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Organic and conventional agriculture in Kenya: A typology of smallholder farms in Kajiado and Murang'a counties

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ABSTRACT

Understanding the diversity of smallholder farms is key for the development of interventions, strategies and policies aimed at addressing the numerous challenges these farmers face as well as for those shaping the future of smallholder farming in Kenya, Africa and beyond. In this study, we developed a typology for smallholder farms in Kenya using survey data from 488 farm households in Kajiado and Murang'a counties. Multivariate statistical techniques (principal component and cluster analyses) were used to group farms into five types differentiated by household characteristics, resource endowment, cropping practices, social networks, access to information, dietary diversity and gender equity. Types 2, 3 and 5 were mostly market oriented, possessed high to medium levels of wealth and had strong social networks. Types 3 and 5, however, mainly practised organic agriculture while Type 2 farms included organic and non-organic cultivated areas. Types 1 and 4 were characterised by low to medium levels of wealth, maintained poor social networks and had low adherence to organic agriculture practices. Yet, while Type 4 farms mainly practised conventional market-oriented agriculture, farms of Type 1 could be defined as organic-by-default and were self-subsistent. The majority of the surveyed farms belonged to Type 2, the wealthiest group of farmers and mostly located in Kajiado county. Murang'a county was dominated by farms of Type 5 practising mainly certified organic agriculture. Overall, the practice of organic agriculture was associated with higher agricultural income, legal ownership of land, older household heads, larger household sizes, stronger social networks, higher access to information, more diverse diets and higher levels of gender equity. In contrast, poorer, younger and less well-connected farmers were less involved in organic agriculture. The results of this study may help to increase efficiency in the implementation of pro-poor and organic agricultural interventions, strategies and policies on the ground and to shape policy instruments accordingly.

1. Introduction

Smallholder farmers are the pillar of the economies of Kenya and other sub-Saharan African (SSA) countries that are heavily reliant on agriculture (Altieri, 2009; Davis et al., 2017; GoK, 2009; Salami et al., 2010). In Kenya, smallholder farms with an area ranging from 0.2 to 3 ha are the source of more than 70% of the of the country's total agricultural produce. In a country where the agricultural sector is responsible for approximately 26% of the gross domestic product (GDP), and 18% of formal and 60% of informal employment in rural areas, the role of smallholder farmers is vital (GoK, 2009). According to different estimates, almost 50% of the population of Kenya lives in poverty. Majority of the poor live in rural areas where there are high levels of food insecurity. In addition, over 65% of the Kenyan population are between 18 and 35 years, and make up over 50% of the unemployed in the country majority (ILO, 2016; Krishna et al., 2004; WFP, 2016).

On the one hand, agricultural growth has been recognised for its capacity to reduce poverty and food insecurity in SSA (Dethier and Effenberger, 2012; Salami et al., 2010; von Braun, 2010), which is essential to achieve the Sustainable Development Goals (SDGs) (UN General Assembly, 2014). On the other hand, hundreds of millions of smallholder farmers continue to face serious challenges such as poor and declining soil fertility leading to large yield gaps for almost all crops, and limited access to financial capital, markets, land, inputs, information and technology. Pre- and post-harvest crop and animal losses due to pests and diseases are still high (GoK, 2009; Salami et al., 2010; Tittonell and Giller, 2013). In addition, because many African countries rely on food imports, they are vulnerable to external influences such as price fluctuations and trade barriers (WFP, 2016). There is a general consensus that for most of the countries in SSA, sustainable development will largely depend on improving agricultural productivity as well as the welfare of smallholder farmers (Dethier and Effenberger, 2012; Salami et al., 2010).

The practice of organic agriculture (OA) is growing among

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smallholder farmers in SSA and has recently received special attention from policy makers and development experts. It is perceived as a pro-poor and sustainable agricultural production model and therefore promoted as one way to deal with the persistent problems of food insecurity as well as other challenges facing smallholder agriculture in SSA (Bett and Freyer, 2007; Niggli et al., 2016). However, smallholder farmers differ in structural aspects such as financial resources, information access and asset availability and allocation as well as in functional aspects such as agricultural production objectives, livelihood strategies and their dynamics (Kuivanen et al., 2016a; Pacini et al., 2014; Tittonell et al., 2010), diversification approaches (van de Steeg et al., 2010) and other socio-economic aspects (Bidogeza et al., 2009). Given the heterogeneity of smallholder farmers in SSA, any effort aimed at addressing their challenges needs to begin with an understanding of this complex diversity.

One way of addressing the diversity of smallholder farms is classifying them based on their similarities into homogenous groups, i.e. farm types (Kostrowicki, 1977; Kuivanen et al., 2016a). Farm typologies help to identify appropriate and type-specific innovations, to scale them up and to investigate their outcomes (Signorelli, 2016). For instance, farm types have been created for increasing the general applicability of recommendations for farm improvement (Chikowo et al., 2014; Köbrich et al., 2003), identifying reasons for low technology adoption (Bidogeza et al., 2009), supporting policy design, better targeting of agricultural novelties and household resource allocation (Tittonell et al., 2010), as well scaling-up of best-fit options (Alvarez et al., 2014).

One approach for classifying smallholder farms is the consideration of variables of the whole farming system (i.e. household, cropping and livestock systems) as well as their relationship with the ecological, economic and social outside contexts (Alvarez et al., 2014). Variables that have been used in typology studies in SSA include those on household characteristics like age, education and literacy mainly of the household head, and the size of the smallholder household. Resource endowments in terms of availability of land, livestock and other agricultural assets, labour (non-/off-farm versus on-farm), capital (i.e. income, credit access), technology and capacity to invest, are the most common variables of categorising farms. Environmental variables used in typologies include soil and water conservation, land use and management as well as cropping practices. Others variables such as production orientation (i.e. market, self-subsistence), food security and gender equity have also been used in typologies (Bidogeza et al., 2009; Giller et al., 2011; Kuivanen et al., 2016a, 2016b; Mutoko et al., 2014; Pacini et al., 2014; Sakané et al., 2013; Shepherd and Soule, 1998; Signorelli, 2016; Tittonell et al., 2005a, 2005b, 2010, 2010; van de Steeg et al., 2010).

A number of publications used different methods to categorise smallholder farms in Kenya. Shepherd and Soule (1998), for example, grouped farmers in Western Kenya based on their resource endowment and constraints. Tittonell et al. (2005a, 2005b) identified farmer classes based on resource endowment, production orientation, farming constraints and other socioeconomic factors. In the same region, similar criteria of smallholder farm categorization were also used by other researchers (Giller et al., 2011; Mutoko et al., 2014; Valbuena et al., 2008). Household and location factors were used to categorise farmers across various other regions in the Kenyan highlands (van de Steeg et al., 2010) (Sakané et al., 2013). grouped smallholder farmers in wetlands in the Mount Kenya highlands of Nyeri North and Laikipia West based on their livelihood strategies and production orientation.

All of the typology studies mentioned here were carried out in the humid and semi-humid highlands of Kenya with an annual rainfall from 600 to 2700 mm. However, more than 80% of the land in Kenya is classified as arid and semi-arid (ASAL) with an annual rainfall ranging from 150 to 1100 mm (GoK, 2009; Sombroek et al., 1982). To the best authors' knowledge however, no published study have build a typology of smallholder farms in the ASAL regions of Kenya. To capture these two distinct climatic categories, farms from two counties in Kenya were selected for this study, i.e. one humid to semi-humid and one arid to semi-arid county. These counties were also selected due to their proximity to the capital Nairobi where the main market for agricultural produce is located. While studies on smallholder farm typologies of the Kenyan highlands are abundant, the contribution of this study lies in the inclusion of smallholder farms in the ASAL region and comparing them to those of the humid to semi-humid highlands. This study also attempts to provide relevant knowledge on factors driving variability in smallholder farms as well as those that set apart smallholder farms practicing OA from the rest in order to better contextualise and support policy discussions on OA as well as on other agriculture interventions and development strategies in Kenya.

The importance of improving productivity in agriculture and the welfare of smallholder farmers to sustainable development in SSA is undisputed. However, the complexity of smallholder farms poses a threat to the effectiveness of any efforts to achieve this. Past interventions by donors, government and other stakeholders have not fully succeeded in this regard, given the persistent poor productivity and wellbeing of smallholder farms. Typologies of these farms that take into account their complex heterogeneity as well as heterogeneity of their biophysical environment can be a first step to target interventions such as the EOA initiative more effectively. This in turn can contribute to improving their productivity, ultimately contributing to efforts seeking to alleviate of poverty, food insecurity and unemployment particularly in rural areas in Kenya and beyond.

Typology development should be guided by the research objectives, questions and characteristics of the study area (Duvernoy, 2000; Köbrich et al., 2003). This study sought to answer the following two research questions: 1) Which types of smallholder farms can be identified, which factors drive their variability and how are they distributed between the two case counties? 2) What are the main drivers of variability between smallholder farms applying OA and those that do not? To answer the research questions we applied cluster analysis (CA) to the output of a principal component analysis (PCA), a technique known from many other similar studies (Bidogeza et al., 2009; Kuivanen et al., 2016a, 2016b; Mutoko et al., 2014; Sakané et al., 2013; Tittonell et al., 2010).

1.1. Organic agriculture in Kenya

Organic agriculture started in Kenya in the early 1980's as an initiative of non-governmental organisations (NGOs), commercial companies as well as faith- and community-based organisations. It has been suggested that OA is associated with many benefits such as poverty reduction, enhanced food security and gender equity, adaptation to climate variability, access to markets especially through export trade, and provision of other social as well as environmental benefits (African Union, 2011; Amudavi et al., 2014; Ayuya et al., 2015; Bett and Freyer, 2007; Chiputwa and Matin, 2016; Ndukhu et al., 2016; Niggli et al., 2016). Like in other SSA countries, the OA sector in Kenya has developed without formal regulation.

Currently, however, the sector is under legislation through the "Ecological Organic Agriculture" (EOA) initiative by the African Union. This initiative seeks to mainstream OA into national agricultural production systems in Africa by 2025 as a development pathway for the continent to improve agricultural productivity. The definition of the EOA is similar to that used by the IFOAM (International Federation of Organic Agriculture Movements) to describe OA, and is also used in this study (Niggli et al., 2016). According to the IFOAM, 'Organic agriculture is a production system that sustains the health of soils, ecosystems and people and relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects' (IFOAM, 2013). In this study, the terms EOA and OA are used synonymously.

Organic and non-organic smallholder farmers in Africa represent a