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The rise and fall of foreign private investment in the jatropha biofuel value chain in Ghana

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ABSTRACT

The article draws on the multi-level perspective (MLP) and global value chain (GVC) frameworks to analyse the drivers and trajectories of foreign private investment in biofuel production in Ghana. It is based on a narrative of the evolution of a niche for jatropha production in Ghana in the period 1995–2016 including company case studies. The factors analysed relating to MLP are alignment of expectations, network formation, and learning and knowledge sharing, and those relating to GVC are chain structure, governance, ownership, and access to land and capital. High entry barriers for creating a new agriculture-based value chain for global biofuel markets, i.e. high volume requirements, high capital needs, and market risks contributed to the collapse of the jatropha sector in Ghana. A low level of learning and knowledge sharing between jatropha actors in Ghana, alongside weak public R&D support, reduced access to technical and managerial information. Confirming previous GVC research on biofuels, policy and NGOs had a stronger influence on the jatropha value chain than in typical agricultural chains. Moreover, global drivers and the strategies and capabilities of foreign investors can strongly influence the development of a new biofuel value chain in a developing country. The latter points complement previous research on jatropha, which highlights politico-economic factors such as land tenure, regional and local power relations, and the interests of donors and NGOs. The study exemplifies a non-evolutionary niche development that goes beyond the European experiences of industrial niche development on which the MLP framework was first established. The importance of investors and policy at different levels of the value chain illustrate the synergies in combining the MLP and GVC frameworks in research on energy transitions in developing countries.

1. Introduction

Since the turn of the millennium, *Jatropha curcas* has emerged as a promising opportunity for sustainable biofuel production due to a number of positive properties that are attributed to it, such as high yield, low water and fertilizer requirements, high resistance to pests, and not least its ability to grow on marginal land without competing with food production (Jongschaap et al., 2007; Achten et al., 2008). Between 2005 and 2009 especially, there was strong global enthusiasm for jatropha (Sanderson, 2009), which many investors government actors and NGOs perceived as a miracle or wonder crop (von Maltitz et al., 2014). Globally, however, jatropha did not live up to these inflated expectations. By 2014 global jatropha production was still negligible (van Eijck et al., 2014a), and, based on the experience of jatropha cultivation in Tanzania (Segerstedt and Bobert, 2013), it was concluded that ‘both domestic production and (certified) exports are too expensive to be able to compete with conventional diesel/rapeseed oil from the

EU’. Nonetheless ‘the crop may have potential for large-scale production as a niche product’ (ibid.).

Jatropha was also grown on a large scale in Mali (Favretto et al., 2015), Kenya (Hunsberger, 2014) and Mozambique (Slingerland and Schut, 2014; von Maltitz et al., 2014), but Ghana and Tanzania were the two African countries that attracted the greatest number of private companies prepared to make substantial investments in large-scale jatropha farming (Is, 2011,c; van Eijck et al., 2014b,c). In Ghana research into jatropha has mainly focused on land issues (Boamah, 2014a,b; Campion and Acheampong, 2014; Kidido and Kuusaana, 2014; Schoneveld and German, 2013; Wisborg, 2013) and questions of the environment and livelihoods (Acheampong and Campion, 2014, 2013; Boamah and Overå, 2016; Schoneveld et al., 2011), but we find no attempts to understand the phenomenon of the jatropha investments in Ghana from the perspective of a transition to sustainability or in respect of agricultural or industrial development.

Research into sustainable transitions emerged in European countries

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with a focus on the Netherlands, the UK and Denmark, being pursued mainly from three different perspectives: the multi-level perspective (MLP) (Geels, 2002), the strategic niche management (SNM) perspective (Kemp et al., 1998) and a technological innovation system (TIS) perspective (Bergek et al., 2008; Hekkert et al., 2007). Lately, research on sustainability transitions in developing countries has attracted much interest, with seminal contributions by (Angel and Rock, 2009; Berkhout et al., 2010, 2009; Romijn and Caniels, 2011; van Eijck and Romijn, 2008). While the geographical range has mainly been on emerging economies in Asia (see e.g. Hansen and Nygaard, 2014), research into sustainability transitions has also been undertaken in Africa, especially in Tanzania and Kenya (Byrne, 2009; Ockwell and Byrne, 2015; Tigabu et al., 2015). However, as Lundvall et al. (2009) have already pointed out, there are profound differences between how transitions unfold in low-income developing countries and in western high-income, industrialized economies respectively. Compared to developed countries, developing countries often have weaker formal institutions, higher levels of political and bureaucratic inefficiency and corruption, greater political and economic instability, and less transparent and efficient legal frameworks. When it comes to using the theoretical frameworks of transition theory in the context of a developing country, the most important challenge may be the fact that technology, knowledge and finance in general are to a larger extent sourced through links with international research organizations, foreign companies, investors and international donors (Hansen and Nygaard, 2013), as (Pietrobelli and Rabellotti, 2009) have also highlighted.

The role of international ties can be addressed by means of the global value chain (GVC) approach, which has played a prominent role in analyses of agricultural and industrial development in developing countries since the early 1990s (Gereffi, 1999). Much of the GVC literature focuses on how firms and farms in developing countries are integrated into global markets (Bolwig et al., 2010). Some of this literature concerns agricultural exports from Africa, mainly with a focus on food (Bolwig et al., 2013; Gibbon and Ponte, 2005), but also fibre (Glin et al., 2012; Rieple and Singh, 2010), while only a few GVC studies from developing regions concern agro-fuel (biofuel) exports (Hunsberger et al., 2014; Ponte and Hunsberger, 2014). GVC studies of global biofuels markets (Ponte, 2014) and biofuel imports (Harnesk et al., 2017) have recently been published, pointing to the strong influence of policies and NGO advocacy in the governance of biofuel value chains.

Based on the empirical knowledge gap outlined above, this paper sets out to analyse the drivers behind the large-scale foreign investments in a biofuel value chain in Ghana and to identify the main reasons for their rise and fall. To address this question, we shall draw on transition theory, especially the MLP framework, to acquire insights into the historical evolution of the niche and regime conditions and the interactions between them, as well as insights from the GVC framework to understand the international links involved. We shall draw on the theory of hype cycles as a structuring tool in the paper (van Lente et al., 2013; Verbong et al., 2008).

The remainder of this paper is organized as follows. Section two presents an integrated analytical framework based on the MLP and GVC perspectives. Section three outlines the data collection and research methods that underpin the study. Section four presents the historical evolution of the jatropha niche, followed by section five, which discusses the main reasons for the rise and fall of foreign investments in biofuel production in Ghana. Some conclusions are presented in section six.

2. Conceptual framework

2.1. Multi-level perspective or MLP

The multi-level perspective (MLP) on systems innovations considers how niche proliferation is influenced by interacting processes at

different socio-technical levels, namely the landscape (macro), regime (meso) and niche (micro) levels (Geels, 2002; Kemp et al., 1998). The *landscape* level covers the large-scale and exogenous structural context that influences dynamics at the regime and niche levels. The *regime* level refers to the relatively stable configurations of institutions, techniques and artefacts, and of the rules, practices and actor networks, that determine the ‘normal’ development and use of technologies. Because of stabilizing mechanisms, regimes are characterized by path-dependency, structural lock-in and actors’ resistance to change, which hinder or constrain the emergence of alternative technological trajectories (Rohracher, 2008; Unruh, 2000). A *niche* is a local platform or ‘incubation room’ from which new socio-technical trajectories may emerge and eventually fulfil functions within existing regimes. Because of the stabilizing mechanisms just mentioned, niche proliferation is contingent upon destabilizing tensions that open up ‘windows of opportunity’ at the regime level (Hans de Haan and Rotmans, 2011; Verbong et al., 2008). Such tensions may arise from processes at the landscape level or from regime-level dynamics.

In the MLP, niches are distinct application domains that provide a time-restricted and protected space within which new practices and technological innovations can incubate and become viable through experimentation. The viability of niches is influenced by three internal niche-level processes (Schot and Geels, 2008): (i) the shaping and *alignment of expectations*, (ii) the *formation of a social actor network* and (iii) *learning processes*. Increasing alignment of expectations involves niche-level actors increasingly sharing similar visions, beliefs and interests. A high level of aligned expectations is generally conducive to niche development, although the envisaged opportunities must be made specific, and they will rely on positive, tangible results (Geels and Raven, 2006). The second niche-level process concerns the formation of a constituency behind a new socio-technical trajectory that consists of a network of engaged actors. The formation of close social ties and regular interactions among actors is seen as stimulating niche development, as does the involvement of a broader and more varied actor network (Coenen et al., 2010; van der Laak et al., 2007). Lastly, learning processes involve learning about the technological aspects of niche-level experiments, including technical design, functionality and performance, as well as the learning processes pertaining to the social embeddedness of these aspects (Hansen and Nygaard, 2014). The latter requires that actors and society at large learn about many aspects of the technology, including economy, user preferences, regulation and environmental impacts.

In empirical MLP research, the three levels of regime, landscape and niche are often operationalized using territorial boundaries: regimes tend to be depicted as national processes, landscape dynamics as international ones, and niche processes as sub-national or local. Hence transnational linkages and the global dimensions of transitions have to a large extent been analysed as part of an all-embracing ‘landscape’ (Geels, 2011). Such territorial and arguably simplistic approaches have met with criticism from within the MLP community (Raven et al., 2012). Social networks in niches, for example, are not necessarily only local, as sustainability experiments and niche-level actors are often embedded in global flows of knowledge, technology and finance (Coenen and Truffer, 2012; Rock et al., 2009). Likewise, regimes may be transnational in their physical extent and influenced by global actor networks and institutional linkages that may either support or destabilize them (Smith et al., 2010). Thus, both regimes and niches may exhibit a similar form of multi-scalar layering in their spatial reach (Wieczorek et al., 2015). However, the understanding of niche formation and transition dynamics as shaped by interactions between actors and institutions situated across different spatial scales has only recently been introduced in the MLP (Binz et al., 2012).

In this paper, we draw attention to the flows of knowledge and resources facilitated through international biofuel investments and the resulting global value chains as one element in a transnational analysis of niche development. We use insights from the GVC literature that

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