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# Farmers' Preferences for Supermarket Contracts in Kenya

Dennis O. Ochieng <sup>1\*</sup>, Prakashan C. Veetil <sup>2</sup>, and Matin Qaim <sup>1</sup>

## Abstract

With the modernization of global agri-food systems, the role of contract farming is increasing. This also involves smallholder farmers in developing countries. While previous studies have looked at economic impacts of contract schemes on smallholder farmers, little is known about farmers' preferences for contracting in general, and for specific contract design attributes in particular. Better understanding farmers' preferences and constraints is important to make smallholder contract schemes more viable and beneficial. This article builds on a choice experiment to analyze farmers' preferences and preference heterogeneity for contracts in Kenya. In the study region, supermarkets use contracts to source for fresh vegetables directly from preferred suppliers. However, farmer dropout rates are high. Mixed logit models are estimated to examine farmers' attitudes towards critical contract design attributes. Having to deliver their harvest to urban supermarkets is costly; hence farmers require a significant output price markup. Farmers also dislike delayed payments that are commonplace in contract schemes. The most problematic contract attribute is related to unpredictable product rejection rates, which substantially add to farmers' risk. Designing contracts with lower transaction costs, more transparent quality grading, and fairer risk-sharing clauses could enhance smallholder participation in supermarket procurement channels.

*Keywords:* supermarkets, contracts, farmers' preferences, choice experiment, Kenya

*JEL codes:* O12, O13, Q12, Q13, Q18

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## **1. Introduction**

With the modernization of global agri-food systems, the role of contract farming is increasing (Wang et al., 2014; Otsuka et al., 2016). This also involves farmers in developing countries. Export or processing companies often source agricultural products through outgrower schemes, in order to ensure consistent and high-quality supply (Barrett et al., 2012; Dedehouanou et al., 2013; Bellemare and Novak, 2016). Also in domestic supply chains in developing countries, the role of contracting increases. Rising urban middle classes have higher preferences for food quality and convenience. As a result, modern supermarkets are gaining market shares in retailing (Reardon and Timmer, 2014; Rischke et al., 2015). Especially for fresh and perishable products, supermarkets often do not rely on traditional wholesale markets but procure directly from farmers through contracts (Rao et al., 2011; Michelson et al., 2012; Trebbin, 2014).

Contract farming arrangements in general and supermarket contracts in particular can provide new marketing opportunities for smallholder farmers in developing countries. Contracted smallholders may benefit from higher and more stable prices, as well as better access to inputs, technology, and information (Berdegué et al., 2005; Sartorius and Kirsten, 2007; Blandon et al., 2009a; Barrett et al., 2012; Reardon and Timmer, 2014). Indeed, recent studies show that supermarket contracts have contributed to higher farm productivity and household welfare in some smallholder situations (Minten et al., 2009; Rao and Qaim, 2011; Rao et al., 2012; Michelson, 2013; Chege et al., 2015). However, some also show that smallholders are sometimes unable to participate in supermarket channels (Hernández et al., 2007; Neven et al., 2009), or they drop out of contracts for reasons that are not always entirely clear (Andersson et al., 2015). To some extent, the inability to participate can be explained by lack of human and financial capital, but also unfavorable contract design may play an important role (Otsuka et al., 2016). Better adjusting the contract designs to the particular needs and

constraints of smallholders could help make contract farming more viable and socially inclusive.

However, relatively little is known about how variations in contract design affect smallholder participation and socioeconomic impacts. This is difficult to analyze with purely observational data since variations in contractual design rarely occur in the same setting. A few recent studies used randomized field experiments to analyze the effects of changing the contract designs in existing schemes (Saenger et al., 2013; Saenger et al., 2014). Field experiments are costly and hence, implementing a larger number of experimental treatments – which would be required to evaluate changes in multiple contract design attributes – is hardly possible. Choice experiments are less costly to implement and have been used in recent studies to analyze smallholder preferences for contracts and particular contract terms and provisions. These studies evaluated preferences for hypothetical contract attributes related to output price and quality levels, the need for upfront investments, and the provision of training, credit, and inputs through the contracting company, among others (Bandon et al., 2009b; Schipmann and Qaim, 2011; Abebe et al., 2013). None of these studies looked at supermarket contracts, which often differ from those of export or processing companies.

We add to the literature by analyzing farmers' preferences for supermarket contracts in Kenya using data from a choice experiment. We specifically look at a sample of smallholder vegetable producers that was surveyed over many years. Some of these farmers supply vegetables to supermarkets under contract while others sell their vegetables in traditional spot markets. Other farmers in the sample also had a supermarket contract in the past, but decided to switch back to supplying traditional markets. We hypothesize that the low rates of contract participation may be related to certain contract terms and provisions that are difficult to meet or simply disliked by farmers. This is tested by examining farmers' marketing choices with hypothetical variations in contract design attributes. We also analyze the relative importance

of attributes by computing farmers' willingness to accept for each attribute level. Mixed logit models are estimated to account for preference heterogeneity. Choice experiments, like other approaches used to elicit stated preferences, are often associated with hypothetical bias (Hensher et al., 2005). Building on a sample of farmers with actual contract experience and using variations from existing contracts increases the level of realism in our experiment and may therefore help reduce such bias.

The remainder of this article is organized as follows: the next section provides background on supermarket contracts in the Kenyan vegetable sector. Then the sample of farmers, the choice experiment, and the estimation procedures are described, before the results are presented and discussed. The last section concludes.

## **2. Supermarket Contracts in Kenya**

Kenya ranks second after South Africa in terms of growth and expansion of supermarkets in Sub-Saharan Africa (Planet Retail, 2016). Supermarkets account for about 10% of total food retailing in Kenya with a growing trend. In Nairobi and other big cities, the supermarket share is already much higher (Chege et al., 2015). As in other developing countries (Reardon and Timmer, 2014), modern supermarkets started their business in major cities, but more recently have opened stores in other smaller towns (Rischke et al., 2015). The most widespread supermarket chains in Kenya include Nakumatt, Uchumi, Tuskys, Naivas, and Ukwala, all of which are Kenyan owned. The spread of foreign owned supermarket chains has been limited in Kenya until now (Rao et al., 2012).

Supermarket stores in smaller towns so far primarily sell processed foodstuffs. However, many of the stores in bigger cities also have a large fresh food section, where a variety of fruits and vegetables are sold. Urban consumers often associate fruits and vegetables bought

in modern supermarkets with higher quality, food safety, and freshness than products bought in traditional markets. On average, fresh products are also more expensive in supermarkets than they are in traditional markets. Supermarkets tend to place much emphasis on consistent supply and good outward appearance of fresh fruits and vegetables. As traditional wholesale markets are not sufficiently reliable in this respect, many of the fresh products are procured directly from farmers through contractual arrangements (Neven et al., 2009). Typically, farmers have to deliver their harvest directly to the supermarket stores. The produce has to be cleaned by farmers before delivery; leafy vegetables also have to be sorted and bundled ready for supermarket shelves (Rao and Qaim, 2013). Supermarket procurement officers occasionally visit contracted farmers to inspect production and post-harvest handling activities.

This study focuses on farmers in Kiambu County, Central Kenya, not far from the capital city of Nairobi. These farmers have a long tradition of growing vegetables, notably green leafy ones (various kale species) for the domestic market. Some of the farmers have marketing contracts with supermarkets in Nairobi whereas others sell the same type of vegetables in traditional markets, mostly to traders at the farm gate or in the village. The supermarket contracts do not differ much between supermarket chains. Contracts only refer to the sales of vegetables and do not involve any provision of credit or inputs. Contracts stipulate the quantity of vegetables that a farmer has to deliver to a particular supermarket store on specified dates and payments are usually delayed by up to two weeks (Rao and Qaim, 2011). Farmers who are unable to deliver as scheduled are subsequently struck off the list of preferred suppliers and lose their contracts. Beyond the quantities agreed, contracted farmers can sell their vegetables in traditional markets. However, as farmers in Kiambu are small-scale producers, they rarely have significant excess quantities. In other words, contracted farmers sell the most shares of their vegetables to supermarkets.



Most of the contracts are made between supermarkets and individual farmers, but in some cases farmer groups are also contracted. Collective action can help farmers to coordinate their supplies and reduce transportation and transaction costs (Andersson et al., 2015).

We have observed contractual arrangements between supermarkets and farmers in Kiambu since 2008. Over the past few years, contractual details have evolved. In some cases, instead of fixed delivery dates, supermarkets have shifted to placing orders with contracted farmers through phone calls a few days prior to expected delivery. Furthermore, the payment mode has changed. Initially farmers were paid for the actual quantities of vegetables delivered to supermarkets. Quantities not meeting the quality requirements were rejected, but this was a relatively predictable process. Rejected quantities could then be sold in traditional markets. More recently, farmers are no longer paid for the quantities delivered, but rather for the quantity that the supermarket is able to sell to its customers. This means that most of the supermarket's marketing risk is transferred to farmers. Quantities not sold by supermarkets to their customers can be traced back to individual farmers through small color codes on the vegetable bundles. Farmers can take the unsold quantities back if they wish, but this requires additional tours to the supermarket stores to pick up withered vegetables that can hardly be sold elsewhere.

In spite of these changes, participation in supermarket contracts was shown to be economically beneficial for farmers in Kiambu (Andersson et al., 2015). Nevertheless, deteriorating contractual terms may be one reason for the high dropout rates observed. As will be shown below, many farmers who had supermarket contracts in the past reverted to the traditional market. Focus group discussions revealed that this was often based on the farmers' own decisions rather than losing contracts unintentionally. Our choice experiment builds on these existing and evolving contracts to better understand farmers' preferences and constraints.

### **3. Materials and Methods**

#### *3.1 Sample of farmers*

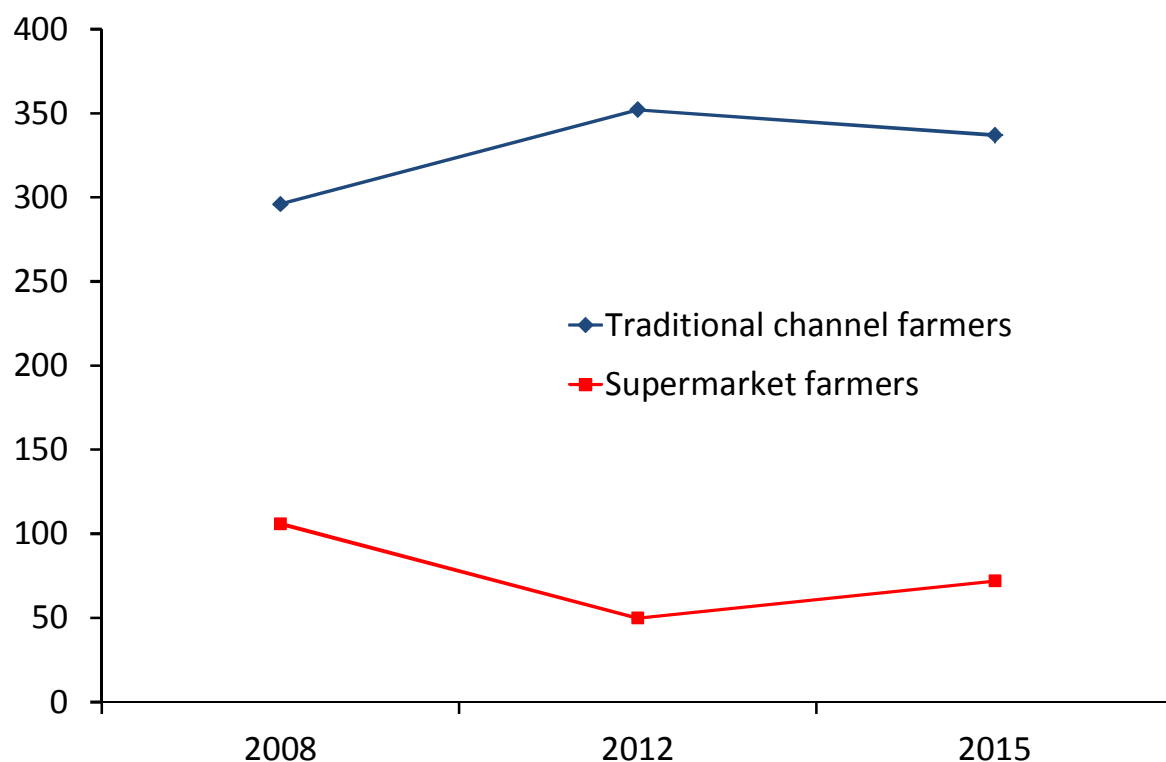
This study builds on a sample of vegetable farmers from Kiambu County, in Central Kenya. The sample was selected in 2008 through a stratified random sampling procedure (Rao and Qaim, 2011; Rao et al., 2012). Supermarket (SM) and traditional channel (TC) farmers were randomly selected from complete lists in 31 administrative locations within the County. A total of 402 farmers were selected in 2008. These farmers were surveyed in 2008, 2012, and 2015. A few farmer replacements were necessary over time due to sample attrition. By 2015, we had 409 farmers in the sample.

Data were collected through face-to-face interviews using a structured questionnaire. We captured details of vegetable production and marketing, as well as other farm and off-farm economic activities of the households. The interviews were conducted in the local language with the household head or another household member who was responsible for vegetable production and marketing. The 2015 survey also included a choice experiment, details of which are provided below.

Figure 1 shows that the number of farmers supplying supermarkets and traditional channels changed remarkably between 2008 and 2015. The number of contracted supermarket suppliers more than halved between 2008 and 2012, and then again increased somewhat by 2015. However, those who dropped out of the supermarket channel by 2012 are mostly not the same as those who joined the supermarket channel after 2012. Out of the 409 farmers in 2015, 69% had never supplied supermarkets. In the following analysis, we refer to these 69% as TC stayers. In contrast, only 8% of the sample farmers supplied supermarkets during the entire period of observation (SM stayers). Fourteen percent had a supermarket contract in 2008 but dropped out from the supermarket channel in subsequent years (SM dropouts), while

9% had not supplied supermarkets in 2008, but decided to enter the supermarket channel through a contract in subsequent years (SM newcomers).

**Figure 1. Number of farmers supplying supermarkets and traditional channels (2008-2015)**



### *3.2 Choice experimental approach*

Choice experiments have become a standard tool to evaluate the preferences of respondents with respect to hypothetical goods or services and are widely used in consumer research and environmental economics (Hensher et al., 2005; Louviere et al., 2010; Veetil et al., 2011). Recently, they have also gained popularity in an agricultural market context. A few recent studies have used choice experiments to assess marketing preferences of smallholder farmers in developing countries (Bandon et al., 2009b; Schipmann and Qaim, 2011; Gelaw et al., 2016; Vassalos et al., 2016).

Choice experiments are grounded on the microeconomic theory of consumer behavior and random utility theory (Lancaster, 1966; McFadden and Zarembka, 1974). It is assumed that consumers derive utility from the characteristics (attributes) of a good rather than the good itself. Individuals are assumed to choose alternatives that yield the highest utility among the range of available options. The actual choices observed thus provide useful insights into the underlying utility functions. In the context of this study, the “goods” are supermarket contracts with varying contract design attributes. In the experiment, a farmer can choose between  $i$  different contract options. Farmer’s utility for a particular contract option is composed of observable and unobservable parts:

$$V_i^j = V(\mathbf{A}_i, \mathbf{F}_i^j) + \varepsilon_i^j \quad (1)$$

where the observable component,  $V(\mathbf{A}_i, \mathbf{F}_i^j)$  is a function of  $\mathbf{A}_i$ , a vector of design attributes of the contract, and  $\mathbf{F}_i^j$ , a vector of socioeconomic characteristics that influence the farmer’s choice.  $\varepsilon_i^j$  is an independent and identically distributed error term that captures unobservable factors that may also influence farmer’s choice. A farmer chooses alternative  $i$ , if  $V_i > V_k$ , that is, utility derived from  $i$  is higher than utility derived from alternative  $k$ . The choice probabilities are derived with the assumption that the error term follows a logistic distribution (McFadden and Zarembka, 1974).

### *3.3 Contract design attributes*

The first step in designing a choice experiment is selecting relevant attributes and their corresponding levels (Hensher et al., 2005). The experiment was designed such that the attributes closely resembled those in the actual contracts that supermarkets issue to vegetable farmers in Kiambu (see previous section). The surveys in 2008 and 2012 and the related analyses (Rao and Qaim, 2011; Rao et al., 2012; Andersson et al., 2015) were useful in designing the choice experiment that was conducted in 2015. In addition, several focus group

discussions were carried out in Kiambu in late 2014 to understand farmers' views on different contract attributes in a qualitative way. Based on this information, we selected five attributes used in the choice experiment, as shown in Table 1.

**Table 1. Contract attributes and attribute levels**

Attribute	Levels	Description of attribute levels
Price	Price	10 Ksh per bundle*
		12 Ksh per bundle
		14 Ksh per bundle
		16 Ksh per bundle
		18 Ksh per bundle
		20 Ksh per bundle
Place of sale	Place1	Farm gate*
	Place2	Nearby market
	Place3	Buyer's premise
Form of sale	Form1	Sold as harvested*
	Form2	Sold in washed and sorted form
Timing of sale	Timing1	Sales possible at any time*
	Timing2	Sales at times specified in a contract
	Timing3	Sales based on phone orders by buyer
Payment mode	Payment1	Payment immediate, based on quantity delivered*
	Payment2	Payment delayed, based on quantity delivered
	Payment3	Payment delayed, based on quantity buyer sold to customers, physically verifiable by farmer
	Payment4	Payment delayed, based on quantity buyer sold to customers, verifiable by farmer through bar coding system
	Payment5	Payment delayed, based on quantity buyer sold to customers, not verifiable by farmer

\* This attribute level is common in traditional marketing channels.

The first contract attribute is price, expressed in Kenyan shillings (Ksh) per vegetable bundle. We used six price levels ranging from Ksh 10, the average price in traditional channels, to Ksh 20, the highest price supermarket farmers reported to have received in their contracts during recent years. The second attribute is the place of sale with three attribute levels (Table 1). As discussed, contracted farmers have to deliver their vegetables to supermarket stores in Nairobi (buyer's premise). This involves significant transportation and transaction costs (Andersson et al., 2015). The other two levels (farm gate and nearby market) were included to test how constraining these costs really are to farmers.

The third attribute is the form of sale with two attribute levels. “Sold as harvested” without any post-harvest treatment is the common form in traditional channels. However, supermarket farmers have to wash, sort, and bundle the vegetables ready for supermarket shelves. These post-harvest operations can be quite labor-intensive; most of the post-harvest handling is carried out by female household members or female hired laborers (Rao and Qaim, 2013).

The fourth contract attribute relates to the timing of sales with three attribute levels. Traditional channel farmers sell in the spot market, so they sell whenever they want while supermarket farmers have to deliver their vegetables according to the time schedule specified in the contract. The latter requires more careful planning and management of the production process. As explained, a few supermarkets have recently also started to procure vegetables by calling on contracted farmers whenever quantities are needed. This makes planning and crop management even more difficult for farmers.












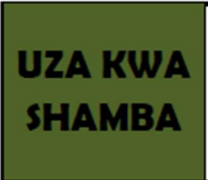



The fifth attribute relates to the payment mode. Whereas traditional channel farmers receive spot payments, in supermarket contracts, payment delays by up to two weeks are common. We further consider actual payments to the farmer, either for the actual quantity delivered, as was common in contracts until 2012, or for the quantity that the supermarket was able to sell to consumers, as has become common recently (see previous section). Finally, in the same attribute we differentiate between options for the farmer to verify the quantity that the supermarket claims it was unable to sell. Modalities of verification are important especially when levels of trust between transacting partners are limited (Singh, 2002). The first option in our experiment is physical verification, meaning that the farmer could see and pick up the unsold quantity at the supermarket store. The second option is through a barcoding system, where the farmer would get a computer-generated slip with sold and unsold quantities recorded by a barcode scanner. The latter is hypothetical as such technology is not yet used by

Kenyan supermarkets for vegetable sales. The third option is “not verifiable by farmer” (Table 1).

These attributes and corresponding levels lead to 540 possible combinations ( $6 \times 3 \times 2 \times 3 \times 5$ ). We used the software *R* to develop a D-optimal choice design. Fractional factorial design yielded a subset of the full factorial design choice alternatives while retaining the main and first-order interaction effects (Hensher et al., 2005). The choice design thus developed comprised 30 choice sets, blocked into five. Every respondent in the choice experiment was randomly assigned to one of the five blocks, each having six choice cards. Each choice card had three options, two contract options with varying attribute levels, and a no-contract option, representing the conditions in traditional channels. Respondents were asked to only choose one option in each of the six choice cards.

Prior to starting the choice experiment, detailed explanations on the differences between attributes and attribute levels were provided to farmers. On the choice cards, pictures were used to further facilitate farmers’ understanding of the different options to choose from. An example of a choice card with English labels is shown in Figure 2.

Figure 2. Example of a choice card

	Price	Place of sale	Form of sale	Timing of sale	Payment mode
Option 1	 20 shillings/bundle	 Sell at Farmgate	 Sell as harvested	 Phone call orders	 Bar code verification
Option 2	 14 shillings/bundle	 Sell at Farmgate	 Washed and sorted	 As scheduled	 After verification
Option 3	 10 shillings/bundle	 Sell at Farmgate	 Sell as harvested	 Sales at any time	 Immediate cash

### 3.4 Estimation procedure

We use the mixed logit model for estimation (Hole, 2007), which relaxes the restrictive independence of irrelevant alternatives (IIA) assumption that is common in simpler models such as the conditional logit. The unobserved factors (captured in the error term) are therefore allowed to be correlated over choice alternatives. Furthermore, the mixed logit model takes into account preference heterogeneity across respondents so that it is possible to elicit multiple choice sets from the same respondents with unrestricted substitution patterns (Hensher et al., 2005).

We start with a model that only includes the contract attributes as explanatory variables:

$$Y_{njt} = \alpha_n ASC + \beta P_{njt} + \gamma'_n A_{njt} + \varepsilon_{njt} \quad (2)$$

where  $Y$  equals one if farmer  $n$  chooses choice alternative  $j$  given choice options  $t$ .  $P$  is the price attribute, and  $A$  the vector of other contract attributes, including place of sale, form of sale, timing of sale, and payment mode. Positive coefficients for the estimated  $\gamma$  coefficients



imply that respondents have a positive preference for the particular attribute level, and vice versa.  $\varepsilon$  is the random error term. ASC is the alternative-specific constant, which captures farmers' general preferences for contracts, beyond the contract attributes specified. The base scenario is dummy coded; it takes a value of one if the no-contract option was chosen, meaning that a positive  $\alpha$  coefficient implies negative general attitudes towards contracts, and vice versa.

In further specifications, we extend this model with additional explanatory variables. In particular, we include different sets of interaction terms to learn more about preference heterogeneity among farmers. Some farmers in our sample had real supermarket contracts in 2015, others had contracts in the past, yet others had no own experience with supermarket contracts. To examine the role of farmers' own contract history, we estimate the following model:

$$Y_{njt} = \alpha_n ASC + \beta P_{njt} + \gamma'_n \mathbf{A}_{njt} + \delta'_n (ASC \times \mathbf{H}_n) + \varepsilon_{njt} \quad (3)$$

where  $\mathbf{H}$  is a vector of dummy variables characterizing SM stayers, SM dropouts, and SM newcomers. TC stayers are used as the reference group. Positive  $\delta$  coefficients mean that farmers in the particular group have stronger negative attitudes towards contracts than farmers in the group of TC stayers, and vice versa.

We also analyze the possible role of other socioeconomic characteristics:

$$Y_{njt} = \alpha_n ASC + \beta P_{njt} + \gamma'_n \mathbf{A}_{njt} + \rho'_n (ASC \times \mathbf{S}_n) + \varepsilon_{njt} \quad (4)$$

where  $\mathbf{S}$  is a vector of socioeconomic variables, including farm characteristics, farmer's age, education, and gender, as well as household income and region dummies.

Socioeconomic factors may not only influence farmers' general contract preferences but also their attitude towards particular contract attributes. This is analyzed with the following model:

$$Y_{njt} = \alpha_n ASC + \beta P_{njt} + \gamma'_n A_{njt} + \tau'_n (A_{njt} \times S_n) + \varepsilon_{njt} \quad (5)$$

Positive  $\tau$  coefficients mean that farmers with higher levels of  $S$  have more positive (or less negative) attitudes towards a particular contract attribute level, and vice versa.

Using dummy coding, all models are estimated in preference space, which leads to a better fit in mixed logit models than those estimated in willingness to pay space (Hole and Kolstad, 2012). For the price attribute, we assume a fixed coefficient, while for all other contract attributes we assume preference heterogeneity across respondents with normal distribution. Following Hole (2007), parameters were estimated using the simulated maximum likelihood method.

The coefficient estimates from the model in equation (2) are also used to calculate farmers' willingness to accept (WTA) the different contract attribute levels as follows:

$$WTA = \partial P / \partial A \quad (6)$$

Positive WTA estimates imply that farmers would only accept a particular contract attribute level when being offered a higher price. Like the price attribute, WTA is expressed in Ksh. Comparing WTA estimates between the different attributes and attribute levels can help identify contract terms that are seen by farmers as particularly critical.

## 4. Results and Discussion

### 4.1 Descriptive statistics

Table 2 presents summary statistics of selected socioeconomic variables for the sample of vegetable-producing farm households in Kiambu. Most farms are very small, averaging 1.8

acres, with vegetable area of about 0.5 acres. In addition to vegetables, sample farms typically grow maize, bananas, and a few other cash crops. Many are also involved in off-farm economic activities. However, vegetable production is the main source of income for most farm households. The majority of the farmers (86%) are members of a farmer group, although many of the groups are not very active.<sup>2</sup> Only 8% of the farmers market their vegetables in a coordinated way through the groups. Such coordination can be observed among both supermarket and traditional channel farmers. In terms of household demographics, 86% of the farmers are male. The household heads have an average of almost 10 years of schooling, farmers' educational levels are relatively high.

**Table 2. Summary statistics of selected socioeconomic variables (2015)**

Variable	Description of variable	Mean	SD
Farm size	Land owned by household (acres)	1.81	2.89
Farm income	Annual farm income (000 Ksh)	418.63	938.81
Off-farm income	Households has off-farm income sources (dummy)	0.78	0.42
Total income	Annual household income (000 Ksh)	556.57	1018.52
Irrigation	Access to advanced irrigation technology (dummy)	0.72	0.45
Vegetable area	Land cultivated with vegetables in 2015 (acres)	0.54	0.81
Vegetable share	Contribution of vegetable income to total farm income (%)	0.84	0.28
Group member	Membership in farmer group (dummy)	0.86	0.35
Group marketing	Vegetables are marketed through farmer group (dummy)	0.08	0.27
Distance	Distance to the nearest supermarket (km)	9.79	8.61
Credit access	Household has access to credit (dummy)	0.72	0.45
Livestock	Ownership of livestock (dummy)	0.84	0.37
Male	Male household head (dummy)	0.86	0.35
Age	Age of household head (years)	54.31	14.15
Education	Years of schooling of household head (years)	9.67	3.66

Notes: Observations = 409; SD, standard deviation; 1 US dollar = 103 Kenya shillings (Ksh).

#### *4.2 Farmers' preferences for contracts and contract attributes*

Estimation results of the first set of mixed logit models are shown in Table 3. We tested for the IIA assumption using Hausman test. The null hypothesis that the IIA assumption holds had to be rejected ( $p < 0.05$ ), implying that the mixed logit model is preferred over the

<sup>2</sup> Farmer groups in Kenya are often established with a particular project in mind, though some groups remain active also after the project has ended. Other groups continue to exist on paper, yet without much activity. Sometimes, passive groups can be revived when a new project is initiated.

conditional logit. The superiority of the mixed logit is also underlined by the significant standard deviation estimates, which are shown in the lower part of Table 3. The significance of these estimates confirms that heterogeneity in farmers' preferences for the different contract attributes exists.

We start discussing the estimation results by looking at column (1) of Table 3, which shows estimates of the model that only includes the contract attributes (equation 2). The estimate of the ASC is insignificant, implying that farmers' attitudes towards supermarket contracts seem to be captured quite well by the contract design attributes included in the model. Beyond these attributes, farmers do not seem to have strong views on selling their vegetables under contract or in the spot market. Concerning the contract attributes, the positive estimate for price indicates that, *ceteris paribus*, farmers prefer contracts when they offer higher prices, which is to be expected.

For all other contract attributes, we observe significantly negative coefficients, meaning that farmers do not like these contractual terms and conditions and are only willing to accept them when being compensated through higher prices. This is also expected. Having to deliver the vegetables to a nearby market (place2) or to the supermarket in Nairobi (place3) is associated with higher transport and transaction costs than selling at the farm gate. Washing and sorting the vegetables (form2) requires more work than selling as harvested. Selling at specified dates (timing2) or when called by supermarket procurement officers (timing3) makes planning and crop management more complex. Delayed payments (payment2) and unpredictable rates of product rejection increase farmers' economic risks. The magnitude of the coefficients and related WTA estimates will be discussed in more detail below. However, a quick comparison of the estimated coefficients already suggests that the payment mode attribute is seen as particularly critical by farmers.

**Table 3. Mixed logit model estimates of farmers' preferences for contracts**

	(1)	(2)	(3)
<i>Parameters</i>			
ASC	0.37(0.35)	1.05* (0.59)	1.06(1.62)
Price	0.51*** (0.06)	0.66*** (0.12)	0.48*** (0.06)
Place2	-2.13*** (0.40)	-2.39*** (0.51)	-2.10*** (0.38)
Place3	-2.75*** (0.50)	-3.69*** (0.82)	-2.43*** (0.43)
Form2	-1.00*** (0.29)	-1.20*** (0.39)	-0.96*** (0.28)
Timing2	-0.84*** (0.32)	-0.75*** (0.37)	-0.47 (0.32)
Timing3	-1.57*** (0.47)	-2.33*** (0.69)	-1.32*** (0.41)
Payment2	-3.11*** (0.51)	-4.06*** (0.90)	-2.78*** (0.46)
Payment3	-6.82*** (0.97)	-9.03*** (2.14)	-6.98*** (1.20)
Payment4	-15.37*** (2.89)	-21.60*** (5.18)	-11.28*** (2.07)
Payment5	-16.36*** (3.04)	-24.17*** (5.35)	-14.67*** (2.66)
<i>Interactions</i>			
ASC x SM stayers (dummy) <sup>a</sup>		-1.10(0.73)	
ASC x SM dropouts (dummy) <sup>a</sup>		-0.97(0.70)	
ASC x SM newcomers (dummy) <sup>a</sup>		-1.25*(0.65)	
ASC x Githunguri region (dummy) <sup>b</sup>			1.81** (0.75)
ASC x Westlands region (dummy) <sup>b</sup>			-1.14 (0.90)
ASC x Kikuyu region (dummy) <sup>b</sup>			0.18 (0.37)
ASC x Group marketing (dummy)			-1.69** (0.71)
ASC x Age (years)			0.01 (0.02)
ASC x Education (years)			-0.02 (0.06)
ASC x Male (dummy)			-0.59 (0.61)
ASC x Annual income (000 Ksh)			-0.00029* (0.00018)
<i>Standard deviations</i>			
ASC	0.71(0.47)	1.72** (0.81)	1.01 (0.72)
Place2	2.71*** (0.51)	3.66*** (0.81)	2.19*** (0.47)
Place3	3.79*** (0.61)	5.31*** (1.09)	3.27*** (0.50)
Form2	1.27*** (0.40)	1.95*** (0.57)	1.37*** (0.37)
Timing2	2.30*** (0.51)	2.90*** (0.68)	2.26*** (0.52)
Timing3	3.03*** (0.55)	4.94*** (1.04)	3.02*** (0.51)
Payment2	3.52*** (0.53)	4.37*** (0.93)	3.29*** (0.59)
Payment3	3.56*** (0.66)	5.12*** (1.21)	3.66*** (0.80)
Payment4	8.81*** (1.70)	12.56*** (2.99)	6.20*** (1.28)
Payment5	7.77*** (1.51)	12.36*** (2.80)	6.92*** (1.27)
Log likelihood at start	-1393.21	-1386.34	-1380.62
Log likelihood at convergence	-1314.09	-1308.55	-1310.28
Likelihood ratio $\chi^2$ (55)	586.94	533.14	519.20
Pseudo $R^2$	0.3058		

Notes: Observations=7362 (6 cards x 3 options x 409 respondents); standard errors in parentheses; ASC, alternative specific constant (refers to traditional channel without contract); SM, supermarket; TC, traditional channel; <sup>a</sup> Reference category is TC stayers; <sup>b</sup> Reference category is Lari/Limuru region.

\* significant at 10% level; \*\* significant at 5% level; \*\*\* significant at 1% level.

In column (2) of Table 3, we test for the influence of farmers' contract history in shaping their preferences (equation 3). The interaction of ASC with the SM newcomers dummy is negative and statistically significant, meaning that farmers who recently joined the supermarket channel have a more positive attitude towards contracts than other farmers in the sample. This is not surprising, given that SM newcomers recently decided to enter into a contractual

relationship. The coefficient for the ASC itself is now positive and significant, implying that farmers who never supplied supermarkets (TC stayers) have negative attitudes towards contracts in general.

#### *4.3 The role of socioeconomic characteristics*

In column (3) of Table 3, we test for the influence of various socioeconomic characteristics (equation 4). The interaction of ASC and Githunguri region is positive and statistically significant, meaning that farmers in this region have a more negative general attitude towards contracts than farmers in other regions of Kiambu. Out of the regions surveyed, Githunguri is the one furthest away from Nairobi and has relatively poor road infrastructure. Farmers in that region therefore have a locational disadvantage for contracts with supermarkets in Nairobi. As is known from the literature, remoteness does not only reduce farmers' market access in general but also obstructs their participation in higher-value supply chains (Moustier et al., 2010).

The interaction of ASC and group marketing is negative and significant, indicating that farmers who market their vegetables through a farmer group have a more positive preference for contracts than farmers who market individually. This is plausible given that collective marketing can reduce transport and transaction costs (Andersson et al., 2015). Furthermore, active farmer groups are important platforms for learning and information exchange, which can be particularly relevant in meeting more stringent quality requirements. The interaction of ASC and household income is negative and significant as well, meaning that better-off households have more positive general attitudes towards contracts. This may possibly be related to richer households being more able to make investments into technology, inputs, and external labor. Such investments can help to better meet contractual obligations.

In addition to influencing general contract preferences, socioeconomic characteristics can also influence attitudes towards the different contract attributes. This is tested by interacting

contract attributes with socioeconomic variables (equation 5). Results of these models are shown in Table 4. In column (1), the contract attributes were interacted with the age of the household head. Each interaction term has to be considered together with the coefficient of the corresponding contract attribute itself. For instance, the coefficient for the interaction of age and place2 is negative and significant, meaning that older farmers have more negative attitudes towards delivering their vegetables to a nearby marketplace than younger farmers. Probably, older farmers are less mobile. At the same time, the coefficient for place2 itself, which is negative and significant in the models in Table 3, is now insignificant. This implies that younger farmers have no problem with delivering their vegetables to a nearby marketplace (as compared with selling at the farm gate). Nearby markets are usually located in the next town, to which younger farmers travel more frequently than older farmers anyway. In contrast, the negative attitude towards having to deliver to Nairobi (place3) applies to all farmers irrespective of their age.

Column (1) in Table 4 also shows that older farmers have less negative attitudes than younger farmers towards phone call orders (timing3) and payments based on quantities that the supermarket was able to sell to customers without the possibility of physically verifying unsold quantity (payment4 and payment5).<sup>3</sup> This suggests that older farmers have more trust in contract partners than younger farmers.

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<sup>3</sup> Note that the positive interaction terms for payment4 and payment5 do not mean older farmers like these attribute levels. For interpretation of absolute preferences, the interaction coefficients need to be multiplied by age and then added to the linear payment4 and payment5 coefficients. This still results in a negative preference for all farmers in the sample. The interaction term coefficients alone can only be interpreted in a relative sense, meaning here that older farmers have less negative attitudes towards these attribute levels than younger farmers.

**Table 4. Correlated mixed logit models with interactions between contract attributes and socioeconomic characteristics**

	Variables interacted with attribute levels					
	(1)	(2)	(3)	(4)	(5)	(6)
	Age of household head (years)	Education of household head (years)	Annual household Income (000 Ksh)	Githunguri region (dummy)	Male household head (dummy)	Group marketing (dummy)
<i>Interacted with</i>						
...Place2	-0.06** (0.03)	-0.05*** (0.02)	0.0001 (0.0003)	-2.37** (1.03)	0.90 (1.07)	-0.61 (0.78)
...Place3	-0.02 (0.03)	-0.04** (0.02)	0.0001 (0.0003)	-1.51 (0.96)	0.06 (1.05)	0.34 (0.92)
...Form2	-0.02 (0.02)	-0.02* (0.01)	-0.0001 (0.0002)	-0.75 (0.67)	1.396* (0.84)	-0.57 (0.58)
...Timing2	-0.002 (0.02)	-0.02 (0.02)	0.0001 (0.0002)	-0.54 (0.75)	-0.06 (0.88)	1.36* (0.73)
...Timing3	0.09*** (0.03)	0.05** (0.02)	-0.0002 (0.0004)	0.36 (1.10)	0.15 (1.12)	-0.45 (0.92)
...Payment2	-0.004 (0.03)	-0.002 (0.02)	0.0008*** (0.0003)	0.05 (1.02)	2.063* (1.24)	1.38 (1.00)
...Payment3	0.04 (0.03)	0.02 (0.03)	0.0005 (0.0003)	-1.47 (1.54)	1.09 (1.27)	3.28*** (1.07)
...Payment4	0.12** (0.06)	0.02 (0.04)	0.0012* (0.0006)	-0.261 (1.84)	1.36 (1.89)	5.49*** (1.81)
...Payment5	0.137** (0.06)	0.20*** (0.07)	0.0008 (0.0009)	-0.364 (2.81)	9.04** (4.34)	7.18*** (1.70)
<i>Parameters</i>						
ASC	0.27 (0.47)	0.36 (0.33)	0.60 (0.37)	0.30 (0.39)	0.77 (0.52)	0.17 (0.34)
Price	0.69*** (0.12)	0.51*** (0.07)	0.52*** (0.06)	0.53*** (0.07)	0.62*** (0.12)	0.49*** (0.06)
Place2	0.09 (1.35)	0.86 (1.01)	-2.15*** (0.47)	-1.65*** (0.37)	-3.24*** (1.16)	-2.29*** (0.43)
Place3	-2.92* (1.63)	-0.77 (1.26)	-2.45*** (0.50)	-2.47*** (0.55)	-3.12*** (1.10)	-3.09*** (0.55)
Form2	-0.63 (0.92)	0.14 (0.77)	-0.73** (0.32)	-1.12*** (0.34)	-2.20** (0.90)	-1.10*** (0.32)
Timing2	-0.87 (1.12)	0.27 (0.88)	-0.67*** (0.33)	-0.70** (0.32)	-0.71 (0.87)	-0.97*** (0.34)
Timing3	-7.33*** (2.17)	-4.22*** (1.31)	-1.41*** (0.50)	-1.94*** (0.54)	-1.93 (1.25)	-1.68*** (0.47)
Payment2	-4.24*** (1.56)	-3.06** (1.28)	-3.73*** (0.63)	-3.30*** (0.62)	-5.50*** (1.52)	-3.11*** (0.55)
Payment3	-12.11*** (3.12)	-8.20*** (1.94)	-7.36*** (1.22)	-6.47*** (0.96)	-8.75*** (1.96)	-7.17*** (1.06)
Payment4	-24.73*** (5.90)	-16.61*** (4.10)	-18.05*** (3.78)	-13.57*** (2.60)	-17.23*** (3.99)	-13.57*** (2.92)
Payment5	-36.56*** (7.99)	-37.87*** (9.78)	-22.78*** (6.71)	-17.85*** (3.03)	-35.60*** (9.85)	-17.34*** (3.13)



**Table 4 (continued)**

<i>Standard deviations</i>						
ASC	0.74 (0.63)	0.44(0.57)	1.25** (0.47)	1.42* (0.74)	2.09** (0.97)	0.04 (0.52)
Place2	0.35*** (0.98)	2.53*** (0.58)	3.22*** (0.64)	2.87*** (0.53)	3.55*** (0.84)	2.73*** (0.52)
Place3	4.80*** (1.02)	4.16*** (0.76)	4.03*** (0.63)	3.96*** (0.65)	4.52*** (0.93)	4.06*** (0.64)
Form2	1.40*** (0.46)	1.66*** (0.46)	1.31*** (0.37)	1.46*** (0.36)	1.74*** (0.57)	1.29*** (0.31)
Timing2	3.16*** (0.83)	2.44*** (0.50)	2.02*** (0.50)	2.15*** (0.43)	3.12*** (0.74)	2.53*** (0.50)
Timing3	5.23*** (1.15)	3.48*** (0.74)	3.53*** (0.59)	4.04*** (0.48)	4.12*** (0.98)	3.15*** (0.48)
Payment2	5.50*** (1.17)	4.34*** (0.82)	3.79*** (0.75)	3.86*** (0.74)	4.53*** (1.07)	3.73*** (0.63)
Payment3	4.86*** (1.13)	3.96*** (0.76)	3.72*** (0.73)	3.05*** (0.61)	4.22*** (1.06)	3.17*** (0.62)
Payment4	9.69*** (2.46)	9.15*** (2.03)	9.44*** (2.08)	7.61*** (1.69)	8.88*** (2.02)	7.00*** (1.61)
Payment5	13.76*** (3.10)	14.57*** (3.68)	10.98*** (3.62)	8.45*** (1.49)	15.41*** (3.91)	8.11*** (1.65)
LL. at start	1383.78	1382.39	1380.99	1388.17	1395.11	1379.56
LL at convergence	1301.22	1315.58	1304.80	1310.69	1314.23	1303.52
LR chi <sup>2</sup> (55)	596.91***	568.19***	579.50***	575.67***	567.11***	569.52***

Notes: Observations=7362; Standard errors in parentheses; LL, log likelihood; LR likelihood ratio.

\* significant at 10% level; \*\* significant at 5% level; \*\*\* significant at 1% level.

In column (2) of Table 4, the contract attributes are interacted with education. Better educated farmers have stronger negative attitudes towards having to deliver their vegetables to a nearby market or to Nairobi than less educated farmers. This may be related to better educated farmers often having higher opportunity costs of time. Higher opportunity costs of time may also explain the more negative attitudes of better educated farmers towards washing and sorting the vegetables (form2). Washing and sorting are time-intensive operations. The results also indicate that better educated farmers have fewer problems with phone call orders, perhaps because they are better able to manage the activities flexibly.

Column (3) of Table 4 looks at the role of household income. Richer farmers have less negative attitudes towards delayed payments. This is plausible given that richer farmers tend to be less affected by liquidity constraints than poorer farmers. Most other interaction effects in this model are insignificant, meaning that income does not affect farmers' preferences for these other contract attributes. In column (4), the only significant interaction term is that between Githunguri region and delivering to a nearby market (place2). The coefficient is highly negative and significant. This can be explained by the poorer infrastructure conditions in Githunguri, meaning that even traveling to a nearby market can be costly in terms of time and higher rates of product damage.

Columns (5) and (6) of Table 4 show models with interactions of contract attributes with the gender of the household head and group marketing. Male farmers have less negative attitude towards washing and sorting than female farmers. This can be explained by the fact that these post-harvest operations are primarily carried out by women (Rao and Qaim, 2013). Farmers who market their vegetables through a group are more positive about the exact timing of sales as specified in the contract than their colleagues who market individually. Group marketing requires timely coordination anyway, with and without supermarket contracts. Furthermore, farmers marketing through a group are less concerned about payments based on quantities that

the supermarket was able to sell with or without the possibility of verifying. This can be explained by the fact that groups share the marketing risk. The risk for each individual member is hence lower. Moreover, due to joint learning, information exchange, and social pressure, groups may deliver vegetables of higher quality, so that the risk of supermarkets being unable to sell could be lower. Indeed, the focus group discussions revealed that farmer groups with a supermarket contract had lower average rejection rates than farmers who sell to supermarkets individually.

#### *4.4 Farmers' willingness to accept*

The model estimates so far have shown that farmers have neutral attitudes towards contracting in general, but dislike some of the typical attributes in supermarket contracts and are only willing to contract when these disadvantages are compensated through higher product prices. Now we want to analyze farmers' willingness to accept (WTA) these contract attributes more explicitly. Mean WTA estimates for each contract attribute level are shown in Table 5.

The WTA values are expressed in Ksh per bundle of vegetables and can be interpreted as the average price markup farmers require to accept a particular attribute. The average price of vegetables in traditional marketing channels was Ksh 10 per bundle. Against this background the estimates in Table 5 appear quite high. It should be mentioned that the exact WTA values should not be over-interpreted, and their magnitude might have to be discounted somewhat, given the well-known hypothetical bias that stated preferences data often suffer from (Hensher et al., 2005; Schipmann and Qaim, 2011). Moreover, mixed logit models tend to result in higher WTAs when estimated in preference space, as done here, than when estimated in willingness to pay space (Hole and Kolstad, 2012). However, there is no reason to believe that these issues affect some attributes more than others, so an unbiased relative ranking between the different attributes is possible.

**Table 5. Mean willingness to accept (WTA) different contract attribute levels**

Attribute level	Full sample	SM farmers	TC farmers
Sales at a nearby market (place2)	4.19 [3.88,4.50]	3.22** [2.38,4.07]	4.40 [4.07,4.72]
Sales at buyers' premises (place3)	4.79 [4.27,5.32]	3.45** [2.10,4.81]	5.08 [4.52,5.64]
Sold in washed and sorted form (form2)	1.93 [1.72,2.13]	1.69 [1.19,2.19]	1.98 [1.75,2.20]
Sales as scheduled in contract (timing2)	0.97 [0.71,1.23]	0.79 [0.08,1.49]	1.01 [0.73,1.29]
Sales based on phone orders (timing3)	2.69 [2.32,3.06]	2.80 [1.80,3.80]	2.67 [2.27,3.07]
Payment delayed, for quantity delivered (payment2)	5.66 [5.26,6.06]	4.22*** [3.20,5.24]	5.97 [5.54,6.40]
Payment delayed, for quantity buyer sold to customers, physically verifiable (payment3)	14.44 [14.04,14.84]	13.44** [12.32,14.56]	14.65 [14.23,15.07]
Payment delayed, for quantity buyer sold to customers, verifiable through bar coding (payment4)	23.19 [22.44,23.93]	20.31*** [18.10,22.51]	23.80 [23.05,24.56]
Payment delayed, for quantity buyer sold to customers, not verifiable (payment5)	29.85 [29.10,30.59]	27.02*** [24.55,29.49]	30.45 [29.73,31.17]
N ( observations)	409	72	337

Notes: Values are expressed in Ksh per bundle of vegetables. Confidence intervals (95%) are shown in brackets; these were derived with the delta method. SM, supermarket; TC, traditional channel.

\*\* difference between SM and TC farmers significant at 5% level; \*\*\* difference between SM and TC farmers significant at 1% level.

Looking at the results for the full sample in Table 5, farmers require a price markup of Ksh 4.2 (42%) to accept a contract with delivery to a nearby market. This WTA is relatively large and underlines that transportation and transaction costs – including opportunity costs of the farmer's time – are sizeable. The quantities typically delivered per transaction are small. Many of the farmers do not own a motor vehicle and so they have to use public transportation or organize transport in other ways. The required markup for delivering to the supermarket stores in Nairobi is also high (Ksh 4.8). Interestingly, however, the WTA difference between delivering to a nearby market and to Nairobi is not that big. Establishing more decentralized collection centers therefore might not substantially increase the rates of farmers' participation in contracts.

Having to sell in washed and sorted form requires an average price markup of 19% to compensate for the additional costs of post-harvest handling. For the condition to deliver their

vegetables at specified dates, farmers demand a price increase of about 10%. In comparison to the WTA estimates for the other attributes, these conditions related to post-harvest handling and timing of sales do not seem to be the major hurdles for farmers to engage in supermarket contracts. The WTA more ad-hoc orders through phone calls is higher (27%), but even this is small as compared to the much higher WTA values for the supermarket payment modes.

All payment mode attribute levels are associated with high WTA estimates, suggesting that these are the most critical features in the supermarket contracts from the farmers' perspective. For delayed payments, farmers require a price markup of 57%. This can be explained by liquidity constraints. Farmers need the cash to pay for household needs, outstanding bills, and farm inputs required to ensure high-quality production. Delayed payments also increase the subjectively felt risk of contract partners defaulting. The WTA gets much higher when payments are not based what farmers delivered but rather on what the supermarket was able to sell to its customers. To some extent, this depends on the quality delivered. Yet there are also other factors that determine supermarket sales completely beyond the farmers' control. Hence, the marketing risk increases substantially.

When payment is based on the quantity the supermarket sold to customers, verifiable through later inspection of the unsold quantity, farmers' mean WTA is a price markup of Ksh 14.4 per bundle. This attribute level (payment3) is the one that was actually observed in supermarket contracts in 2015. However, this WTA is much higher than contractual price markups typically observed. This recent change in contractual design may therefore explain – at least partly – why some farmers dropped out of their contracts and why overall participation rates remain relatively low.

For the other two attribute levels related to payment mode, WTA estimates are still much higher, which is likely due to issues of distrust. When farmers are unable to verify the quantity the supermarkets sell to their customers (payment5), there may be concerns that the

supermarkets cheat by underreporting the actual sales. Verification through a barcoding system (payment<sup>4</sup>) could be a technical way of reducing the chances of opportunistic behavior, while also lowering transaction costs (in comparison to physical inspection). However, the WTA estimates suggest that farmers do not seem to have full trust in this technological alternative.

The two columns on the right-hand-side of Table 5 differentiate the mean WTA for SM farmers and TC farmers. This classification refers to the situation in 2015. A few of the estimates differ statistically, with somewhat lower WTA values for the subsample of SM farmers. This is plausible, as these farmers have actual contract experience so the choice experiment was less hypothetical for them. Yet, the magnitude of differences between the two subsamples is relatively small. It seems the choice experiment was well understood even by those without current contracts, which increases the confidence in the general findings. Furthermore, contracted and non-contracted farmers appear to have similar attitudes towards contracts, suggesting that modifications in contractual design could indeed affect farmers' participation rates considerably.

## **5. Conclusions**

We have carried out a choice experiment with vegetable farmers in Kenya to analyze how changes in contractual design may possibly help to increase smallholder participation in supermarket contracting. The hypothetical contracts used in the choice experiment closely resembled those that Kenyan supermarkets actually apply to procure fresh vegetables from farmers. In these existing contract schemes, smallholder participation rates are relatively low and dropout rates are high.

The choice experimental data and mixed logit models were used to show that farmers are open to contracting in general. However, some of the contract design attributes make participation difficult. The contracts require farmers to deliver their vegetables to supermarket stores in Nairobi, which is associated with high transport and transaction costs, especially for farmers in more remote regions with poor infrastructure. Supermarkets also require farmers to wash, sort, and bundle the vegetables ready for supermarket shelves. These post-harvest operations are also associated with higher costs. Willingness to accept (WTA) estimates reveal that farmers require price markups of 20-40% to compensate for the higher costs associated with these contract attributes. Results suggest that the WTA may even be higher for farmers with high opportunity costs of time. Nevertheless, these contract attributes related to the place and form of vegetable sales do not seem to be the main hurdles for more widespread smallholder participation.

The most critical contract attributes are related to payment mode. Farmers dislike delayed payments that are commonplace in contract schemes. Delayed payments can aggravate liquidity constraints and also increase the possible risk of defaulting. The mean WTA delayed payments is a price markup of around 50%. Also related to payment mode, supermarkets have recently changed the basis for which payments are made. Rather than paying for the quantity of vegetables delivered, farmers are now paid only for the quantity that the supermarket was able to sell to its customers. This change has further increased farmers' marketing risk. The choice experimental data suggest that farmers' mean WTA this payment clause is around 140%, which is higher than typical price markups observed in the existing contracts. Hence, the unfavorable payment mode may be an important factor in explaining the high dropout rates and the low participation of smallholders in supermarket contracting. The analysis also revealed that distrust may be an issue. Farmers do not seem to believe supermarket statements about unsold quantities without the option to physically verify.

These results confirm that contractual design matters and better tailoring contracts to the conditions of smallholders can help to make supermarket procurement schemes more socially inclusive. Reducing payment delays, introducing standardized and verifiable quality grading systems, higher levels of transparency, and a fairer distribution of risk are all avenues that could make contracts more viable for smallholders. Our analysis also suggests that contracts with farmer groups rather than individual farmers could be very useful. Collective action in groups reduces transaction costs and – through joint learning and peer pressure – can also raise the quality and consistency of product supplies.

Modifying contracts in the proposed directions would be useful from a development policy perspective to avoid exclusion and further marginalization of smallholder farmers. A relevant question is whether supermarkets themselves could also benefit from making contracts more smallholder-friendly. This will depend on the particular situation. When supermarkets can procure sufficient quantities of foodstuffs from larger farms, they may not be interested in contracting many smallholders. However, when supermarkets continue to expand from the big cities to smaller towns and rural areas, and when fresh horticultural products shall gradually also be offered in these newly established stores outside of the big cities, then more procurement from smallholders may possibly become inevitable. Given observed supermarket growth rates in Africa, we argue that it is in supermarkets' own interest to adjust contracts more flexibly to smallholder conditions.



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