004; Walelign, 2013). These resources and activities often provide one or more of the following four essential functions in maintaining or improving rural livelihoods, including: (i) subsistence, supporting current year round households consumption needs; (ii) seasonal gap-filling, covering income or consumption shortfalls due to seasonality of certain income generation activities; (iii) safety net, providing support to overcome unexpected income losses or subsidize consumption shortfall due to unexpected shocks (e.g. crop failure) or high expenditures (e.g. wedding, funeral); and (iv) pathway out of poverty, providing households with a regular cash income that can be saved and used to buy assets (Angelsen and Wunder, 2003; Cavendish, 2002). Contribution of environmental resources and services to rural livelihoods can be measured in monetary units and constituent environmental income in households' total income accounting (Angelsen et al., 2014; Babulo et al., 2009). The share of environmental income to household's total income reflects households' environmental dependency. Overall, rural households often exhibit a higher level of dependency on environmental resources (Angelsen et al., 2014; Babulo et al., 2009; Vedeld et al., 2007; Walelign and Nielsen, 2013).

Due to a high degree of heterogeneity observed in rural livelihoods (Ansoms and McKay, 2010; Ellis, 2000; Yaro, 2002), households are more likely to have distinct level of environmental dependency. Hence, environmental dependency assessments should be undertaken at sub-groups of a population – by grouping households that exhibit some level of similarity. In the previous studies on household level environmental dependency, distinct wealth groups are often identified based on income, assets or both. For instance, Córdova et al. (2013), Hogarth et al. (2013)), Yemiru et al. (2010), Vedeld et al. (2007) and Mamo et al. (2007) used income quintiles, Rayamajhi et al. (2012) and Babulo et al. (2009) used income quartiles, Adhikari et al. (2004a), Heubach et al. (2011) and Kabubo-Mariara (2013) used income terciles, Walelign (2013) used two income poverty groups, Charlery and Walelign (2015)

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and Nielsen et al. (2012) used four poverty groups based on a combined income and asset measure. These studies provide better understanding on household environmental dependency of different categories. Often, the richer households extract more resources from the environment, while the poor are more dependent on environmental resources.[1]

Unlike other studies, we identify livelihood strategy categories instead of wealth categories in this paper. Wealth based categories fail to capture the diversity that may present with each wealth group. For instance, rural households that are identified as poor are not homogeneous, rather they are often heterogeneous in the way that they make a living, engaging in different mix of livelihood activities to maintain or improve their livelihoods (Ansoms and McKay, 2010; Yaro, 2002). Hence, we assert that environmental dependency is better understood if the household categories are identified on the basis of what they do (e.g. income they get from different livelihood activities, assets investments into the activities or both) rather than what they currently own (e.g. total income, assets or both). And, understanding environmental dependency in the context of rural livelihood strategies improves the efficiency of policy interventions.

Nguyen et al. (2015), Porro et al. (2015), Walelign (2016), Chilongo (2014), Tesfaye et al. (2011), Zenteno et al. (2013) and Babulo et al. (2008) identify livelihood strategy groups to assess environmental dependency of rural households. They employee hierarchical and/or k-means cluster analysis to identify livelihood strategies using absolute income or share of income (to total income) generated from different livelihood activities as a choice variable.[2] Three major limitations underpin these studies. First, income per se is stochastic and does not reflect the amount of assets households invested in different activities[3] (Nielsen et al., 2012). Hence, the use of income is not well suited to identify and categorize household into livelihood strategies (Jansen et al., 2006; Nielsen et al., 2013). Second, the use of agglomerative and k-means cluster algorithms is relatively arbitrary and subjective in livelihood strategy clustering (Haughton et al., 2012; Magidson and Vermunt, 2002). Third, the studies overlooked the dynamics in livelihood strategies amid the presence of ample evidence that rural households' switch or modify livelihood strategies (Berhanu et al., 2007; Jones and Thornton, 2009; Van den Berg, 2010). Thus, lacking this dynamic aspect is a major flaw for livelihood studies (De Haan and Zoomers, 2005; Scoones, 2009).

This paper is aimed at empirically investigating the dynamics of livelihood strategy transitions and changes in environmental reliance, and their interrelationship. We focus on three questions: i) what are the household livelihood strategies and their transitions? ii) How much do households dependent on environmental income over the years (2009–2012) and across livelihood strategies? and iii) how does changes in environmental reliance associate with transitions of livelihood strategies over the years (2009–2012)? Using an environmentally augmented panel dataset from Nepal, a latent model clustering approach was employed to identify livelihood strategies and households' environmental dependency were analyzed across the various livelihood strategy and dynamic transition groups.

2. Conceptual framework

This study is theoretically grounded in the conceptual frameworks on sustainable rural livelihoods (Scoones, 1998, 2015; Ellis, 2000), and household livelihood strategy framework (Winters et al., 2001; Nielsen

et al., 2013). The sustainable livelihood approach lays out a basis for livelihood analysis and draws on key factors (i.e. livelihood resources, contexts and institutional processes, livelihood strategies and outcomes) that affect rural livelihoods. Household livelihood strategy framework elaborates further and enables a closer examination of the relationships between livelihood assets, activities, outcomes and contextual factors. In addition, this paper makes use of the recent methodological advances to quantify environmental augmented rural household income data (Angelsen et al., 2011; Cavendish, 2002).

Fig. 1 presents the analytical framework of this paper which is based on the household strategy framework (Nielsen et al., 2013) originally adapted from Winters et al. (2001). The household is considered a social unit for the analysis under the framework. The main concepts used for analyses are assets, activities, outcomes and context. Assets (natural, social, physical, human and financial capital) play critical roles in the livelihood dynamics; they are influencing directly the choices of livelihood activities and outcomes as well as decisions to adapt. Livelihood strategy is the portfolio of livelihood activities that a household is undertaken; similarly, it is dynamic and adaptable to availability resources (e.g., labour, physical assets, and financial capital) and changing context. Environmental reliance is conceptualized here as the relative income share of the total household income; it varies across livelihood strategies and changes over time. Moreover, transitions of livelihood strategies are interacted with changes in environmental reliance.

3. Methods

3.1. Study area and data collection

The data was collected from six village development committees (VDCs, an administrative unit) under the Community-based Forest and Tree management in the Himalayas (ComForM) project following the Poverty Environment Network (PEN) study approach (PEN, 2007). The VDCs are located in four districts (Kaski, Chitwan, Mustang and Gorkha) in the Western and Central Development regions and span across the three major agro-ecological zones of Nepal (Mountains, Midhills and Terai). The study villages were selected purposefully considering the following criteria: (i) the altitudinal and vegetation variation in Nepal, (ii) households' environmental reliance, (iii) community's attitude towards long-term research, and (iv) village accessibility and safety for researchers (due to the ongoing civil war in Nepal during site selection in 2005) (Larsen et al., 2014).

Data collection involved a series of structured household surveys, including biannual and quarterly survey instruments. The biannual surveys were conducted at the start and end of each survey year. The start survey collected basic household information such as demographics, assets, access to forest and markets for forest products. The end survey focused on household livelihood changes in the survey period of one year (e.g. regarding gain or loss of assets, whether households experienced crises or unexpected expenditure). The quarterly surveys were designed to collect high quality income data with relatively short recall periods of maximum three months being applied to minimize errors arising from long recall periods as well as the seasonality of income sources. Income is defined as the value added of labour and capital; the total value of cash or goods obtained from the trade of goods and/or services by members of the households minus the cost of input except households labour. Similarly, environmental income is defined as the value added of labour and income from collection of products from forest and non-forest environments (e.g., grassland, bushlands, wetlands, fallows). Labour was not considered in the income calculation due to estimation difficulties and the poor labour market in the study sites. The resulting data is a panel data from 2008 and 2012 in Gorkha and in 2009 and 2012 in the remaining districts. We put all variables measured in monetary units in 2009 prices using the national Consumer Price Index (CPI).

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[1] A notable exception to this finding is Heubach et al. (2011) who report that the richer households generates more income from and also are more dependent on environmental resources in Northern Benin.

[2] Porro et al. (2015) and Babulo et al. (2008) are an exception. Both do not employ cluster analysis to identify livelihood strategies. Porro et al. (2015) generates livelihood strategy groups based on assessment of households dependency on income from livelihood activities, forest income, agricultural income and wage and business income while Babulo et al. (2008) generates environmental dependency quartiles and label these groups as livelihood strategy groups.

[3] This limitation does not apply for Nguyen et al., 2015 which employ asset as activity based choice variables.