Agricultural marketing by smallholders in Kenya: A comparison of maize, kale and dairy

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ABSTRACT

Research has demonstrated that commercializing smallholder agricultural production is one of the effective ways to boost farmer incomes, employ labor, and stimulate rural economies in Sub-Saharan Africa, but this differs by commodity. We use panel data covering over a decade to estimate output supply functions for smallholder farmers in Kenya, and compare these among three commodities with distinctive product attributes: maize, kale and milk. We find that despite improved market access over the decade, there is little discernible growth in market participation except in the case of milk. A minority of households consistently sell from year to year and market concentration remains high across all the commodities, indicating that production is largely subsistence. Nevertheless, there is greater market orientation and less market concentration in kale and milk than in maize. For all the commodities, market participation is strongly associated with access to land, productive assets, technology use, expected prices and rainfall amount and reliability. We argue that broad-based smallholder market participation can only be realized through interventions that raise smallholder production of marketable surpluses through raising productivity, and this cuts across even the high value sub-sectors such as horticulture and dairy. Also essential alongside such interventions are strategies to improving market access by reducing transaction costs.

Introduction

An estimated 80% of Kenya's human population live in rural areas, and about half of these fall beneath the poverty line (Republic of Kenya, 2008). With 75% of the total agricultural output produced by farming households on landholdings averaging 0.2–3 hectares (Republic of Kenya, 2010a), small-scale agriculture remains the major engine for the growth of rural economies and for any livelihood pathway that can lift large numbers of the rural people out of poverty (Hazell, 2005; Hazell et al., 2007; Byerlee et al., 2009; World Bank, 2008). Boosting rural incomes will require a transformation from the semi-subsistence, low-input, low-productivity farming systems that characterize much of Africa south of the Sahara, Kenya included.

Broadly speaking, agricultural commercialization refers to the shift from subsistence production to an increasingly complex production and consumption system oriented to market transactions (Goletti, 2005), implying also that product choice and input use decisions are based on the principles of profit maximization (Pingali and Rosegrant, 1995). Commercialization reinforces vertical linkages between input and output markets (Jaleta et al., 2009).

Commercialization pathways, and the features of the rural transformation that these generate, will depend on the farming system, market institutions, and policy frameworks. Contextual understanding is fundamental, including which commodities and value chains are most likely to enable participation by large numbers of smallholder farmers.

There are well-known barriers to participation by Kenyan smallholders in markets as sellers. Access to export markets for horticultural crops has been hampered by increasingly stringent health standards on agricultural imports into developed countries (Asfaw, 2007; Okello et al., 2008). Yet, even as farm sizes shrink, smallholder farmers may opt to produce horticultural crops and

dairy products instead of staple foods because of relative prices (Jayne et al., 2005) and high returns to land and labor (Weinberger and Lumpkin, 2007). Evidence drawn from household surveys suggests that smallholder farmers in Kenya do not often participate in staple food markets and when they do, their market share is low. Mather et al. (2013) found that only 43% of rural households were net sellers of maize and that sales were highly concentrated among a few sellers. As the population urbanizes, consumer demand for staple food products is expected to expand; rising incomes, however, may generate greater domestic demand for rice and wheat, dairy products, fruits and vegetables. Consistent with the notion of comparative advantage in the framework of the household farm, over time, some smallholders may specialize in producing cash crops, meeting their food consumption needs through purchasing staples.

A substantial body of applied research has addressed the constraints to participation by smallholder farmers with limited resources, and the types of interventions that can overcome them (e.g., Bijman et al., 2007; Poulton et al., 2006; compilation by ILRI, 2011). Authors have differentiated among various types of transactions costs (access to 'soft' and 'hard' infrastructure, risk (production, price, income) and resource constraints (skills, land, equipment)). Barrett (2008) has stressed the importance of distinguishing constraints that tend to influence participation at different scales of analysis (household, community, region).

In this paper, we estimate output supply functions for smallholder farmers in Kenya using a unique panel dataset that spans over a decade (1997–2010). We compare determinants of market entry and quantities sold across three lead food commodities: maize grain (hereafter referred to as maize), cow's milk (hereafter referred to as milk), and kale (locally known as *Sukuma wiki*). Our objective is to understand the factors that drive smallholder entry in maize, kale and milk markets as sellers and influence volume of sales, comparing factors by commodity type.

To accomplish this objective, we test lognormal and truncated normal forms of Cragg's (1971) double hurdle model which enables us to differentiate the processes underlying market entry and quantity choices made by smallholder farmers. We also control for unobserved heterogeneity by applying the Mundlak–Chamberlain device (1978, 1984). Our aim is to contribute to the design of development strategies that enhance participation of smallholder farmers in the markets for economically important value chains.

We chose these farm products for two reasons. First, each of them has major economic significance not only on a national scale but also in the livelihood strategies of Kenyan smallholders. Maize is the main staple crop and is widely grown by smallholders in virtually all agricultural regions of the country. Although maize has benefited from decades of agricultural research, high rates of hybrid seed use, increased rate of fertilizer use, and gradual liberalization of seed, fertilizer and grain markets, national maize production has not kept pace with population growth and farm profitability is highly differentiated (Suri, 2011). Milk is referred to as "white gold," and the dramatic impacts of dairying on development pathways among smallholder farmers have been extensively researched (Ngigi et al., 2010; Staal et al., 2002). Similarly, the economic contribution of horticultural production to Kenya's economy, the potential and constraints for smallholder involvement in the industry, have been well documented (e.g. Minot and Ngigi, 2010; Okello et al., 2008).

Second, the three products are distinguished by market characteristics that reflect product attributes. Maize is a major food staple even among the smallholder farmers who produce it. As a cereal crop, maize can be stored for longer periods for future consumption or marketing. Since post-harvest losses can be minimized by storing maize with recommended methods at the appropriate

moisture content, maize is not considered to be "perishable." Kale and milk, on the other hand, are highly perishable and must be consumed or sold a few hours or days after harvesting/production. This makes market access for kale and milk particularly critical for the producing households.

Other characteristics of milk and kale supply channels differ in important ways. Although actors in the horticultural sector range from large commercial farms with formal contracts, to small-scale contract growers, and growers that sell with no contract at all (Minot and Ngigi, 2010), kale growers are generally small-scale producers who operate with no contract. The growers who supply domestic rural markets transport their product by head-load or on bicycles and sell directly to consumers and other traders; those who supply urban markets depend on long-distance traders and transporters (Minot and Ngigi, 2010).

Dairy producers have a long organizational history, beginning during the colonial period when the industry was heavily subsidized and dominated by settler farmers. From independence in 1963 to the late 1980s, the focus of dairy production shifted to smallholder farmers with impressive rates of productivity growth, but the industry remained tightly controlled by the government. From the late 1980s, with market liberalization and the dismantling of subsidies and the Kenya Cooperative Creameries monopoly, growth rates in production slowed. Alongside this process, sales of raw milk in informal channels increased. By 2010, raw milk supply channels accounted for 85% of the total milk consumed in Kenya (Ngigi et al., 2010). The expansion of raw milk supply channels, which are informal, presents a strategic opportunity for milk marketing by smallholder dairy farmers.

In the next section we summarize the conceptual basis of our analysis. In the third section, we present the elements of our empirical strategy, describing the data source, the econometric approach, the estimating equations and variables. We report our findings in the fourth section. Conclusions are drawn and implications for policy discussed in the final section.

Conceptual framework

Our empirical model is anchored in the agricultural household model originally developed by Singh et al. (1986), and elaborated to explain subsistence decision-making by de Janvry et al. (1991). Profit-maximizing behavior is a special case of the model, in which consumption and production decisions can be considered separately because prices are determined exogenously in perfect markets. We invoke the non-separable model in the context of Kenyan smallholders, who face numerous market imperfections despite an increasingly commercial orientation. We draw particularly on the adaptations of the model to smallholder marketing decisions by Key et al. (2000) and to the context of eastern and southern Africa by Barrett (2008). We add a focus on specific crops.

The core model depicts a farming household that maximizes utility over a bundle of consumption goods produced on the farm or purchased from the market, subject to an income constraint generated by a combination of farm production, sales and non-farm earnings. The defining feature of the non-separable model is that the prices guiding farmer decisions (decision prices) are endogenously determined by observed market prices and also by factors that influence the transactions costs associated with participating in input and output markets. Most importantly, these are household-specific prices that are unobserved and heterogeneous across smallholder farmers.

The household engages in production and decides to consume or sell the outputs, and the respective quantities. In Barrett's (2008) application of the model to market-related decisions, the household chooses whether or not to participate as a seller (a vector **M** of indicator variables equal to one for market entry, 0