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Analysis

Certification of Semi-forest Coffee as a Land-sharing Strategy in Ethiopia

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ABSTRACT

We analyze whether private sustainability standards can improve the economic benefits from less intensified semi-forest coffee production in southwestern Ethiopia. We compare garden and semi-forest coffee systems, including non-certified and Rainforest Alliance certified semi-forest coffee, and evaluate yields, returns to land, returns to labor and profits. We use original household- and plot-level survey from 454 households and 758 coffee plots derived from a household survey and Geographic Information Systems, and ordinary least squares and fixed effects regression models. We find that more intensified garden coffee plots bring about higher yields and returns to land than less intensified semi-forest coffee plots; and that Rainforest Alliance certification of semi-forest coffee leads to higher returns to land and labor, and profits than non-certified semi-forest and garden coffee, mainly by guaranteeing farmers a better price and not by improving yields. Findings imply that in southwestern Ethiopia coffee certification can support farmers' incentives for land-sharing between coffee production and semi-natural forest conservation.

1. Introduction

Sustainable agricultural production is a challenge. Especially in developing countries there are large trade-offs between socio-economic goals of increasing rural incomes and decreasing poverty and environmental goals such as biodiversity conservation (Bekessy et al., 2010). There is an ongoing debate on whether sustainability is best achieved through land-sharing or land-sparing (Green et al., 2005; Phalan et al., 2011; Kremen and Miles, 2012; Tscharntke et al., 2012; Kremen, 2015). The first entails the integration of both biodiversity conservation and agricultural production on the same land, presuming a less intensive production system and lower yields. The latter entails intensified agricultural production with higher yields on farmland while protecting other land from agricultural encroachment and sparing it for biodiversity conservation. Some ecological studies conclude land-sparing to be most beneficial for biodiversity conservation (Phalan et al., 2011; Law et al., 2015) while others find comparable biodiversity outcomes from both strategies (Yoshii et al., 2015). Some studies have taken into account the socio-economic implications of these strategies and conclude land-sharing to result in more diversified livelihoods (Dressler et al., 2016) and employment creation (Lee et al., 2014). Others argue that agricultural intensification on farmland and land-sparing for biodiversity conservation is the best option for enhancing profits and farmers' welfare (Lusiana et al., 2012). Yet, there is also doubt on the potential of land-sparing strategies to close yield gaps, and to meet the growing global food demand (Phalan et al., 2014). Agro-forestry systems have been put forward as possible land-sharing strategies. It has been shown that low-shade agro-forestry systems can reduce trade-offs between income, biodiversity and ecosystem functioning in the process of tropical rainforest conversion and agro-forestry intensification in Indonesia (Steffan-Dewenter et al., 2007). For coffee systems in Ethiopia it has been shown that, when benefits from ecosystem functions, biodiversity conservation and carbon storage are taken into account along with economic benefits, land-sharing between semi-natural forest and coffee production is more sustainable than land-sparing for strict forest conservation with traditional forest conversion for food crop production (Reichhuber and Requate, 2012).

In this study we add on this literature with a different perspective and analyze whether certification to private sustainability standards can create the economic incentives for land-sharing between coffee cultivation and semi-natural forest conservation in Ethiopia. We compare in a static way more intensified clear-cut garden coffee systems and less intensified semi-forest coffee systems, including non-certified and Rainforest Alliance certified semi-forest coffee. We analyze the economic benefits of these systems and evaluate coffee yields, return to land, return to labor and profits. We use original household- and plot-level survey data from 454 households and 758 coffee plots in Jimma and Kaffa zones in southwestern Ethiopia. We apply ordinary least

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squares regression models, controlling for a large set of plot- and household-level observable characteristics, and fixed effects regression models in which household-level unobservable heterogeneity is controlled for.

The focus on coffee is particularly relevant. The debate on land-sharing versus land-sparing as a sustainability strategy is especially fierce for coffee and other commodities that are grown at higher altitudes in forest marginal areas and that are vital for countries' foreign exchange earnings and for the livelihoods of a large share of the population. A number of ecological studies point to negative effects of coffee intensification on biodiversity conservation (Hundera et al., 2013a; Hundera et al., 2013b; Hylander et al., 2013). Such studies rarely take into account economic benefits and work under the assumption that coffee intensification increases productivity and farm incomes; thereby assuming a trade-off between ecological and economic goals. There are only a handful of studies taking into account yields, and sometimes costs and revenues, in evaluating the implications of coffee intensification versus land-sharing between coffee production and forest conservation. Noponen et al. (2013) confirm that coffee intensification increases profits in Costa Rica, while other studies from Mexico and Indonesia show that coffee intensification does not improve yields or economic returns (Romero-Alvarado et al., 2002; Peeters et al., 2003; Philpott et al., 2008). The effects of coffee intensification might not hold the same for Ethiopia due to the gradual process in coffee intensification and low level of external input use for coffee production.

The focus on private sustainability standards, Rainforest Alliance (RA) in particular, as a tool to promote land-sharing is relevant because private standards are spreading rapidly in many agri-food sectors, and often promise to minimize the trade-offs between food production and biodiversity conservation, and to foster more sustainable production systems (Pinto et al., 2014). For example, RA is a market based mechanism that seeks to transform agriculture into a sustainable activity that strives to conserve on-farm biodiversity and improve livelihoods (Rainforest Alliance, 2015a) — and thereby implicitly supports a land-sharing strategy. RA certification is expanding and in 2014 RA-certified farms accounted for 15.1% of world tea production, 13.6% of cocoa and 5% of coffee production (Rainforest Alliance, 2015b). Ecological studies show that RA enhances tree cover, semi-natural forest quality and forest connectivity in semi-natural coffee forest landscapes (Takahashi and Todo, 2013; Takahashi and Todo, 2014; Hardt et al., 2015; Rueda et al., 2015; Takahashi and Todo, 2017). Economic studies indicate that RA certification increases yields and incomes and reduces poverty — e.g. in Nicaragua (Ruben and Zuniga, 2011) and Ethiopia (Mitiku et al., 2017). Perfecto et al. (2005) raise doubt on the beneficial impact of RA certification and argue that the price premium for certified coffee does not compensate for low yields in less intensified shade coffee systems in Mexico. Most of these economic studies on the impact of RA (and other eco-) certification, however, do not take into account the intensification gradient in coffee production systems and do not control for plot-level heterogeneity.

The focus on Ethiopia is relevant because land-sharing between coffee production and biodiversity conservation is a common practice in the Afromontane forest of southwestern Ethiopia, the birth place of *Coffea arabica* and known for its rich biodiversity. Nevertheless, forest thinning for coffee intensification and for conversion into other cropland is an on-going process, accounting for over 36% forest cover loss in the last four decades in the region (Aerts et al., 2013; Getahun et al., 2013; Hundera et al., 2013b; Tadesse et al., 2014). RA certification was introduced in the coffee sector in southwestern Ethiopia in 2007 to exclusively certify semi-natural forest coffee production systems with a shade cover of at least 40%. In this paper we investigate whether RA certification can create economic benefits and support incentives for land-sharing between less intensified coffee production and semi-natural forest conservation.

2. Background

2.1. Coffee Production Systems in Ethiopia

Ethiopia is the main coffee producing country in Africa and the fifth worldwide (International Coffee Organization, 2017). Coffee accounts for 24% of Ethiopia's foreign exchange earnings (Minten et al., 2014) and contributes to the livelihood of more than a quarter of the country's population (Tefera and Tefera, 2014). Over the period 1990 to 2016, coffee production increased from 2.9 million bags (with one bag equivalent to 60 kg) to 6.6 million bags; and exports increased from 0.85 to 3.2 million bags (International Coffee Organization, 2017). About 95% of coffee production is realized by smallholder farmers with average landholdings below 2 ha; some of whom are organized in cooperatives (Francom and Tefera, 2016).

Coffee is produced under four different production systems, along an intensification gradient: forest coffee accounting for 10% of total coffee production; semi-forest coffee accounting for 35%; garden coffee for 50%; and plantation coffee for 5% (Kufa, 2012). Forest coffee is not planted but is picked from natural coffee shrubs in less disturbed natural forests with no or hardly any management efforts (Hundera et al., 2013b). Semi-forest coffee is produced in relatively disturbed natural forests where the upper canopy is tinned and coffee is sometimes randomly planted in the forest to increase the number of shrubs (Gole et al., 2008). Farmers usually slash undergrowth once a year to reduce competition for soil nutrients with other species. Garden coffee is planted on small-scale agricultural plots either in monoculture with scattered shade trees or intercropped with fruit trees, spices, false banana (*Enset ventricosum*) and khat (*Catha edulis*). Coffee plantations are large-scale coffee farms established by larger private investors with modern production techniques. While forest, semi-forest and garden coffee production systems have a long tradition in Ethiopia, coffee plantations are more recent. Coffee yields increase along this intensification gradient and are estimated at 50 to 150 kg of green coffee per ha for forest coffee, 100 to 200 kg/ha for semi-forest coffee, 400 to 500 kg/ha for garden coffee and 450–750 kg/ha for plantation coffee (Wiersum et al., 2008).

In southwestern Ethiopia, coffee intensification is gradually evolving through thinning the natural unmanaged (spared) forests, where wild coffee naturally grows and producers simply pick the coffee cherries. Coffee producers intensify coffee management in the forest by opening the upper canopy, planting more coffee shrubs, slashing the undergrowth and gradually converting forest coffee to semi-forest coffee production systems. Garden coffee systems may emerge from further removal of forest trees, increasing coffee shrub density by planting coffee and increased intensify of coffee management in semi-forest coffee systems as well as from planting coffee on already cleared farmland. In general in Ethiopia, the use of inputs such as chemical fertilizers and pesticides in coffee production is very low, even in garden coffee systems. Hence, the process of coffee intensification is less associated with capital intensification, and different from the situation where shade coffee is converted into monoculture coffee plantations with high external input use, as observed in other countries.

Coffee intensification and coffee expansion are among the major responsible factors for substantial forest cover loss in Ethiopia. It has been estimated that in the last four decades in Southwestern Ethiopia, the conversion of forest coffee to semi-forest coffee resulted in a 34% reduction in woody forest species and the conversion of semi-forest coffee to garden coffee in a 37% woody forest species reduction (Tadesse et al., 2014). Coffee intensification is responsible for an important part of the forest cover loss of > 50,000 ha between 1973 and 2009 in three zones in Southwestern Ethiopia (Tegegne, 2017).

2.2. Rainforest Alliance Coffee Certification in Ethiopia

Private sustainability standards started to emerge in the coffee