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More than trees! Understanding the agroforestry adoption gap in subsistence agriculture: Insights from narrative walks in Kenya☆

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A B S T R A C T

Agroforestry can contribute to the mitigation of climate change while delivering multiple benefits to sub-Saharan farmers who are exposed to climate variability, land degradation, water scarcity, high disease burden and persistent poverty. But adoption is slow. Based on a critical problem solving approach and grounded theory as a strategy, we study agroforestry and subsistence agriculture as integrated, yet separate, socio-ecological systems with different organisational logics and temporal dynamics. Using 'narrative walks' as a qualitative method to construct grounded data, we explore the social and natural dimensions of the complex, diverse and uncertain landscape and life-worlds of subsistence agriculture. In the grounded analysis, we clarify how social stratification constructs incentives and disincentives to adopt agroforestry. To exemplify, food secure and opportunity seeking farmers may invest land and labour in trees, nurseries and social networks while risk evading farmers are constrained by the 'food imperative', the 'health imperative' and poverty in and of itself. By recognising material, symbolic and relational aspects we show how the ontology of global policies focussing on the merits of agroforestry differs from the ontology of everyday practices and strategies in subsistence agriculture. Such ontological stratification constitutes another constraint to agroforestry adoption as a comprehensive form of socio-technological change.

1. Approaching the agroforestry adoption gap in sub-Saharan Africa

Despite all its merits, agroforestry adoption is slow and the adoption gap remains largely unexplained. The underrepresentation of social studies of agroforestry is part of the explanation as repeatedly pointed out in review articles (Kiptot and Franzel, 2011; Mercer, 2004; Mercer and Miller, 1997). In previous research, we showed how peasant farmers in western Kenya who do adopt agroforestry can increase their adaptive capacity while mitigating climate change via carbon sequestration (Olsson and Jerneck, 2010). Inspired by economic theory and management literature, we then showed in more detail how food secure farmers with entrepreneurial orientation adopt agroforestry (Jerneck and Olsson, 2013). In this article, we show how agroforestry, as a socio-ecological and knowledge-intensive long-term activity, interacts with subsistence agriculture as a complex, diverse and risk-prone system. As a main finding the social stratification of rural sub-Saharan livelihoods constrains agroforestry adoption as do the ontological stratification between global and local views of the benefits of agroforestry.

As suggested by sustainability science (Jerneck and Olsson, 2011; Jerneck et al., 2011) we start from a critical problem-solving approach and seek to integrate social and natural dimensions in the analysis. The critical problem-solving approach, in our context, aims at capturing how and why peasant farmers decide to adopt or *not* adopt agroforestry thereby questioning why peasant farmers would, *in any circumstances*, adopt a new technology. The integrated view aims at capturing how nature and society interact in agronomic, climatic, epidemic and other dynamics (Thompson and Scoones, 2009). Theoretically, and drawing on Ellis (2000) and Scoones (1998, 2009), we design a livelihoods frame to identify the social and natural dimensions of agroforestry adoption in subsistence farming. Methodologically, we use constructivist grounded theory as a qualitative research strategy to generate data while building theory (Charmaz, 2006). Empirically, we construct data in

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narrative walks as a field method for *in situ* exploration of social and natural dimensions of the landscape and lifeworlds. In the grounded analysis, we show how socially differentiated assets, agency, achievements and aspirations in subsistence agriculture, as a complex system, structures various incentives and disincentives to venture into agroforestry as a risky long-term activity. In addition, we show how stratified ontologies constrain agroforestry adoption.

In the study site, peasant farmers are exposed and sensitive to the multiple stressors of land fragmentation, high disease burden and persistent poverty (Gabrielsson et al., 2012; Olsson and Jerneck, 2010). Beyond that, the area is typical of rainfed farming systems defined by the interrelated biophysical and socio-economic dynamics of climate variability, drought, flooding, crop-livestock integration, soil quality and water availability as well as various aspects of tenure security, marketing margins and the policy environment, not to mention the necessary risk management practices (Harrington and Tow, 2012). We argue that, despite high place-specificity in such 'complex, diverse and risk-prone' systems (Morton, 2007), insights from 'narrative walks' can be transferred to, tested in or scaled up in similar settings.

2. Agroforestry as a complex activity

Tropical agroforestry landscapes are extremely dynamic settings with different intensity, productivity and capacity for continuous adjustment to changing circumstances (Harrington and Tow, 2012). Increasingly they are influenced by climate change (Dawson et al., 2011). Historically, agroforestry was narrowly defined in terms of numbers and kinds of species interacting in an agroecological system (Somarriba, 1992) and commonly known as the integration or deliberate retention of trees on agricultural land (Nair, 1985). Now, agroforestry is described also in economic terms stressing that 'the use of woody species must result in the enhancement of either the biological productivity or the economic return of the system, or both' (Cornell, 2007). Even if qualitative inquiries on agroforestry, landscape ecology, soils and vegetation are emerging (Assé and Lassoie, 2011; Dhakal et al., 2012; Xu et al., 2012) most studies are oriented towards quantitative estimates of biophysical and economic benefits making social aspects less visible (Pattanayak et al., 2003). Following Mercer (2004) we take a broad view and define agroforestry as a multifaceted, multicomponent and multiproduct activity with many purposes and benefits.

The multiple merits of agroforestry for providing environmental services, economic products and social goods are well-known and widely recognised (Jose, 2009). One billion peasant farmers around the world could potentially reverse land degradation, improve the environment and enhance their livelihoods by adopting agroforestry to replenish soils, protect water catchments, restore landscapes and conserve biodiversity (Garrity, 2004; Jose, 2009; Reubens et al., 2011). Mounting evidence indicates that farmers who *do* acknowledge the merits of agroforestry will incorporate certain techniques into their farming practices if they can afford it (Pastur et al., 2012). To exemplify, peasant farmers who are poor can benefit from agroforestry aimed at land restoration if projects incorporate a rights approach while 'blending local experience with external expert support' (Xu et al., 2012). The high potential of agroforestry in sub-Saharan Africa is also confirmed in gender research. But among women farmers, of whom there are many, the adoption rate is (s)lower. Gender, as a fundamental aspect of social organisation, determines the distribution of land titles, labour resources, women's heavy work load, their time poverty and possibly also their higher risk aversion in relation to technology adoption, like that of agroforestry (Kiptot and Franzel, 2011).

Agroforestry has been promoted for decades as an improved form of land management to reverse environmental degradation and improve sustainability (Sanchez, 1995). It also contributes significantly to climate change mitigation via enhanced uptake and storage of carbon in the biosphere (FAO, 2004; Farage et al., 2007). From a natural science perspective agroforestry can thus be valued as providing, in addition to all its social and cultural goods, four major environmental services: soil enrichment, biodiversity conservation, air and water quality improvement and carbon sequestration (Garrity, 2004; Jose, 2009). Owing to its high carbon storage capacity (Roshetko et al., 2007) the tropical agroforestry landscape thereby has a potential to mitigate climate change while also serving as an adaptation strategy in synergy with mitigation (Verchot et al., 2007).

In an effort to stress the policy aspects, the World Bank has highlighted that carbon storing activities can contribute to climate change mitigation and the sustainability of farming systems while alleviating poverty – especially among sub-Saharan smallholders who grasp income opportunities from emissions trading in the emerging carbon economy (WorldBank, 2007). In parallel, observers believe that gains from emissions trading, based on the Kyoto Protocol, will flow into special funds for expanding agroforestry and reaping these environmental services (Brown and Corbera, 2003). If managed well, agroforestry could thus be instrumental in storing carbon and at the same time countering environmental degradation and persistent rural poverty in sub-Saharan Africa (Sanchez, 2000; Verchot et al., 2006).

Leichenko and O'Brien (2008) argue that smallholders are subject not only to persistent poverty and ill-health but to the contemporary dual force of environmental change and globalisation; hence a double exposure to major transformative processes. In contrast, others argue that globalisation brings about new market options in smallscale agriculture in the form of payments for environmental services such as carbon storage from agroforestry (WorldBank, 2007). However, such global to local transfers of payment for environmental services, PES, will increase only if they are rigorously monitored and verified (Wunder, 2008). And reaching peasant farmers who are really poor would require much regulation which reduces effectiveness (Wunder, 2008). The value of PES as a poverty alleviation tool is therefore questionable. And like other responses to climate change based on economic valuation, PES is criticised for relying on *exchange* value rather than *use* value (Gómez-Baggethun et al., 2010) and for using *monetary* rather than *neutral* valuation tools (Gómez-Baggethun and Ruiz-Pérez, 2011).

Agroforestry adoption is often compared to the introduction of a new agricultural production technology, like new seeds or fertilisers, but the complex input–output mix in agroforestry makes such comparisons invalid (Mercer, 2004). Owing to its multicomponent and multiproduct features it is a far more challenging commitment (Mercer, 2004) involving a sequence of activities which link the past to the present while aiming for the fruition of investments mainly in the distant future (Nair, 1997). Nevertheless, few studies deal with perceptions of risk and uncertainty pertaining to agroforestry as a rather novel practice in smallscale agriculture (Mercer, 2004). In the context of subsistence farming, itself a complex socio-ecological system, the spatial and temporal dynamics of agroforestry as a series of integrated activities and techniques are poorly understood. This calls for interdisciplinary studies that capture more fully the interactions between social conditions and natural endowments (Montambault and Alavalapati, 2005) while also aiming at realising the potential of agroforestry adoption in sub-Saharan subsistence agriculture.