

# Impacts of Supermarkets on Farm Household Nutrition in Kenya

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**Summary.** — Many developing countries experience a food system transformation with a rapid growth of supermarkets. We analyze impacts of supermarkets on farm household nutrition with survey data from Kenya. Participation in supermarket channels is associated with significantly higher calorie, vitamin A, iron, and zinc consumption. We use simultaneous equation models to analyze impact pathways. Supermarket-supplying households have higher incomes, a higher share of land under vegetables, and a higher likelihood of male control of revenues. Furthermore, income and the share of land under vegetables have positive impacts, while male control of revenues has negative impacts on dietary quality. Policy and further research implications are discussed.  
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## 1. INTRODUCTION

In the recent past, many developing countries have experienced a profound food system transformation with a rapid growth of supermarkets (Minten, Reardon, & Sutradhar, 2010; Neven, Odera, Reardon, & Wang, 2009; Reardon, Timmer, & Minten, 2012; Timmer, 2009). This supermarket growth can be attributed to both demand and supply side factors (Lakatos & Fukui, 2014; Mergenthaler, Weinberger, & Qaim, 2009; Reardon, Barrett, Berdegúe, & Swinnen, 2009). On the demand side, rising incomes, urbanization, and changing lifestyles contribute to preference shifts toward higher value foods, including processed and convenience products, which modern retailers are better equipped to provide than traditional markets (Rischke, Kimenju, Klasen, & Qaim, 2015). On the supply side, the supermarket growth was facilitated by policy changes such as market liberalization in the food industry and greater openness for foreign direct investment. This retail revolution has also caused structural changes along the supply chains. Supermarkets try to offer their customers a consistent variety of high-quality products. To ensure continuous supply, supermarkets have established their own procurement systems, involving centralized buying points and contractual arrangements with farmers and traders (Rao, Brümmer, & Qaim, 2012; Reardon & Berdegúe, 2002; Reardon *et al.*, 2009).

Several studies have analyzed impacts of farmer participation in these new supermarket channels on farm productivity (Hernández, Reardon, & Berdegúe, 2007; Neven *et al.*, 2009; Rao *et al.*, 2012), sales prices (Michelson, Reardon, & Perez, 2012), household income (Andersson, Chege, Rao, & Qaim, 2015; Michelson, 2013; Miyata, Minot, & Hu, 2009; Rao & Qaim, 2011), and labor markets (Neven *et al.*, 2009; Rao & Qaim, 2013). Most of these studies conclude that supermarkets can contribute to rural economic growth and a modernization of the small farm sector. Strikingly, however, there is no research that has analyzed possible impacts of supermarkets on farm household nutrition (Gomez & Ricketts, 2013; Popkin, 2014). While recent research has examined how supermarkets may influence dietary habits and nutrition of urban consumers (Asfaw, 2008; Kimenju, Rischke, Klasen, & Qaim, 2015; Neven, Reardon, Chege, & Wang, 2006; Pingali, 2007; Rischke *et al.*, 2015; Tessier *et al.*, 2008), a focus

on farm household nutrition is important, too. Smallholder farmers make up a large proportion of the undernourished people worldwide.

In this article, we address this research gap and analyze the impacts of supermarkets on farm household nutrition, using detailed survey data specifically collected for this purpose. We contribute to the literature in two ways. First, we add a new perspective to the existing body of literature on supermarket impacts. Second, we contribute conceptually to the analysis of agriculture–nutrition linkages. Given the persistently high rates of rural undernutrition, the international community has shown a renewed interest in better understanding the nutrition and health impacts of agricultural innovations (Dube, Pingali, & Webb, 2012; Smith & Haddad, 2015). Yet, very few studies have evaluated such impacts; identifying suitable methodologies has proven a challenge (de Haen, Klasen, & Qaim, 2011; Kabunga, Dubois, & Qaim, 2014; Masset, Haddad, Cornelius, & Isaza-Castro, 2012).

Our study focuses on smallholder farmers in Kenya. Kenya is an interesting example because supermarkets have rapidly gained in importance there in recent years. Supermarkets in Kenya now account for about 10% of national grocery sales, and over 20% of food retailing in major cities (Planet Retail, 2015). Whereas this share in Kenya is still lower than in middle-income countries in Asia and Latin America, it is already higher than in most other countries of sub-Saharan Africa. Based on detailed food consumption data, we compare nutritional indicators between farm households with and without supermarket contracts. In addition to calorie intakes, we analyze levels of micronutrient consumption as indicators of nutritional quality. Possible issues of selection bias are addressed with an instrumental variable approach. We also analyze impact pathways. Participation in supermarket channels may affect household nutrition through increasing cash incomes. Moreover, supermarket contracts may influence the farmers' choice of commodities produced, and thus the types of foods available in the household from own production.

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Finally, there may be changes in gender roles within the farm family that could also affect household nutrition (Imai, Annim, Kulkarni, & Gaiha, 2014; Sraboni, Malapit, Quisumbing, & Ahmed, 2014). Earlier research showed that commercialization of agriculture is often associated with men taking over control of resources that were previously controlled by women (von Braun & Kennedy, 1994). We develop and estimate simultaneous equation models to analyze such impact pathways.

## 2. FARM HOUSEHOLD SURVEY

In 2012, we carried out a survey of smallholder vegetable farmers in Kiambu District, Central Province of Kenya (after the constitutional change in Kenya this is now Kiambu County). Kiambu is relatively close to Nairobi and is the capital’s main source of horticultural produce (Rao & Qaim, 2011). Some of the farmers in this region produce vegetables for supermarkets, while others sell their vegetables in traditional channels. The two biggest supermarket chains sourcing vegetables from Kiambu are Nakumatt and Uchumi, which are both Kenyan owned. Foreign-owned retail chains so far play a much smaller role in Kenya (Planet Retail, 2015).

Based on information from the district agricultural office, four of the main vegetable-producing divisions were chosen. In these four divisions, 31 administrative locations were purposively selected, again using statistical information on vegetable production. Within the locations, vegetable farmers were sampled randomly. In total, our data set comprises observations from 384 farm households—85 that participated in supermarket channels and 299 that sold only in traditional channels. These households were visited, and household heads were interviewed face-to-face, using a structured questionnaire that was carefully designed and pretested. The data collected include general household characteristics, details on vegetable production and marketing, other farm and nonfarm economic activities, food and nonfood consumption (see below for details), and various institutional variables.

Sample households are typical smallholder farmers with an average farm size of about 2 acres (0.8 hectares). These households produce vegetables that are exotic to Kenya, such as

kale, spinach, and cabbage, as well as Kenyan indigenous vegetables like black night-shade and amaranth. In addition, sample households are engaged in other agricultural activities such as the production of staple and cash crops like maize, beans, tea, and coffee. Many are also involved in small-scale livestock farming. Table 1 shows sample descriptive statistics for a number of socioeconomic variables that are used as controls in the regression analysis below. In addition to the household head, we captured some information about gender relations within the household. Eighty-nine percent of the sample households are headed by males. Household heads have 9.6 years of formal schooling on average. In contrast, the main female in the household, who in most cases is the spouse of the household head, has a formal education of only about one year.

Table 1 also reveals that there are significant differences between supermarket and traditional channel farmers with respect to several socioeconomic variables. This is because farmers self-select into the group of supermarket suppliers according to their conditions and preferences, which needs to be accounted for in the impact analysis. Supermarket farmers tend to be wealthier and more educated than farmers in traditional channels. Following Fischer and Qaim (2012a), survey respondents were also asked which household member controls vegetable production and revenue. To ensure collection of reliable information, enumerators were trained to ask these questions and confirm the responses from various perspectives. As can be seen in Table 1, males control the revenues from vegetable production in 85% of the supermarket-supplying households. In traditional channel households, this number is significantly lower with 69%.

Supermarket and traditional channels also differ considerably with respect to marketing conditions. Traditional channel farmers have no advance agreements with the buyers of their vegetables. They either sell to traders at the farm gate or in traditional wholesale markets without any promise of repeated transactions. There is no market assurance in traditional vegetable channels, and prices tend to be volatile. In contrast, supermarket farmers have agreements, either with the supermarkets directly or with specialized agents. These agreements are mostly verbal in nature; they specify vegetable quantities, quality, and form of supply. Prices in supermarket channels are stable and higher than in traditional channels. For actual

Table 1. Summary statistics of farm and household variables by marketing channel

Variables	Full sample		Supermarket channel		Traditional channel	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Farm land owned (acres)	2.1	2.9	2.8**	3.7	1.8	2.6
Share of area grown with vegetable (%)	53.2	29.0	60.4*	30.0	51.2	28.4
Annual household income (1,000 Ksh)	472	738	939***	1,160	339	490
Household assets (100,000 Ksh)	2.3	5.7	4.2***	8.6	1.8	4.5
Off-farm income (dummy)	0.70	0.5	0.82**	0.4	0.66	0.5
Annual off-farm income (1,000 Ksh)	148	302	292***	508	108	191
Distance to market (km)	3.1	3.6	2.8	1.9	3.1	3.9
Credit access (dummy)	0.17	0.4	0.22	0.4	0.16	0.4
SM farmers among five nearest neighbors (number)	1.0	1.4	2.3***	1.7	0.6	1.0
Male household head (dummy)	0.89	0.3	0.95*	0.2	0.87	0.3
Age of household head (years)	51.8	13.5	51.1	12.8	51.9	13.8
Education of household head (years)	9.6	3.7	10.6**	3.3	9.3	3.8
Education of main female (years)	1.0	3.0	0.3*	1.4	1.2	3.3
Male control over vegetable revenue (dummy)	0.73	0.5	0.85**	0.4	0.69	0.5
Number of observations	384		85		299	

Notes: Ksh, Kenyan shillings; SM, supermarket. The official exchange rate in 2012 was 1 US dollar = 85 Ksh.

\* Mean difference between supermarket and traditional channel farmers significant at 10% level.

\*\* Mean difference significant at 5% level.

\*\*\* Mean difference significant at 1% level.

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