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Evaluating the livelihood impacts of a large-scale agricultural investment: Lessons from the case of a biofuel production company in northern Sierra Leone

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ABSTRACT

Large-scale agricultural investment (LSAI) involves complex trade-offs with regard to West African farmers' livelihoods. Our research presents a robust impact evaluation of a biofuel investment in northern Sierra Leone. The LSAI case evaluated has been certified by the Roundtable of Sustainable Biomaterial and is noted for complying with several other international guidelines. A total of 882 households were surveyed in the treatment and control areas, and asked about their livelihood structures. Statistical results show that farmers in the LSAI area have reduced their agricultural area for food production, have lower yields, and need to spend more on external labour. By contrast, the LSAI-impacted villages present a clear increase in total monetary income, a perceived improvement in food and water security, and an increase in food consumption expenditure. However, the improvement in financial income was higher for landowners than for tenants, and access to wage labour was mainly given to men rather than women, suggesting that LSAI can potentially increase local inequalities. It is therefore not possible to speak about a linear impact in this case, but more of a transformation of livelihood structures toward a more wage-dependent system. The findings also support the idea that the enforcement of international guidelines on responsible investment is necessary to mitigate the negative consequences of LSAI on local livelihoods. Further efforts must also be made along these lines to create a security net, to prevent potentially harmful consequences in the case of operations shutting down.

1. Introduction

Large-scale agricultural investment (LSAI) – sometimes also referred to as "land grabbing" or Large-Scale Land Acquisition – is on the rise in developing countries. Globally, LSAI covers an area of about 28 million ha, 30% of which was in Africa in 2016 (Nolte et al., 2016). The effects of LSAI on local livelihoods are hotly debated (Edelman et al., 2013; Baumgartner et al., 2015; Hall et al., 2015; Jiao et al., 2015; Thondhlana, 2015; Yengoh and Armah, 2015). Generally, there is evidence that LSAI (particularly biofuel production) can have damaging impacts on social and ecological systems (Altieri, 2009; German et al., 2011a,b; Schoneveld et al., 2011; Obidzinski et al., 2012). Differentiated impacts of LSAI that have been documented are based on class (Jiao et al., 2015), gender (Elmhirst et al., 2015; Yengoh et al., 2015; Marfurt et al., 2016), and ethnicity (Oberlack et al., 2016a). LSAI not only affects access to land but also to natural resources (Richards 2013), such as water (Rulli et al., 2013) and forest (Fairhead et al., 2012; Baumgartner et al., 2015). Proponents of LSAI argue that investment (in high-yielding varieties, agro-chemicals, and mechanization) is required to increase productivity of underused land in remote places; in addition, it creates new job opportunities and therefore regional and even national development (Deininger et al., 2011; Deininger and Byerlee, 2012; Liu, 2014; World Bank, 2014; Baumgartner et al., 2015).

More critical approaches to LSAI demonstrate that the land used often lies in highly productive and quite densely populated areas with good access to markets (Messerli et al., 2014). There are several documented cases in which LSAI has resulted in local food shortages (Cotula, 2013; Richards, 2013; Acheampong and Campion, 2014; Timko et al., 2014; Thondhlana, 2015) and serious agricultural land degradation due to a reduction in fallow periods (Acheampong and Campion, 2014). Intensive use of soil, water, and other natural resources has led to a reduction in ecosystem services upon which the

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poorest depend (German et al., 2011a, 2011b; Jiao et al., 2015). Critics also point to unfair labour relations and low wages, or complete land and resource dispossession (Li et al., 2011; Li, 2011; Obidzinski et al., 2012; Edelman et al., 2013). They also say that the majority of benefits from such investments are captured by local elites and that new institutional arrangements between the investors, state representatives, and local elites can exacerbate conflicts and existing inequalities between traditional landowners and tenants (Cotula, 2013; Bottazzi et al., 2016; Oberlack et al., 2016a).

It is estimated that currently about 12.1 million people worldwide (two-thirds of whom are in Africa) are potentially affected by LSAI (Davis et al., 2014). According to Davis et al. (2014), 10% of the population in Sierra Leone is potentially affected by LSAI, but there is still little research allowing more specific statements as to the negative or positive effects and the degree to which people are affected.

Acknowledging the potential threats to local livelihoods, social inequalities, and the environment, international organizations (e.g. Food and Agriculture Organization FAO, the World Bank, and the United Nations Conference on Trade and Development UNCTAD) and corporate social responsibility (CSR) organizations (e.g. the Roundtable on Sustainable Biomaterials RSB) have started to develop standards and guiding principles of "responsible investments" to prevent negative impacts of LSAI (RSB 2010; FAO, 2012, 2014). Since their adoption, however, very little research has been carried out on concrete LSAI cases where such guidelines have been taken into account. Research on LSAI often focuses on pre-existing utilitarian and deontological positions that influence the methodological choices of corresponding empirical assessments (Mann and Bonanomi, 2016). This situation contributes to "framing assumptions" on LSAI that are then used inadequately in policy rhetoric (Scoones et al., 2013).

The present research paper aims to fill those gaps by providing a grounded semi-experimental impact evaluation of a publicly funded biofuel LSAI in Sierra Leone that grows sugar cane for bioethanol for the European energy market. Addax Bioenergy Sierra Leone (ABSL) was a subsidiary of the Swiss-based transnational company Addax Oryx Group. This particular LSAI was presented as a case of compliance with international standards, i.e. RSB certified. To what degree the compliance with such standards translates into preventing negative effects or increasing positive outcomes for local people's livelihoods is evaluated systematically in only few cases. Our research therefore aims at precisely measuring the LSAI's consequent trade-offs and synergies on local villagers' livelihoods. We paid particular attention to the effects of the LSAI on the potential reinforcement of inequalities between landowners and tenants. Our main contribution is to show the relevance of using robust evaluation methods in the field of LSAI impact assessment. We propose a case/control method and a set of core indicators to illustrate the multidimensionality of LSAI impacts on local livelihoods. This method helps to overcome the use of negative or positive assessment framings, allowing us to offer a more holistic evaluation which considers trade-offs between multiple outcomes. Our conclusion leads to policy recommendations regarding compensation and monitoring of responsible investment measures.

2. LSAI impact evaluation

Up to now, very few robust evaluations have been done to measure the effect of LSAI on local livelihoods, using methods such as semi-experimental, cross-sectional, and randomized design. Most published work is based on qualitative or descriptive quantitative methods, *meta*-analysis, or macroeconomic data. In our literature review we found only three case studies presenting the characteristics of high-standard impact evaluations (Jiao et al., 2015; Shete and Rutten, 2015; Herrmann, 2017).

A robust study published in the present journal used control/treatment and propensity score matching (PSM) to evaluate the impact of an LSAI in Ethiopia (Shete and Rutten, 2015). Its results clearly show the negative impacts of LSAI on local people's food security through the reduction in land access and cultivated surface, number of livestock, income levels, and food consumption expenditure. The study also found an increase in coping strategies in terms of facing food insecurity. Although the research mentioned a reduction in monetary incomes in absolute terms, it does not expand on the implication of potential paid wages from the company in the impacted area and other business opportunities created by the company, or its relative influence on the livelihood structure of affected households. The authors also express concern about the higher threats to the migrant population than to indigenous, but there is no systematic comparison between groups and the role of LSAI on other socio-economic inequalities.

Also in this journal, Jiao et al. (2015) present a detailed and robust study on the impact of LSAI on environmental and farm incomes and inequalities in Cambodia. They use survey data from a randomly selected sample of 600 affected and non-affected households and the Poverty Environment Network methodology (Angelsen et al., 2011) as well as PSM to estimate the treatment effect (Angrist, 2010) of LSAI on local livelihoods. Their results show that the LSAI has negative impacts on local households' incomes, the size of cultivable land, and livestock holdings. They conclude that LSAI does not fulfill the promises to create jobs and improve welfare, and that those most affected are poor households with a greater reliance on land and natural resources.

A third, recently-published case (Herrmann, 2017) shows positive effects of LSAI on household incomes and basic needs in Tanzania. The research uses a PSM method to compare outgrowers and industrial wage workers in rice and sugar productions (treatment) with non-LSAI related households (control). The authors argue that "land-rich outgrowers seem to benefit more than land-poor in absolute and relative terms" (2017:305).

Although the above studies allow a precise measurement of the impacts of LSAI on local livelihoods, additional evaluations are needed in the field to assess the trade-offs between multiple outcomes of LSAI in different situations. Moreover, since the recent adoption of international guidelines on responsible investment and attempts to fulfil them by some LSAI companies, no evaluation of such cases has yet been made. Our work aims at filling those gaps.

3. Material and methods

3.1. Background of case study areas

ABSL started operation in 2010 with € 267 million in public funding (out of a total investment of more than € 400 million), provided by 12 international cooperation agencies including the African Development Bank (African Development Bank, 2010).

The operational area of ABSL covers a total of 53,000 ha located between 30 and 10 km south of the city of Makeni (see Fig. 1) across the two districts of Bombali and Tonkolili (central point is latitude: 8.663355, longitude: −12.199338). In 2010, the company leased a total area of 33,200 ha (inhabited by about 13,000 people), including 48 villages located in three chiefdoms and two different districts. Of these 33,200 ha, 8000 ha were returned to the villagers as a compensation measure, allowing them to maintain traditional agricultural practices for their food security.

The company's sugar cane is grown on irrigated circular 75 ha-plots called "pivots" (covering a total area of 10,500 ha at the time of our fieldwork). Irrigation is made possible by a mechanical arm that receives pumped water from the nearby Rockel river. Once the land is converted into a sugar cane plantation it becomes strictly managed by the company, and no outgrower schemes are offered to the farmers that would have allowed them to continue production for sale to the company. To compensate the loss of agricultural land, the company implemented a Farmer Development Programme (FDP), supporting farmers with mechanized agriculture in plots that are collectively managed by interested villagers. Improved seed varieties and training