Purchasing Behaviour and Relational Contract Decision of Retailers in Grasshopper Value Chains in Uganda

by Emmanuel Donkor, Robert Mbeche, and Dagmar Mithöfer

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Abstract
Agrifood marketing in sub-Saharan Africa is associated with high inefficiencies, which emanate from high transaction costs, poor coordination and asymmetric information. These challenges lead to high food prices and limited accessibility to consumers. Formal contracts could address these challenges, but they are largely non-existent in the traditional agrifood marketing. Studies addressing the agrifood marketing challenges have focused mainly on farmers and consumers. However, the mid-stream actors who bridge the gap between farmers and consumers are ignored in scientific and policy debates. The paper therefore analyses the purchasing behaviour and relational contract decision of retailers using a primary data set from 500 grasshopper retailers in Central Uganda. We find that most retailers prefer to purchase non-value added grasshoppers from wholesalers. Consistent with the theory of relational contract, trust and close relationship reinforce relational contract between retailers and suppliers. We find a significant positive relationship between demand for grasshopper products and relational contract.

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Abstract
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Keywords: Purchasing behaviour, grasshopper value chain, retailers, relational contract, transaction cost theory, buyer-seller model

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1. Introduction

The agri-food sector plays a critical role in ensuring sustainable food security, poverty reduction and improved standard of living in developing countries (AGRA, 2019). The sector provides employment opportunities for many people in sub-Saharan Africa (SSA) and supplies raw materials for agro-food processing companies (AGRA, 2019; Reardon et al., 2019; van Berkum, Just, & Ruben, 2018). However, high transaction costs, poor vertical coordination, poor access to support services, asymmetric information, and lack of standardisation hamper active participation of farmers, intermediaries and consumers in the sector (Burke, Jayne, & Sitko, 2019; Montalbano, Pietrelli, & Salvatici, 2018). This contributes to market failures and inefficiencies leading to limited access to food, poverty and food insecurity (Barrett, 2008; Barrett et al., 2012).

Formal contracts can contribute to mitigating market failures and stimulating market participation among smallholder farmers to promote their welfare in SSA (Barrett et al., 2012; Bellemare & Bloem, 2018; Bellemare & Lim, 2018). For instance, Bellemare (2012) and Bellemare and Lim (2018) observed positive effects on smallholder farmers' incomes in Madagascar. Meemken and Bellemare (2020) found contract farming to stimulate higher demand for hired labour and improve incomes of rural farmers in Bangladesh, Cote d'lvoire, Mozambique, Nigeria, Tanzania and Uganda. Consistent with Meemken and Bellemare (2020), Arouna, Michler, and Lokossou (2021) showed positive impacts of contract farming on welfare and productivity measures of farmers in Benin.

In the research and policy discourse, less attention has been paid to mid-stream actors who bridge the gap between farmers and consumers in the agrifood sector (AGRA, 2019; Reardon, 2015). In microeconomic theory, the focus is on modelling behaviours of producers and consumers rather than mid-stream actors (Fafchamps, 2004). The intermediation role of retailers is regarded as redundant and trivial because it is perceived that producers and consumers can easily perform transactions with no or reduced cost (Fafchamps, 2004).

In most agrifood markets in SSA, mid-stream actors, notably retailers mostly procure commodities through spot market transactions. However, spot market transactions are associated with information assymmetry, uncertainties in commodity price and supply, which can contribute to long-term market failure. Formal contracts have been promoted as a coordinating mechanism to address these challenges (Barrett et al., 2012). However, formal

contracts are largely non-existent among mid-stream actors and their suppliers in the traditional agrifood markets in SSA. Instead, retailers develop relational contract with their suppliers to address these problems. Relational contract refers to unwritten codes of conduct and informal agreement between market actors in exchange of goods and services (Baker, Gibbons, & Murphy, 2002; Brown, Falk, & Fehr, 2004). In relational contract, retailers develop close relationship with suppliers they normally transact business with (Tadesse & Shively, 2013). The informal arrangements may encompass an agreement on product quantity and price. The purchasing behaviour and relational contract decision of retailers are not well investigated and understood in the literature. However, without insights into informal relationships among economic agents, it is difficult to understand the nature of formal contracts (Gibbons & Henderson, 2012). Abdulai and Birachi (2009) analyse socioeconomic and transaction factors affecting trader-supplier transactions including spot market, relational and written contracts but do not assess how social factors such as trust influence these transactions. They did not also investigate factors influencing traders' purchasing behaviour of the traders, notably the choice of suppliers and quantity purchased.

The present paper analyses retailers' purchasing decision and relational contract using the case of the grasshopper value chain in Central Uganda. The specific objectives are to analyse factors that affect retailers' choice of suppliers, grasshopper products and quantities of the products purchased from the suppliers, and to evaluate the nexus between retailers' purchasing behaviour and relational contract decision.

Our study contributes to expanding the study of Abdulai and Birachi (2009) by investigating retailers' purchasing behaviour and incorporating social factors such as trust, close relationship and number of suppliers traded with in relational contract model. Insights on relational contract are instrumental in developing a formal contract to suit an emerging agri-food sector like edible insects. Our paper also contributes to narrowing the research and policy gaps on mid-stream actors by expanding on the scarce literature on market participation among retailers in the agrifood sector through better understanding of their purchasing behaviour. Furthermore, empirical studies on marketing of edible insects are scanty, especially on purchasing behaviour and marketing relations of retailers. To the best of our knowledge, this is the first study on edible insects that rigorously investigates retailers' purchasing behaviour and relational contract.

2. Grasshopper markets in Uganda

The consumption of edible insects has been promoted to address malnutrition in many developing countries including Uganda (van Huis, 2019). In Uganda, grasshoppers are the most consumed edible insects (Odongo et al., 2018). Other insects such as termites, white and black ants, lakeflies are also consumed but in smaller quantities. Grasshoppers are seasonal and collected from the wild. Unlike other insect species, grasshoppers are traded in two seasons: April-June and November-December.

The grasshopper market attracts many participants including collectors, wholesalers, transporters and retailers that make grasshoppers more accessible to urban consumers in either processed or non-processed forms (Odongo et al., 2018). Grasshopper trading is more concentrated in the central part of Uganda. Masaka District, peri-urban communities in Kampala District and other parts of western Uganda are the major sources of grasshoppers in Kampala District. Wholesalers purchase unplucked grasshoppers directly from collectors in Masaka District and other parts of western Uganda, and transport them to Kampala District, which serves as a central trading hub of grasshoppers in Uganda. Unplucked grasshoppers refer to the raw grasshoppers with legs, wings and antennae. Most grasshoppers that land in central Uganda are sent to Katwe Market, which is a wholesale hub. All the other major retail grasshopper markets such as Busega, Ndeeba, Kalerwe, Kibuye, Kamwokya, Nateete, Nakasero, Usafi, and Old Taxi Park rely on Katwe Market for their supplies. Besides

grasshoppers, other food items like vegetable, fruits and potatoes are sold in these markets. Unplucked grasshoppers are the main form of grasshopper products traded by wholesalers in Katwe Market. There are also some traders in Katwe Market who sell value-added grasshoppers such as plucked and fried grasshoppers to retailers and consumers. Plucked grasshoppers refer to grasshoppers with wings, legs and antennae being removed. Retailers purchase grasshoppers, which can be either unplucked or plucked or fried from wholesalers and transport them to their various markets to sell to consumers. However, the common practice is that most retailers purchase unplucked grasshoppers from wholesalers. These retailers can decide to sell the raw grasshoppers or process them into plucked, fried or dried. Prices of the different grasshopper products in these markets are mainly determined by the supply raw grasshoppers since grasshoppers are seasonal with unstable supply.

3. Methodology

3.1. Conceptual framework

Figure 1 presents a conceptual framework that shows factors that affect purchasing behaviour and relational contract of retailers. Retailers' purchasing behaviour relates to their choices of suppliers, product types, and quantities of products purchased. These economic decisions are important for retailers to remain competitive and to be profiTablein the market (Jones, Raper, Whipple, Mollenkopf, & Peterson, 2007). We apply three theories, namely the transaction cost theory, buyer-seller matching model and the theory of relational contract to guide the empirical analysis. We use the transaction cost theory to explain the purchasing behaviour of retailers whereas buyer-seller matching model and the theory of relational contract are applied to gain insight into the formation of relational contract.

Transaction cost theory states that firms economise on costs by selecting a form of governance that minimises production and transaction costs (Williamson, 1979). Governance refers to the formal and informal rules of market exchange (Williamson, 1979). Governance structures may include procurement strategies such as spot market transaction and forward purchasing mechanisms (Abdulai & Birachi, 2009; Jones et al., 2007; Mishra, Kumar, Joshi, & D'Souza, 2018).

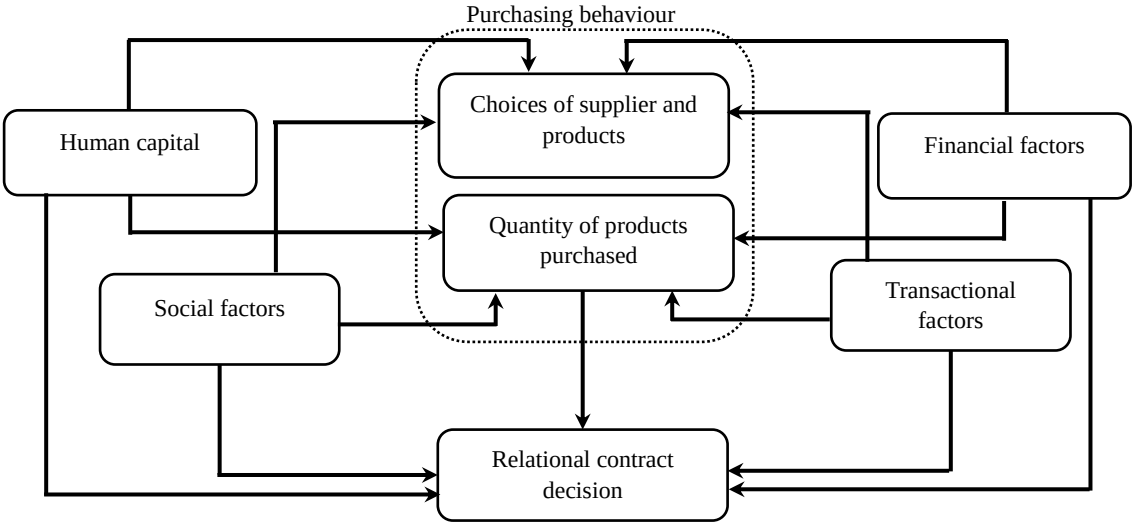

Figure 1: Conceptual framework for purchasing behaviour and relational contract decision of retailers. Source: Authors' design (2021)

Spot market transaction is a common procurement strategy used by many market participants in the traditional agrifood sector (Abdulai & Birachi, 2009; Barrett et al., 2012). This procurement strategy involves buyers purchasing the commodity in a predefined, general quality category on the spot market, immediately take possession in exchange for cash, and

have no or limited direct relationship with the supplier (Jones et al., 2007). Jones et al. (2007) highlight that the spot market is commonly used for a number of reasons: 1) it is a simple strategy, 2) it minimises inventory costs, because no storage may be required especially if the purchase is well coordinated with production needs, 3) it is useful tool in markets with sTableprice and supply of commodity. However, this strategy is associated with high risk in unfavourable market conditions such as price uncertainty and unsTablesupply; hence, buyers may be unable to purchase the volume of commodity required to meet their customers' needs (Jones et al., 2007; Meemken & Bellemare, 2020; Ruml & Qaim, 2020).

In the spot market, buyers need to make important decisions on choices of suppliers, products, and the quantities of products to procure. As shown in Figure 1, we conceptualise that retailers' purchasing behaviour is influenced by a set of factors, namely transactional, financial, social and human capital. Transactional factors are conceptualised as direct facilitators of market transactions (Donkor, Onakuse, Bogue, & De los Rios-Carmenado, 2018). Transactional factors captured in this study include record keeping, access to market information, transport costs, ownership of transport assets, processing information, storage constraint, output and input prices. The selection of these variables are based on the existing literature on market participation and the transaction cost theory (Barrett, 2008; Donkor et al., 2018; Fischer & Qaim, 2012; Kihiu & Amuakwa-Mensah, 2020; Mather, Boughton, & Jayne, 2013; Montalbano et al., 2018). The transaction cost theory suggests that transaction costs are a key determinant of purchasing behaviour of an economic agent like retailers. For instance, suppliers and product types associated with higher transaction costs such as transport costs are less preferred by buyers, since high transport costs reduce their purchasing power and profit margins. Other transactional factors such as record keeping, market information, and processing information facilitate retailers' decision-making process on the choice of suppliers, products and quantity purchased. Financial factors entail economic resources that can be invested in economic activities before being used for consumption (Carney, 1998). Financial factors such as annual income and access to credit strengthen the capital base of the retailers to purchase appropriate products from preferred suppliers and increase the quantities of products purchased. Social factors represent interactions, connections and relationships between individuals and communities (Carney, 1998). They include membership in association. Through membership in an association, members receive relevant information on suppliers, market conditions and prices, and financial support. These benefits allow retailers to make better choices on suppliers, product types and quantity purchased. Human capital encompasses, aptitudes, knowledge, work capacities and health that allow individuals to perform different strategies to meet their livelihoods objectives (Barrera-Mosquera, de los Rios-Carmenado, Cruz-Collaguazo, & Coronel-Becerra, 2010). These include location, age, gender, education, experience, and labour constraint. For instance, retailers in urban areas may be exposed to support services which enable them to develop their business skills.

Buyers can minimise risks of spot market transactions by using forward purchasing strategies such as forward buys and forward contracts (Grosh, 1994; Jones et al., 2007; Ruml & Qaim, 2020). Forward buys entail purchasing and taking possession of a commodity in advance of production needs when spot market prices are favourable (Jones et al., 2007). With this strategy, buyers establish a per-unit commodity price, set final good prices and captures desired profit margins (Jones et al., 2007). In forward contract, buyers establish a contractual agreement with suppliers, encompassing a specification of the delivery period, the quantity and quality to be delivered, place of delivery and price (Barrett et al., 2012; Grosh, 1994). Forward contracts are common in emerging modern agrifood chains in Africa (Barrett et al., 2012; Meemken & Bellemare, 2020). However, in traditional agrifood chains, relational contracts are common (Tadesse & Shively, 2013). Relational contracts are an informal forward contract, in the sense that they are based on repeated transactions, there is no documentation or legal enforcement in breaching the agreement (Baker et al., 2002; Brown et al., 2004). Relational

contracts are not enforced by a third-party (court), but they are self-enforcing through trust and close relationship (Baker et al., 2002; Brown et al., 2004). Once the trust is broken, it reneges the relational contract (Baker et al., 2002).

In this study, we focus on relational contract because the grasshopper value chain is an emerging traditional food chain, where formal forward contracts are barely used. We explain relational contract decisions of retailers using the buyer-seller matching model developed by Tadesse and Shively (2013). The buyer-seller matching model states that the emergence and persistence of a relational contract in small businesses and rural markets is governed by economic and social factors (Tadesse & Shively, 2013). However, the relational contract theory emphasizes strongly on the roles of social factors such as trust and close relationship in the formation and sustaining of relational contracts (Baker et al., 2002). Economic agents make calculated decisions on performing favours, making and sustaining business relationships with anticipated potential future benefits of such decisions (Tadesse & Shively, 2013). Based on the buyer-seller matching model, we conceptualise that sellers and buyers in the grasshopper markets are not randomly matched, rather they operate within a social environment where trust is developed to establish a long-term business relationship (Tadesse & Shively, 2013). We expect retailers to purchase from those they know best presuming that the seller has social obligation and business incentive to behave fairly, even if the trader has limited information (Tadesse & Shively, 2013). In this regard, retailers can repeatedly transact with the same suppliers as a strategy to reduce the costs of searching for information on buyers and obtain required quantities of products to meet their consumer demands (Tadesse & Shively, 2013). As postulated by relational contract and buyer-seller matching model, transactional factors and social factors are key determinants of retailers' relational contract decision. We further explore how other factors such as financial factors and human capital affect retailers' relational contract decision. The social factors incorporated in the relational contract model are membership of association, trust, close relationship and number of suppliers that retailers purchased products from. Retailers who have close relationship and trust their suppliers are more likely to establish relational contract with them.

Lastly, the conceptual framework postulates a nexus between demand for grasshopper products and relational contract (Figure 1). This relationship demonstrates that retailers enter into a relational contract with suppliers to increase the quantity purchased, particularly for grasshoppers, which are highly seasonal with unsTablesupply.

3.2. Empirical model

Based on the conceptual framework, we estimate the empirical model in three steps as shown in Figure 2. First, we analyse simultaneously retailers' decision of the choices of suppliers and products purchased using a bivariate Probit model. Next, we apply Tobit regression model to evaluate retailers' decision on the quantities of grasshopper products purchased from suppliers. Lastly, we use a Probit model to analyse the link between retailers' demand for grassshoper products and relational contract decision. These estimation steps are explained in details in the subsequent sections.

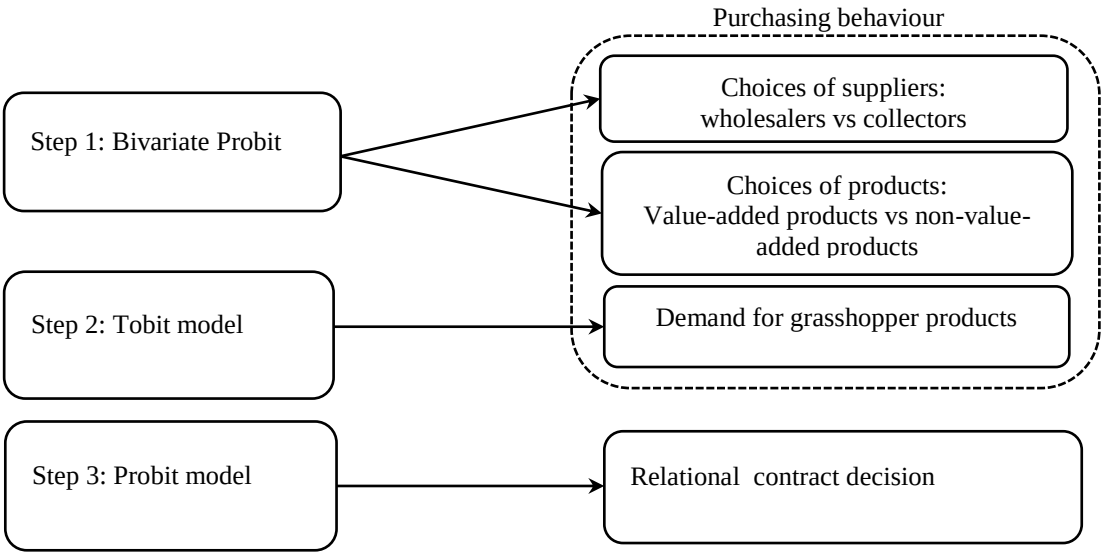

Figure 2: Analytical framework. Source: Authors' design (2020)

3.2.1. Retailers' purchasing behaviour models

Based on transaction cost theory, we conceptualise that retailers decide on the choice of suppliers or where to purchase grasshoppers by evaluating transaction costs associated with purchasing from different suppliers, i.e. in our case wholesalers and collectors. Wholesalers are located close to the markets, where retailers vend their grasshoppers whereas collectors are situated in rural and peri-urban areas, where grasshoppers are harvested. We expect retailers to purchase from wholesalers if the associated transaction costs are less than that of procuring from collectors. This conceptualisation implies that the retailers face a binary choice problem, whether to procure from a wholesaler or collector. Besides the binary choice of suppliers, the retailers faces another choice problem of products to purchase, value-added or non-value-added grasshoppers. The choice of suppliers is directly determined by choice of product to be purchased Wholesalers supply both value-added (plucked and fried) and non-value-added (unplucked) grasshoppers, whereas collectors only supply non-value-added grasshoppers. Therefore, retailers who want to purchase value-added products can only get them from wholesalers. Retailers jointly make the decision on the choices of suppliers and products. This joint decision problem is evaluated in the literature using a bivariate Probit model (Filippini, Greene, Kumar, & Martinez-Cruz, 2018). Following Filippini et al. (2018), we specify the bivariate Probit model as:

$$y_{1i}^{*} = \varpi_1 x_{1i} + \varepsilon_{1i}, \quad y_{1i} = 1 \text{ if } y_{1i}^{*} > 0, \quad y_{1i} = 0 \text{ otherwise} \tag{1}$$

$$y_{2i}^{*} = \varpi_2 x_{2i} + \varepsilon_{2i}, \quad y_{2i} = 1 \text{ if } y_{2i}^{*} > 0, \quad y_{2i} = 0 \text{ otherwise} \tag{2}$$

$$(\varepsilon_{1i}, \varepsilon_{2i}) \sim \Phi_2[(0,0),(1,1,),\rho], \quad -1 < \rho < 1$$

where y_{1i}^{*} and y_{2i}^{*} are latent dependent variables related to the *i*th retailer, which are observable via the binary variables y_{1i} and y_{2i} . y_{1i} represents retailers' choice of suppliers (1 if the retailer purchases grasshoppers from wholesalers and 0 otherwise). y_{2i} denotes retailers' choice of product (1 if the retailer purchases value-added grasshoppers and 0 otherwise). ϖ_1 and ϖ_2 are the parameters to be estimated. ε_{1i} and ε_{2i} are the error terms which are assumed to be jointly normally distributed with zero means, unit variance and correlation ρ. Φ_2 is a bivariate standard normal distribution with correlation ρ (Filippini et al., 2018). If ρ is statistically and significantly different from zero, it shows the existence of correlation between the two choices as the

unobserved parts associated with y_{1i}^{*} and y_{2i}^{*} are dependent (Greene, 2008; Masiero & Zoltan, 2013). x_{1i} and x_{1i} represent vectors of explanatory variables, which are categorised in this paper as transactional factors (market information, transport asset, transport cost, record keeping, storage constraint, information on processing of grasshoppers), human capital (district dummy, age, gender, experience), financial factors (access to credit, annual income) and social factors (association membership).

The next step is to analyse retailers' decision on the quantities of the different grasshopper products purchased from the suppliers. We postulate that quantities of different grasshopper products purchased by retailers are a function of the buying prices and selling prices of the product forms. The buying prices represent the prices retailers purchased grasshoppers at from suppliers whereas selling prices are the prices that retailers obtain when selling products to consumers. Grasshopper products purchased are regarded as inputs from the perspective of the retailers, who are intermediary between collectors and final consumers. The transaction cost theory argues that input and ouput prices are not the only determinants of market exchange but additionally transaction costs play an important role (North, 2005; Williamson, 1975). Mathematically, we express the retailers' demand of different grasshopper products (D_k) as a function of buying prices (P_b), selling prices (P_s) and associated transaction costs (T_c) as well as other factors such as human capital (H_k), financial factors (F_k), and social factors (S_k):

$$D_k = f(Pb_k, Ps_k, Tc_k, H_k, F_k, S_k),\ k = 1,\ 2 \tag{4}$$

where k denotes the different grasshopper products: non-value-added and value-added grasshoppers. The quantities of the different products purchased are censored, that is, they contain many zero observations. Hence, we apply a Tobit regression model to separately determine retailers decision on the quantities of non-value-added and value-added grasshoppers purchased. The empirical model is specified in a reduced form as:

$$D_k = \eta_k + \lambda_k Pc_{ik} + \varphi_{ik} Ps_k + \psi_k Tc_{ik} + \gamma_k H_{ik} + \tau_k F_{ik} + \phi_k S_{ik} + \xi_{ik},\ k = 1,\ 2 \tag{5}$$

The parameters ($\eta_k, \lambda_k, \varphi_{ik}, \psi_k, \gamma_k, \tau_k, \phi_k$) in the model are estimated using the maximum likelihood estimation approach. The dependent variables (quantities of the different grasshopper products), selling prices, buying prices, transport costs and annual incomes are transformed into inverse hyperbolic sine (asinh) because the dependent variables and their respective buying and selling prices contain zero observations. Unlike natural logarithm transformation, inverse hyperbolic sine transformation retains zero observations (Bellemare & Wichman, 2019).

3.2.2. Relational contract model

The last step of the estimation is to analyse the nexus between retailers` purchasing decision and relational contract. Based on the theory of relational contract and buyer-seller matching model, we express retailers' relational contract decision (RC_i^{*}) as a function of transactional factors (including demand for grasshopper products purchased), social factors, financial factors, and human capital, which is specified using a binary Probit model as:

$$RC_i^{*} = \pi + \varpi D_{1i} + \varphi D_{2i} + \Omega X_i + \zeta_i \tag{9}$$

where the relational contract decision (RC_i^{*}) indicates 1 if the retailer establishes an oral agreement with the supplier and 0 otherwise. π and ϖ denote the parameters to be estimated. X_i denotes the explanatory variables. D_1 and D_2 denote the quantities of grasshopper products

purchased. The quantities of grasshopper products (D_1, D_2) are endogenised in the relational contract model. This may create a correlation between the errors in models (5) and (6), thereby leading to endogeneity problem. An endogeneity test of D_1 and D_2 is performed using Durbin-Wu Hausman (DWH) test. If the test shows that D_1 and D_2 are indeed endogenous, then we correct it using the control function approach. The social factors in the relational contract model include close relationship with suppliers, trusting of suppliers in terms of quantity, quality and price charges, and number of suppliers that retailers purchased from.

3.3. Survey design and data

Cross-sectional data was collected from randomly selected grasshopper retail business owners in Kampala and Masaka Districts in Central Uganda during the grasshopper major season in December 2019. A multistage cluster sampling technique was employed in the study. First, Kampala and Masaka districts in Central Uganda were purposively chosen because they are well known for trading large volumes of grasshoppers. Second, ten major markets (Busega, Katwe, Old Taxi Park, Ndeeba, Kawerle, Nateete, Kamwokya, Kibuye, Nakasero, and Usafi) known for grasshopper trading were selected from Kampala District and two markets (Nyendo and Masaka Central) from Masaka District. The lists of the traders in these markets were not available; hence, a sampling frame of 1250 retailers was generated (see Table1A in the appendix). Five hundred retailers were randomly selected from the sampling frame. The sample size comprised 343 retailers from Kampala District and 157 from Masaka district. A structured digital survey questionnaire was designed using KoboTool Box to collect relevant information from grasshopper retailers in the selected districts in Central Uganda.

Table 1 presents summary statistics of the variables included in the models. We find that most of the retailers purchase unplucked grasshoppers from wholesalers. The mean quantity of non-value-added grasshoppers (unplucked) is 628kg/week (Table 1). On average, the retailers purchase 100kg of value-added grashoppers per week, which are either plucked or fried. Most retailers procure grasshoppers through spot market transactions; formal contracts are not existent in the grasshopper market (Table 1). This observation is consistent with the literature that most agri-food markets are characterised by spot market transactions (Barrett et al., 2012; Tadesse & Shively, 2013). Only a few (21.4%) of the retailers have established a relational contract with their suppliers as a procurement strategy. In the relational contract, retailers verbally agree with suppliers on the price and quantity of products to be purchased (Table 1). As part of the contract, retailers can purchase grasshoppers from suppliers on credit and pay after selling them. Such agreements are not documented and cannot be enforced by a third party (court) if they are breached (Baker et al., 2002).

More than half of traders are members of association. Sixty seven percent of the retailers have established a close relationship with their suppliers whereas more than two-thirds of the traders trust their suppliers in terms of product price, quantity and quality. About one-third of the retailers purchase grasshoppers from less than 6 suppliers, one-third buy from 6-10 suppliers, and less than one-third purchase from more than 10 suppliers during the season. More than half of the retailers are located in Kampala district, which is an urban area. Table 1 shows that educated female youth dominate the grasshopper retail business. Less than half of the retailers reported that high cost of labour and poor working condition constrain their business growth. Twenty six percent of the retailers access credit for their grasshopper business. The mean annual income generated from non-grasshopper business is 366,538 Ugx (US $100). Less than half of the retailers keep records of their business activities. Few retailers own transport assets such as motorbike or vehicle and spend 17,642 Ugx (US $5 per week) on transporting grasshoppers from purchasing to selling point. Access to information on processing of grasshoppers is low among the retailers. Less than half of the traders indicate that lack of storage facility impedes their business growth. The buying price of value-added grasshoppers per kg is two times higher than the cost of non-value-added grasshoppers. Similarly, the average selling

price per kg for value-added grasshopper is about three times greater than the selling price of non-value-added grasshoppers.

Table 1. Descriptive statistics of the variables included in the models

Variables	Description	Mean	Standard deviation
Dependent variables			
Choice of suppliers	1 = wholesalers and 0 = collectors	0.84	0.37
Choice of products	1= value-added and 0 = non-value-added grasshoppers	0.23	0.44
Demand for value-added grasshoppers	Quantity of value-added grasshoppers (plucked and fried) purchased (kg/week)	100	163
Demand for non-value-added grasshoppers	Quantity of non-value-added grasshoppers (unplucked) purchased (kg/week)	628	1817
Relational contract	1 = oral contract with suppliers	0.21	0.41
Nature of relational contract	1= Price of the product to be purchased	0.83	0.38
	1 =Quantity of to be purchased	0.49	0.50
	1=Purchase grasshoppers on credit	0.43	0.50
Explanatory variables			
Human capital			
District	1 = Kampala district	0.69	0.47
Age	Age of retailers in years	33	10
Gender	1= female retailers	0.59	0.49
Education	Number of years of formal education	8	3
Experience	Experience in trading of grasshoppers in years	7	6
Labour constraint	1 if high cost of labour is a constraint to business growth	0.36	0.48
Poor working environment	1=poor working conditions	0.43	0.50
Financial factors			
Credit access	1= access to credit	0.26	0.44
Annual income	Annual income generated from other businesses (Ugx)	366538	745912
Social factors			
Association	1 = membership of association	0.59	0.49
Close relationship with suppliers	1=close relationship with suppliers	0.67	0.47
Trust with product quantity	1=trust suppliers with quantity of product supplied	0.80	0.40
Trust with product quality	1= trust suppliers with product quality	0.74	0.44
Trust with product price	1=trust suppliers with product price	0.78	0.41
Number of suppliers purchased from	1 = less than 6 suppliers	0.36	0.48
	1=6-10 suppliers	0.37	0.48
	1= more than 10 suppliers	0.26	0.44
Transactional factors			

Record keeping	1=record keeping of business activities and	0.39	0.49
Market price information	1= access to information on market prices	0.74	0.44
Transport asset	1=ownership of transport assets such as motorbike or vehicle	0.11	0.32
Transport cost	Cost of traveling to purchasing point and transporting grasshoppers from purchasing point to the selling point	17642	22744
Processing information	1=access to processing information	0.19	0.39
Storage constraint	1=lack of storage facility	0.28	0.45
Buying price of non-value added grasshoppers	Ugx/kg	6166	2398
Buying price of value-added grasshoppers	Ugx/kg	15514	4741
Selling price of non-value-added grasshoppers	Ugx/kg	7503	2156
Selling price of value-added grasshoppers	Ugx/kg	25172	10782

Note: 1USD = 3669 Ugx as at 20th December 2019. Ugx refers to Ugandan Shillings (Ugandan currrency). Source: Authors' computations (2021)

4. Econometric Results

4.1. Determinants of retailers choice of suppliers and grasshopper products

Empirical results of the bivariate Probit model for retailers' choices of suppliers and grasshopper products are presented in Table 2. The mean variance inflation factors (VIF) for the two models are less than the threshold of 10, suggesting that multicollinearity is not a problem in the models. The chi-square from the Breusch Pagan test shows statistical significance ($p > 0.01$) for both models, indicating the presence of heteroskedasticity in the models. This was rectified by estimating the standard errors with the robust estimation approach. The positive signficant correlation term (ρ_{12}) shows that retailers' choices of suppliers and grasshopper products are positively correlated. This confirms that the choice of suppliers is determined by choice of product. The chi-square value from the Wald test of $\rho_{12} = 0$ is statistically significant ($p > 0.05$) (Table2), showing that the application of bivariate Probit model is appropriate. The Wald chi-square value is statistically significant ($p > 0.01$), indicating that explanatory variables jointly determine retailers' choices of suppliers and grasshopper products.

Retailers in Kampala district are more likely to purchase value-added grasshoppers from wholesalers compared to those in Masaka district. Grasshoppers are harvested by collectors in the rural district (Masaka) and transport them to the urban centre (Kampala) by wholesalers. Hence, retailers in rural district purchase raw grasshopers directly from collectors whereas those in the urban centre buy grasshoppers, particularly value-added grasshoppers (plucked or fried) from wholesalers. An increase in retailers' age decreases their probability to purchase value-added grasshopper products.

Female retailers are less likely to purchase value-added grasshoppers compared to their male counterparts. Women play an active role in grasshopper value addition; hence, they would prefer to purchase non-value-added products and perform the value addition themselves instead of buying value-added product. Table2 further shows that an increase in the number of years of formal education decreases retailers' probability to purchase from wholesalers. An increase in retailers' experience in grasshopper trading decreases their probability of purchasing from

wholesalers and buying value-added grasshoppers. "Education and experience are measures of human capital accumulation or learning over time through interactions in the market" (Abdulai & Birachi, 2009). We observe that experienced or educated retailers are knowledgeable on the market dynamics; hence, prefer to buy non-value-added grasshoppers directly from collectors.

Table 2. Bivariate Probit estimates of retailers' choices of suppliers and products

Variables	Choice of suppliers		Choice of products	
	Coeff	SE	Coeff	SE
Human capital				
Kampala	1.32***	0.18	0.54***	0.17
Age	-0.01	0.01	-0.02*	0.01
Gender	0.05	0.16	-0.30*	0.16
Education	-0.05**	0.03	-0.01	0.02
Experience	-0.04***	0.01	-0.04**	0.02
Financial factors				
Credit	0.20	0.20	-0.03	0.17
Asinh (Annual income)	0.03	0.02	0.03	0.03
Social factor				
Association	-0.06	0.16	-0.04	0.15
Transactional factors				
Record keeping	0.21	0.17	-0.26*	0.15
Market price information	-0.35*	0.20	-0.45***	0.16
Transport asset	-0.38	0.26	-0.55**	0.25
Asinh(Transport cost)	0.04**	0.02	0.0001	0.02
Storage constraint			-0.27	0.17
Processing information			0.37**	0.18
Constant	0.80*	0.44	-0.15	0.44
Diagnostic statistics				
Variance inflation factor (VIF)	1.19		1.18	
Breusch pagan test of heteroskedascity	68.90***		12.75***	
Wald chi-square	130.28***			
Rho	0.29**	0.13		
Wald test of Rho = 0	4.55**			

Note: *, **, *** denote 10%, 5%, and 1% statistical significance, respectively. Asinh denotes inverse hyperbolic sine transformation. Source: Authors' computations (2021)

Retailers who keep record of their business activities are less likely to purchase value-added grasshoppers. We find that retailers with access to information on prices are unlikely to purchase grasshoppers from wholesalers, and they are also less likely to buy value-added grasshoppers. Market information enables retailers to compare market prices associated with different suppliers. Buying prices are higher for value-added grasshoppers especially if purchased from wholesalers; hence, retailers with knowledge on market prices tend to purchase non-value-added grasshoppers from collectors, which are cheaper. Ownership of transport asset increases retailers probabality to purchase value-added grasshoppers. Retailers with transport assets, notably motorbikes and vehicle can easily travel to rural areas to purchase non-value-added grasshoppers directly from collectors compared to those without transport asset. The results also show that an increase in transport cost increases retailers' probability of purchasing grasshoppers from wholesalers (Table 2). High transport cost increases retailers' transaction costs and reduces their profit margin. Hence, they prefer to minimise transport cost by purchasing grasshoppers from wholesalers who are close to them. Furthermore, access to information on processing of grasshoppers increases retailers' probability to buy value-added

grasshoppers. Retailers with knowledge on processing of grasshoppers are well informed on the benefits of selling value-added products, which stimulate them to purchase the products.

4.2. Determinants of retailers' demand for grasshopper products

In Table 3, we present the Tobit estimates of retailers' demand for value-added and non-value-added grasshoppers. The mean VIF shows that multicollinearity is not a problem in the models. The Breusch Pagan test shows the presence of heteroskedascity in the model; hence, we computed the standard errors with the robust estimation approach. The F-statistics are statistically significant ($p > 0.01$) for all the models, indicating that the explanatory variables jointly affect retailers' demand for value and non-value-added grasshoppers (Table 3).

Table 3. Tobit estimates of retailers' demand for grasshopper products

Variable	Demand for value-added products	Demand for non-value-added products
	Coefficient	Coeficient
Human capital		
Kampala	-0.69*(0.40)	-0.36**(0.15)
Age	0.05***(0.02)	0.01(0.01)
Gender	0.30(0.32)	-0.19(0.14)
Education	-0.001(0.05)	0.001(0.02)
Experience	-0.10***(0.03)	0.01(0.01)
Financial factors		
Credit	-0.22(0.29)	0.02(0.13)
Asinh (Annual income)	-0.07**(0.03)	0.04**(0.02)
Social factors		
Association	0.08(0.25)	0.36***(0.12)
Transactional factors		
Asinh (Buying price of non-value-added products)	-0.24**(0.10)	0.71***(0.08)
Asinh (Buying price of value-added products)	1.70***(0.50)	-0.19***(0.07)
Asinh (Selling price value-added products)	-0.88**(0.42)	0.06***(0.02)
Asinh (Selling price non-value-added products)	0.07(0.07)	0.05**(0.02)
Market price information	-0.14(0.22)	-0.35***(0.13)
Record keeping	0.97***(0.31)	0.09(0.12)
Transport asset	-0.37(0.55)	0.80***(0.17)
Asinh (Transport cost)	0.08***(0.02)	0.0001(0.01)
Storage constraint	-0.67**(0.26)	-0.14(0.12)
Processing information	-0.51*(0.29)	0.12(0.12)
Constant	-3.43*(1.89)	-1.46*(0.86)
Diagnostic statistics		
Variance inflation factor (VIF)	2.37	2.37
Breusch pagan test	660.10***	19.96***
F-statistics	41.61***	110.69***
Pseudo R^2	0.72	0.48
Observation	500	500

Note: Asinh denotes inverse hyperbolic sine transformation. *, **, and *** denote 10%, 5% and 1% statistical significance, respectively. SE denotes standard errors. Source: Authors' computations (2021)

Retailers in Kampala have a lower demand for value-added and non-value added products than those in Masaka (Table 3). Retailers in Masaka district are closer to suppliers, particularly collectors than those in Kampala district, suggesting that they spend less transport cost and purchase grasshoppers at lower price. As retailers' advances in age, their demand for value-added grasshoppers tend to decline whereas increasing retailers' experience in trading of grasshopers decreases their demand for value-added grasshoppers (Table 3). Our result shows that retailers with higher annual income tend to purchase less value-added grasshoppers but buy more non-value-added grasshoppers. Members of association show higher demand for non-value-added grasshoppers compared to non-members of association. Members in association can easily share information on sources of suppliers, notably collectors, where prices can be lower. Table 3 results show that an increase in buying price of non-value-added grasshoppers decreases demand for value-added grasshoppers, but it increases demand for non-value-added grasshoppers. We also observe that an increase in buying price of value-added grasshoppers stimulates higher demand for value-added; however, it decreases demand for non-value-added grasshoppers. As selling price of value-added grasshoppers increases, there is a corresponding decline in demand for the product, whereas a similar increase tends to increase demand for non-value-added grasshoppers. An increase in selling price of non-value-added grasshoppers increases demand for the product.

The significant negative effects of buying prices on demand for the grasshopper products and the significant positive effect of selling price of non-value-added products are consistent with our expectation and the classical theory of demand. The classical theory of demand establishes a negative relationship between input prices and demand, and a positive relationship between output price and input demand (Machlup, 1957). However, the positive relationship between buying price of value-added grasshoppers and demand for the product; the positive effect of buying price of non-value-added grasshoppers on the products' demand as well as the negative nexus between selling price of value-added grasshoppers and the products' demand are contrary to our expection and theory. The explanation to this striking evidence is that since there is a high market demand for the grasshopper products, retailers can purchase more of the products even if the buying price increases. Retailers can easily transfer the increment in buying prices to the final consumers. Furthermore, increasing selling price of value-added grasshoppers would incentivise retailers to purchase more of non-value-added grasshoppers, which are less expensive and perform the value addition themselves. In this case, they can have control over the cost associated with value addition. They can minimise the cost of value addition to take an advantage of the high selling price of value-added products. However, if they purchase value-added products from wholesalers, they inherently pay the cost of value addition as part of the product cost, which they barely have control over.

Retailers' access to market price information decreases their demand for non-value-added grasshoppers. Record keeping and ownership of transport asset increases retailers' demand for value-added and non-value added grasshoppers, respectively. Retailers with transport assets can easily travel to suppliers' location and purchase non-value-added grasshoppers. Unexpectedly, transport cost positively influences demand for value-added grasshoppers. Wholesalers who usually sell value-added grasshoppers are close to retailers, especially for those in Kampala, and pay lower transport cost. Hence, an increase in transport cost may have a little effect on their profit margins, in particularly if they purchase in bulk. We find that a storage constraint and access to information on processing of raw grasshoppers decreases retailers' demand for value-added grasshoppers.

4.3. Determinants of retailers' relational contract decision

Results of Probit estimates of determinants of retailers' relational contract decision are presented in Table 4. We validated the endogeneity of quantities of grasshopper products purchased in the oral contract model (Model 1). Durbin chi-square and Wu-Hausman F statistics

are statistically insignificant (even at p > 0.10), leading to a conclusion that the quantity variables are exogenous in the oral contract model.

Table 4. Probit estimates of retailers' relational contract decision

Variables	Model 1		Model 2	
	Coeff	SE	Coeff	SE
Human capital				
District	-0.50**	0.21	-0.47**	0.21
Age	-0.01	0.01	-0.003	0.01
Gender	0.18	0.19	0.18	0.19
Education	0.03	0.02	0.03	0.02
Experience	-0.0002	0.02	0.0004	0.02
Financial factors				
Credit	0.40**	0.18	0.38**	0.17
Asinh (Annual income)	0.003	0.03	-0.01	0.02
Social factors				
Association	-0.002	0.17	-0.01	0.17
Close relationship	0.92***	0.23	0.86***	0.22
Trust price	0.75**	0.31	0.78**	0.32
Trust quality	0.90***	0.28	0.99***	0.29
Trust quantity	1.42***	0.43	1.35***	0.43
6-10 suppliers	-0.63***	0.19	-0.61***	0.18
More than 10 suppliers	-0.94***	0.22	-1.00***	0.22
Transactional factors				
Asinh (Demand for value-added product)	0.08	0.07	0.14***	0.06
Asinh (Demand for non-value-added product)	0.19	0.12	0.21***	0.08
Asinh (Buying price of non-value-added product)	0.11	0.07		
Asinh (Buying price of value-added product)	0.06	0.05		
Asinh (Selling price of value-added)	0.02	0.03		
Asinh (Selling price non-value-added)	0.02	0.03		
Record keeping	-0.14	0.17	-0.12	0.16
Market price information	0.01	0.18	0.05	0.18
Transport asset	0.92***	0.25	0.88***	0.25
Asinh(Transport cost)	0.0002	0.02	-0.003	0.02
Constant	-5.65***	1.14	-4.78***	0.92
Diagnostic statistics				
DWH test of endogeneity:				
Durbin (score) chi-square (2)	3.77			
Wu-Hausman F (2, 461)	1.80			
Variance inflation factor (VIF)	3.13		1.52	
Wald chi-square test of price coefficients jointly equal to zero	4.34			
Breusch Pagan test	81.79***		90.30***	
Wald chi-square	90.38***		92.96***	
Pseudo R-square	0.34		0.34	
Log pseudolikelihood	-164.64		-169.79	
Observation	500		500	

Note: Asinh denotes inverse hyperbolic sine transformation. *, **, and *** denote 10%, 5% and 1% statistical significance, respectively. Coeff and SE denote coefficients and standard errors, respectively. Source: Authors' computations (2021).

The overall mean VIF (3.3) suggests that multicollinearity was not problematic in the model (Model 1). However, the individual VIF for the price variables, notably the buying prices are higher, indicating that they present possible multicollinearity problem in the model. These price variables are statistically insignificant in the model (Model 1). Hence, they are excluded from the model to rectify the problem of multicolinearity as shown by the mean VIF (1.52) in Model 2. We further performed Wald chi-square test that the coefficients of the price variables are jointly equal to zero. The test shows no statistical significance, which validates the exclusion of the price variables in the oral contract model. Results from Model 2 are discussed in this section. The Wald chi-square value shows statistical significance ($p > 0.01$), suggesting that the explanatory variable jointly affect retailers' relational contract decision.

Empirical findings in Table 4 show that retailers in Kampala are less likely to establish relational contract with their suppliers compared to those in Masaka. Compared to Kampala, Masaka is smaller district, where it is possible that suppliers are relatives or friends of the retailers, making it easier to establish relational contract arrangement. An increase in education enhances retailers' probability to engage in relational contract with suppliers. Educated retailers may have better understanding of the benefits associated with establishing relational contract with suppliers. This result is inconsistent with Abdulai and Birachi (2009) that education had no signficant effect on trader decision to engage in relational contract with suppliers. Access to credit increases probability to engage in relational contract with suppliers. Credit increases retailers' financial capacity to purchase more grasshoppers from suppliers, which can serve as an incentive for suppliers to accept to enter into relational contract with them. This finding is contrary to an evidence by Ma and Abdulai (2016) that farmers with access to credit were less likely to engage in relational contract in China.

Except association membership, all social factors included in the model show significant effects on retailers' decision to engage in relational contract. For instance, retailers who have establised a close relationship with suppliers are more likely to engage in relational contract compared to those with no relationship with suppliers. Also, trust in terms of quantity, quality and price of the products show strong significant positive effects on retailers' decision to engage in relational contract. These findings confirm the theory of relational contract, which strongly postulates social factors such as trust and close relationship as the main determinants of relational contract (Baker et al., 2002; Brown et al., 2004; Fafchamps, 2004; Tadesse & Shively, 2013). Relational contract is not enforced by a third party; hence, establishing trust and close relationship between parties involved are self-enforcing mechanism that will sustain the contract (Brown et al., 2004; Fafchamps, 2004). Trust will renege moral harzards and information assymetric that may arise from any of the party involved in the relational contract (Baker et al., 2002). Our findings also support the evidence on formal contract that trust and transparency are important to sustain formal contracts between market participants (Kanagaretnam, Mestelman, Nainar, & Shehata, 2010; Tu & Bulte, 2010). Economic benefits alone do not encourage farmers to participate in formal contract instead trust and transparency are essential as shown by Ruml and Qaim (2020) in Ghana. These suggests that sufficient trust is a precursor for proper functioning markets (Tu & Bulte, 2010). Retailers who purchased from 6-10 suppliers and more than 10 suppliers have a lower probability to engage in relational contract compared to those who purchased from less than 6 retailers. Purchasing from the same suppliers increases repeated transactions, which also lead to estalishment of close relationship and trust between the parties. This empirical evidence is consistent with an observation by Fafchamps (2004) that firms shows a higher preference to conduct business with the people they know already.

We observed that an increase in retailers' demand for the grasshopper products increases their probability to establish relational contract with suppliers. Grasshoppers are harvested in the wild and seasonal. Therefore, the supply of the products tends to fluctuate during the season. Hence, retailers establish relational contract with suppliers to ensure that they have adequate

quantity and quality of grashoppers to sell in the market. This explanation is supported by Fafchamps (2004) that the key motivation for contract performance is the preservation of "profitable, long-term relationships and maintain sources of supply and demand". This helps the firm to get more goods in the future to meet their customers' demand.

5. Conclusion and policy implications

The paper analyses retailers' purchasing and relational contract decisions using a primary data set of 500 retailers from Central Uganda. Retailers express a higher preference for non-value-added grasshoppers procured from wholesalers. Most retailers procure their grasshoppers through spot market transactions. However, few retailers establish relational contract with suppliers as a procurement strategy to deal with unsTablesupply in the market.

We observe that different sets of factors influence retailers' choices of suppliers and grasshopper products. Retailers' location, transport cost show positive effects on their choice of suppliers whereas education, experience, access to market information exert negative effects. Retailers' choice of products is positively influenced by location, access to processing information but negatively affected by age, gender, experience, record keeping, access to market information, and ownership of transport asset. Demand for value-added grasshoppers respond negatively to buying price of non-value added product and selling price of value-added product and positively to buying of value-added products. However, Demand for non-value added grasshoppers respond positively to buying price of non-value-added grasshoppers, selling prices of value-added and non-value added products, and negatively to buying price of value-added product. We also find that social factors such as trust, close relationship and number of suppliers that retailers positively influence their relational contract decision. This finding reinforces that trust and close relationship are important for the establishment and sustainability of relational contract (Baker et al., 2002; Brown et al., 2004; Tadesse & Shively, 2013). We also find a significant positive relationship between quantity of grasshopper products demanded and decision to engage in relational contract.

The findings have important policy implications on improving purchasing behaviour and relational contract in the grasshopper markets. First, to increase the scale of retailers in the grasshopper business, market policy should target strengthening collective action among retailers, capacity development of retailers on business management practices notably proper record keeping, developing roads linking wholesale and retail markets, supporting retailers with storage containers and sensitization on value addition innovations. Second, relational contract can be developed as a procurement strategy in the grasshopper markets through intensive sensitisation on the benefits of relational contract, supporting retailers with affordable credit as well as retailers developing and maintaining good relationship and trust with their suppliers.

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Appendix A1

Table1A. Sample frame and selection of respondents

Markets	Target population	Selected retailers	Proportion of selected from target population
Kampala District	**857**	**343**	**69**
Busega	180	72	14
Katwe	178	71	14
Old taxi park	125	50	10
Ndeeba	80	32	6
Kalerwe	75	30	6
Nateete	52	21	4
Kamwokya	50	20	4
Kibuye	50	20	4
Nakasero	47	19	4
Usafi	20	8	2
Masaka Districts	**393**	**157**	**31**
Nyendo	285	114	23
Masaka central	108	43	9
Total	**1250**	**500**	**100**

Authors' construction (2020)