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Effects of industrial plantations on ecosystem services and livelihoods: Perspectives of rural communities in China

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ABSTRACT

This paper addresses the current research void on local community views of changes in ecosystem services associated with rapid land use transformation in the context of plantation-based forestry. This interview-based study, conducted in southern China, aims at assessing the perspectives of local communities of: 1) the effects of *Eucalyptus* industrial plantations on selected ecosystem services and on local development; and 2) opportunities for future community livelihood development, based on the relations with the government and with forest industry operating locally. We analysed data from semi-structured interviews with 70 villagers for their views on changes in ecosystem services after the establishment of plantations, and their future expectations on the local livelihood development. Most interviewees mentioned some negative development on environmental quality after the establishment of the industrial plantations, especially on soil and water. Furthermore, the reduced productivity of cropland surrounding industrial plantations, coupled with other financial drivers, induced several villagers to switch from agricultural crops to household plantations. In the absence of destructive typhoons, household plantations can provide owners more free time, higher income, while industrial plantations provided some employment opportunities. Interviewees' expectations for the future included receiving financial support and capacity building for household plantations and crops, support to local roads and schools, and higher employment opportunities. Some interviewees suggested that solutions should be implemented for improving degraded water quality, while others suggested reducing forestry operations. Even though being highly context-specific, our findings open up the discussion about the further community development opportunities in the context of plantation forestry. In particular, the potential of value sharing mechanisms between the private sector and the local communities should be further studied.

1. Introduction

The number of applications of the ecosystem services concept is growing in scientific research and policymaking. Existing research has hitherto greatly focused on assessing the state and value of ecosystem services (Abson et al., 2014), whereas 'less emphasis has been given to understanding the relative importance and interplay of biophysical, ecological and social components over time and space' (Bennett et al., 2015; p. 79). In particular, limited attention has been dedicated to assessing the demand for different ecosystem services combinations by different groups of beneficiaries[1] (Lamarque et al., 2011). In addition, most of the existing studies on the topic focus on the benefits obtained by people from natural or semi-natural ecosystems (e.g. Landreth and Saito, 2015; Rönnbäck et al., 2007; Simelton and VietDam, 2014).

There is, however, a paucity of research assessing local community views on ecosystem services changes associated with intense land use transformations (Suich et al., 2015). Exceptions include, for instance Vihervaara et al. (2012). Globalization and trade liberalization have influenced global environmental governance, and have often affected local ecosystems and the communities who depend on them (Aggarwal, 2006). Therefore, eliciting community perspectives on changes in land use and ecosystem services is of particular interest.

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[1] In ecosystem services literature people benefiting from ecosystem services are often referred to as 'stakeholders'. In this paper, we prefer to use the term 'beneficiaries' when referring to ES, to distinguish from the terminology used in business literature. The business literature in fact also employs the term 'stakeholders' to identify groups who exchange relationship with or have an influence on the firm (Freeman, 1984), including employees, customers, suppliers, financiers, governmental bodies, media, civil society and local communities.

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In this study we focus on the socio-economic impacts of forestry plantation, which is rapidly expanding worldwide, especially in the Global South (Bauhus et al., 2010). The expansion of tree plantations is often driven by public and private efforts rather than initiatives by smallholders (Kröger, 2014). The appropriate management of industrial plantations[2] and their future role in governing global forest resources is currently the object of heated debate (Bauhus et al., 2010; Gerber, 2011; Rudel, 2009; Schirmer et al., 2015).

Fast-growing plantations contribute greatly to increasing resource needs, while occupying limited amount of land and contributing to reduce pressure on natural forests. Expanding plantation forestry currently cover 7% of the world's forest area and provide one third of global industrial round wood (GFRA, 2015; Barua et al., 2014). Industrial-scale plantations often contribute to local and regional development by providing employment opportunities or by financially supporting local infrastructures (Pirard et al., 2017).

The environmental effects of plantations are very context-specific and depend on several variables, including previous and surrounding land uses, plantation purpose, land tenure and management, and plantation scale and configuration in landscape (Paquette and Messier, 2009; Batra and Pirard, 2015). Comprehensive and decisive analyses on the topic are thus difficult to obtain. However, intensive management of timber production may result in trade-offs especially with local ES, such as water purification and regulation, nutrient cycling, soil maintenance, genetic diversity maintenance, recreation and possibly cultural values (Baral et al., 2016). Therefore, sustainability concerns exist on whether environmental and social costs outweigh the benefits (Charnley, 2005).

A global survey of the perceptions of expert stakeholders perceptions (Kanowski and Drazen, 2015) about policies, governance of intensively managed plantations, as well as their implementation and practices suggest these have progressed since the mid-2000s. However, consistent variation exists across countries, businesses and key issues. Nonetheless, there is a need for 'different modes of plantation industry development and their impacts' (Landry and Chirwa, 2010; p. 543). Stakeholder concerns are of particular relevance to forest companies, for whom corporate sustainability and stakeholder engagement have become pivotal. Stakeholders' opinions are fundamental to legitimize companies' activities and maintain social licence to operate (Mikkilä and Toppinen, 2008).

Southern China is a research region of interest with regard to forest resources. Since the late 1990′s the government has promoted a unique array of policies that targeted reforestation for environmental and economic purposes, in addition to rural development (Yin et al., 2014). These policies were also implemented to stop extensive deforestation and environmental degradation, while addressing the increasing demand for wood. There has simultaneously been a rapid development of industrial plantations led by consistent investments from domestic and international forest companies (Zhang et al., 2015). As a result of these phenomena, China has experienced rapid reforestation and development of intensive plantation-based forestry. About 38% of the national forest area in China consists of plantations, which represents the world's largest plantation area whereas the natural or semi-natural forests in China are newly regenerated and have low stocking levels (GFRA, 2015). Although increased tree cover may be a good achievement per se, forest quality is rarely assessed (Zhai et al., 2013). Intensively managed single-species plantations are not equivalent to naturally regenerating forest, and the establishment of industrial-scale plantations has implications for ecosystem services provision and their beneficiaries, especially at the local level.

This study aims at deepening the understanding of the effects of industrial plantations on ecosystem services and livelihoods by investigating the perspectives of a key stakeholder group, local communities (Yu et al., 2016), about: 1) effects of the industrial plantations locally managed by a forest company, with a specific focus on the interactions between ecosystem services and local development; 2) needs for the future development of community livelihood, especially interactions among local communities, local government and the forest industry. Our study focused on the views of local villagers in Guangxi Province, China.

2. Theoretical background

The theoretical framework of this study (Fig. 1) merges the concept of ecosystem services (MA 2005) with that of sustainable livelihood approach (Scoones, 1998). Moreover, the framework introduces the concepts of ecosystem services valuation, corporate-sustainability and benefit-sharing.

The ecosystem services concept draws from a utilitarian framing of nature (Haines-Young and Potschin, 2010; MA, 2005). Provisioning, regulating and cultural services contribute to human well-being and fundamental livelihood assets (natural, financial, human, physical and social capital) by satisfying basic physiological needs and contributing to education, health, employment, security, social relations and the sense of belonging. In particular, ecosystem services from natural and semi-natural forest ecosystems are important to the livelihoods of local communities (Angelsen et al., 2014; Fisher et al., 2014; Yang et al., 2013) by contributing to food, income, shelter and spiritual values.

ES are determined by the geographical, natural, social, economic and cultural context of the beneficiary(ies) (Haines-Young and Potschin, 2010). The perception and value of ecosystem services also vary among and within different individuals (TEEB, 2010 pp. 3–29; Kumar and Kumar, 2008; Lewan and Söderqvist, 2002). Several assessment methods exist to assess or elicit the relevance of ES, including: qualitative evaluation, biophysical assessment, benefit-flow assessments, mapping and economic valuation (IPBES, 2014). Among these methods, there is the investigation of people's awareness of ecosystem services, and eventual inequalities in the distribution of benefits between actors. Different actors mediate ecosystem services access, status and flow for others. This is determined by the institutional setting (Sikor and Baggio, 2014), including the spatial (e.g. upstream-downstream) and power relations among different beneficiaries, such as access rights, governance, and land stewardship (Bennett et al., 2015; Felipe-Lucía et al., 2015; Pereira et al., 2005). The analysis of the views of a specific group of beneficiaries, such as local communities, can be of interest both as providing novel scientific data and applied knowledge for civil society, regulators, and the private sector (Campos et al., 2012; Sodhi et al., 2010).

Beneficiary management and community involvement have gained a pivotal role for companies by shaping sustainability goals, strategies and actions (Branco and Rodrigues, 2007; Freeman, 1984; Freeman et al., 2004; Jennings and Zandbergen, 1995). According to Bowen et al. (2010), different strategies of community involvement include, transactional, transitional and transformational engagement, from the most basic to the most sophisticated level, respectively. Transactional engagement involves a philanthropic, top-down approach such as charity or nature conservation projects. Transitional engagement aims at community involvement via bidirectional dialogue. Transformational engagement aims at community integration by joint decision-making, and is perceived

[2] In this article we define 'industrial plantations' as monoculture of exotic tree species, managed on large scale by private or public companies for commercial purposes. See Chazdon et al., 2016 for a review of key definitions.