Transaction costs and inter-organizational relations between farmers and farm product buyers in Ghana

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Received 6 January 2021
Revised 5 May 2021
21 July 2021
Accepted 25 July 2021

Abstract

Purpose – The purpose of this paper is to provide an understanding of what motivates farmers to participate in inter-organizational relationships with farm product buyers. Interest in inter-organizational relationships in the Ghanaian agri-food sector has been stimulated in recent years by policies seeking to reduce farmers' market risks while improving buyers' access to commodity inputs. The decision of how to sell farm produce is an economic imperative for the farmer; therefore, the coexistence of spot markets and inter-organizational relationships suggests that the farmers who use them must be having some gains from them.

Design/methodology/approach – This study employed binary logit regression using both qualitative and quantitative data and the transactions cost theory to understand the Ghanaian farmers' motivation for participating in inter-organizational relationships.

Findings – This study found that a farmer having better information regarding product buyers' needs was an important motivator for participation. The farmers' certainty about the price they would get and the quantity they would sell were also major factors that motivated farmers' participation. Again, the motivation to engage in inter-organizational relationships with processors was also influenced by the nature of the crop. Fruit farmers, for example, were 3.7 times more likely to participate in these relationships than non-fruit farmers.

Research limitations/implications – This study considered analysis at the farmer level. However, some farmers produced multiple crops. This means that the farmers who participate in inter-organizational relations with buyers for one crop enterprise may be nonparticipant with the other crop(s). Future studies could target analysis at the crop level while accounting for the associated transactions costs.

Originality/value – This study explores how a combination of transaction costs theory and the different crops that farmers produce explains farmers' decision to participate in inter-organizational relationships.

Keywords Inter-organizational relationships, Transaction costs, Human action, Crop enterprises

Paper type Research paper

1. Introduction

Inter-organizational relationships refer to the way firms connect to achieve their individual or mutual objectives. When the participating firms are at different stages in the supply chain, the relationship may be described as a vertical relationship. When the participating firms are at the same stage in the supply chain, then the relationship is described as a horizontal relationship. This study focuses on vertical relationships at the level of farmers and their buyers.

The decision of how to sell farm produce is an economic imperative for the farmer. Farmers sell their products to potential buyers using different methods, from spot market transactions to more enduring relationships. A farmer who chooses to sell by spot market transactions can be described as one who completes production decisions, finds a buyer after

Funding: The research on which this paper is based was funded by the BHEARD program operated by the United States Agency for International Development as part of the Feed the Future initiative and was managed under the CGIAR fund, Award number BFS-G-11-00002, and the predecessor fund the Food Security and Crisis Mitigation II grant, Award number EEM-G-00-04-00013.

Journal of Agribusiness in Developing and Emerging Economies

2044-0839
DOI 10.1108/JADEE-01-2021-0007

harvesting and sells the farm produce at the prevailing market price (Amanor-Boadu and Martin, 1992; Sporleder, 1992; Peterson *et al.*, 2001). The farmer using this spot market is referred to as a nonparticipant in inter-organizational relationships. Contrariwise, a participant in inter-organizational relationships is the farmer who chooses to engage a buyer in a more lasting relationship to sell their farm products.

Interests in inter-organizational relationships have been stimulated in Ghana in recent years by policies seeking to reduce farmers' market risks while improving buyers' access to agricultural products that meet desired quality and availability (MoFA, 2007, 2017). They are premised on the belief that spot market transactions do not favor farmers given the sector's asymmetric information structure. The assumption is that the participatory and negotiated process needed for farmers' relationships could reduce farmers' disadvantage in the sector's asymmetric information situation (Wagner, 2015). The risks of asymmetric information are exacerbated by power imbalance in the market (Amanor-Boadu *et al.*, 2002). Ghanaian farmers' average land holding is about four hectares and agri-food produce buyers often demand high volumes of output from several hundred hectares. This makes most farmers vulnerable in spot market exchanges, supporting the need to enter relationships with produce buyers.

Regardless of the potential for relationships to overcome some of the challenges that spot markets poses to farmers, there is the recognition that – given the situation – such relationships may not be more beneficial than spot markets (Mighell and Jones, 1963; MacDonald *et al.*, 2011). This indicates that farmers must have some gains whether they used inter-organizational relationships or spot markets. Transaction cost theory, thus, offers the opportunity to understand farmers' motivation for participating in inter-organizational relationships in Ghana and to give a basis for policy making (Coase, 1937, 1988; Williamson, 1975).

Spot market transactions have been the traditional method for farmers to sell their products but in recent years, inter-organizational relationships have become part of the gradual shift to the goal of modernized agriculture and a structurally transformed economy in Ghana (NDPC, 2005; MoFA, 2007, 2015, 2017). How policy makers have understood farmers gain from such relationships with buyers has affected how they have addressed it in this paradigm shift. The problem confronting this research is that inter-organizational relationships may not be valued by every farmer and by the transaction cost theory of the firm (Williamson, 1975, 1985); it is plausible to argue that farmers involved in an inter-organizational relationship perceive greater value from participating. In the same token, those with the option to participate and choose not to participate may be perceiving the value emanating from their participation to be lower than their participation costs.

Human action economics is another theory employed to explain the farmers' decision process regarding inter-organizational relationships. This theory asserts that human action is a purposeful behavior (Von Mises, 1966). Three conditions form the basis for an individual's decision to act: state of apprehension which is determined by the individual; the conception of an improved state; and the expectation that the purposeful action will improve his apprehensive state. Farmers' decisions are therefore conscious and based on rational considerations. These rational considerations also encompass transaction costs of resource exchange endeavors they engage in.

The purpose of this paper is to examine the factors that motivate farmers to participate in inter-organizational relationships with buyers given that other farmers choose not to participate. In Ghana, several explanatory factors have been provided (Poku *et al.*, 2018; Abdul-Rahaman and Abdulai, 2019), but the aspect of transactions cost is particularly lacking. The study hypothesizes that reducing transaction cost increases the likelihood of farmers participating in relationships. Additionally, producers of highly perishable crops are more likely, than producers of highly durable crops, to participate in relationships. Understanding the perceptual and other factors leading to participation choices can help both

managers of firms and policy makers nurture appropriate strategies to achieve private and public economic objectives.

This paper is organized into six parts. Section 1 introduces the study. Section 2 provides a review of the literature on inter-organizational relationships. A conceptual framework that forms the basis of the study is presented in Section 3. The methodology is indicated in Section 4. Section 5 discusses the results, while the conclusions of the study with policy implications and limitations are provided in Section 6.

2. Literature review

The literature on inter-organizational relationships indicates a paucity of knowledge regarding empirical exploration of the rationale underlying participation in inter-organizational relationships (Hobbs, 1997; Galizzi and Venturini, 1999; Fisher and Hartmann, 2010). However, theoretical developments have far advanced.

Coase in "the nature of the firm" realized that though neoclassical economics perceive the market to be efficient, there was a lot of economic activity taking place within integrated firms and thus sought to understand the reason behind this phenomenon. He concluded that there must be costs to using the markets that get eliminated by using the firm (Coase, 1937). These costs are now recognized as transactions costs (Williamson, 1985). Coase again in *The Problem of the Social Cost* asserts that any alternative form of economic organization which can reach similar results at a lower cost compared to using the market raises the value of production (Coase, 1960). Inter-organizational relationships become an option when markets fail (Williamson, 1973; Fisher, 1997; Fisher and Hartmann, 2010). In agriculture, the seasonal nature coupled with characteristics of farm products may present uncertainties that make the market less efficient. Farmers want to be able to sell their products whenever they are ready and at a price, they deem fit. Buyers of the farmers' produce such as processors, wholesalers and trade associations want the right product available whenever they are needed. The overall importance of inter-organizational relationships in overcoming some of the challenges of the spot market is well recognized. However, given the coexistence of spot market and farmer–buyer relationships, the question of what drives farmers into such relationships is a legitimate one that requires an address in the extant literature.

Farmers' relationships, when considered in light of transaction costs, have the potential to trigger different economic implications for both farmers and buyers of the farmers' produce. Williamson's (1973) seminal work on transactions costs theory presents three related sets of transactional factors: (1) uncertainty – under circumstances of uncertainty, market exchanges are vulnerable to opportunism as a full set of contingent claim markets is infeasible (because of bounded rationality); (2) small numbers – if a large number of traders are equally eligible to supply a particular product, market exchanges would be attractive; the small number of trading partners indicates fewer alternatives for the farmer hence defining a power disparity situation; and (3) information impactedness – this is a form of asymmetric information situation where one agent has more information than the other. It is costly for the disadvantaged agent to seek information parity. This is because the market may be dominated by those who disclose information opportunistically than those who make good faith representations (Williamson, 1973).

Generally, the main focus of Williamson's transactions cost theory is the cost of opportunism and the cost of trying to prevent it. The benefits of economic activity will be improved by reducing these costs (Williamson, 1985). By the transaction cost theory of the firm (Williamson, 1975, 1985), it is plausible to argue that farmers involved in an inter-organizational relationship perceive greater value from participating. In the same token, those with the option to participate and choose not to participate may be perceiving the value emanating from their participation to be lower than their participation costs.

Hobbs (1997) explores the importance of transaction costs as a determinant of coordination in the UK livestock industry. The paper presents three broad classifications of transactions costs: (1) information costs – arise *ex ante* to the transaction and include costs from searching for price, product and trading partner information; (2) negotiation costs – arise during the performance of the transaction and include costs of drawing up the terms of exchange; (3) monitoring or enforcement costs – arise ex post to the transaction and include ensuring that the terms of the transaction such as quality standards are adhered to. Frank and Henderson (1992) in their study of vertical coordination in the US food industries also grouped transactional cost into four general categories as: (1) uncertainty – transactions becomes costly to anticipate all contingencies and therefore methods which reduce uncertainty may be more desirable; (2) concentration – diminishing number of buyers and sellers increases bargaining problems; (3) idiosyncratic investments – firms producing specialized products may prefer nonmarket coordination to avoid quasi rent; and (4) internalization costs – firms will internalize transactions up to the point where market cost of an activity equals the cost of internalization.

In Ghana and Africa at large, most of the work that have been done on inter-organizational relationships pertain to contract farming (e.g., Grosh, 1994; Porter and Phillips-Howard, 1997; Bijman, 2008; Oya, 2012; Poku *et al.*, 2018; Ragasa *et al.*, 2018; Adabe *et al.*, 2019; Dubbert, 2019; Bidzakin *et al.*, 2020). Specific studies in Ghana include those that assess the formal (written) and informal (verbal) contracts (Poku *et al.*, 2018; Abdul-Rahaman and Abdulai, 2019). This study is similar to an earlier investigation by Abdul-Rahaman and Abdulai (2019). They examined factors influencing rice farmers' decisions to participate in a written contract, verbal contract and spot market in output transactions. Their explanatory factors used were farmers' socioeconomic characteristics, access to credit, distance to market, the type of buyer and the location of the farm. This study, thus, departs from their study and expands the literature, in the field, in two ways. First, we employ a dependent variable that is dichotomous and examines farmers who participate in relationships to sell their farm products and those who use the spot markets. Second, the explanatory factors are transaction costs and the farmers' crop enterprise.

Some studies suggest that there are tradeoffs between the spot market and inter-organizational relationships. For example, Lajili (1995) in their work based on synthesized literature identified spot markets to have disadvantages such as quantity and quality uncertainties, volatility in prices, information asymmetry, inefficiencies in cases of perishable products, which could be offset by building relationships. They also identified the advantages of spot markets to include little to no switching costs, reduced bargaining cost and the sellers being the sole claimants of residuals. The opposite was found true in built-up relationships. Another example is Fisher and Hartmann (2010) who assert that the effectiveness of inter-organizational relationships over the spot market is dependent on the situation. This claim is also supported by Oliveira and Lumineau (2019) who indicate that the nature of transactions can affect the effectiveness of inter-organizational relationships in overcoming the inefficiencies of the market.

According to the various contributions of the literature, product characteristics is also an important factor affecting how farmers decide to sell their farm products (Lajili, 1995; Fisher, 1997; Camanzi *et al.*, 2018). In this regard, Lajili (1995) evaluate the factors influencing vertical coordination decisions where perishability, one of the main characteristics of agricultural products, was introduced as an indicator of the presence of transaction costs in spot markets in the agri-food sector. A further interesting contribution to the product characteristic as a factor was provided by Fisher (1997). He suggests that an effective supply chain strategy is based on considerations for the nature of the demand for products, the product lifecycle, demand predictability, product variety and market standards.

In the empirical research of the economic rationale for such contractual relationships, farmers' characteristics such as farm income, household income, age, gender, farming experience, education and farm size have been explored. In that regard, a study conducted in

Ghana on the factors influencing cassava farmers' participation in out-grower schemes found that farmers' characteristics were not significant in explaining the farmers' participation. They also found that the contract conditions such as formal or informal, the pricing arrangement and transportation significantly influence farmers' participation (Poku *et al.*, 2018). Other Ghanaian studies also found that only age was significant in determining 458 rice farmers' participation decisions in contractual relationships (Abdul-Rahaman and Abdulai, 2019). However, there exist some contrary results in other countries in Africa that show that age, gender, farming experience, land holding and organization membership are important in the farmers' decision to participate in contract farming (Bellemare, 2012). These results were based on an evaluation of 1,200 farmers producing 10 different crops in Madagascar. The foregoing indicates that it is not fully clear in the literature, how farmers' characteristics influence their contractual choice decisions.

Given the current knowledge in the literature, the primary contribution of this research is to provide the rationale for farmers' participation in inter-organizational relationships in Ghana based on transaction costs, farmers' crop enterprise and the farmers' socioeconomic characteristics.

3. Conceptual framework

A farmer's decision to participate in a relationship with a buyer, from human action economics, is initiated when they find themselves in an apprehensive state (Von Mises, 1966). Following this realization, the farmer should be able to conceive one or more possible solutions that could improve his or her situation. Finally, the farmer should expect that his or her preferred state would be achieved when the planned solution is carried out.

Consider, for example, a farmer realizes that he or she is faced with unpredictable revenues and the inability to plan the production of his crops because of price variability and deterioration or spoilage of products from delayed sales in the spot market. Supposing the farmer is uneasy about this realization and decides to do something about it. Figure 1 illustrates the motivating factors and the farmers' decision-making process.

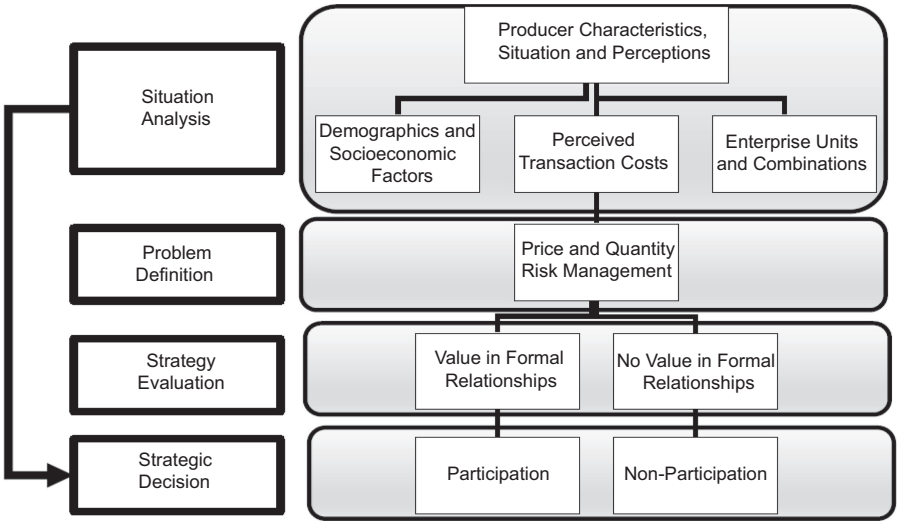

Figure 1. Conceptual framework for farmers' decision to participate in relationships

The problem identified by the farmer originates from transaction costs which include the time and effort expended in searching for the buyer. Opportunistic behaviors of buyers and the cost of preventing such behavior are also transaction costs forming the farmers' problem origin (Adaku, 2020). For example, the farmer may have to transport the farm products over a considerable distance to other markets for the possibility of higher prices. Buyers may however offer lower prices depending on the crop characteristics and how much information they have about the farmers' alternatives. If the farmer tries to prevent such opportunistic behaviors by selling locally, he or she forfeits the possibility for higher prices in other markets. The result of these transaction costs coupled with the farmers' crop enterprises and socioeconomic characteristics is the prevalence of price and sales variability.

When the farmer is faced with prices and sales variability, he or she may be apprehensive or not. Suppose the farmer is apprehensive because he or she realizes a problem of unpredictable revenues and inability to plan production, he or she would choose to participate in a formal relationship with a buyer. This is with the expectation that he or she would have predictable revenues and be able to plan production.

Suppose, instead, individual farmers are not apprehensive about the market risks (prices and quantity sold) confronting them, then they will be less inclined to participate in any formal relationships because these relationships, it has been noted, are not "free," but do have inherent transaction costs. Additionally, the nature of their enterprise units may make these costs higher in formal relationships than in spot market exchanges.

4. Data and methods

Given that the research objective is situated within the frame of transaction cost and human action theories, a mixed-method was an attractive approach because of the associated nonpecuniary components. The mixed-method involved collecting and analyzing both qualitative and quantitative data, hence, providing the basis for a complete study of the rationale for the farmers' participation in relationships with their downstream partners. The data for the research were collected from farmers in Ghana using a structured questionnaire in August 2019. A snowball sampling technique was used to sample and collect data from 354 farmers in Ghana. However, 50 observations were dropped due to missing variables, and a total of 304 observations was used for the analysis. The snowballing was initiated with a base list of 110 farmers provided by two agro-processing firms who buy farm products from these farmers. One of these firms was a fruit processing firm and the other was an industrial cassava starch processor. Though several firms were contacted, the selection of farmers leaned toward the list provided by the two firms who were cooperative in this regard. This is one challenge with the snowballing technique, and to minimize selection bias, 90 farmers out of the base list of 110 farmers were sampled and interviewed. Each farmer interviewed was asked to supply the names and contact(s) of any (without restriction on the type of farmers) other farmer(s) they knew. These new set of farmers were also interviewed and asked to supply names and contacts of other farmers. This process allowed the selection of farmers in diversified crop enterprises such as fruits, grains, root crops and tree nut production.

The questions were structured as farmers' enterprise profile, participation separation, production options, motivating factors, demographics and socioeconomic characteristics of farmers. Farmers' enterprise profile covered the crops the farmers produce for sale. Thirty-seven crops, most of which are the main crops produced in Ghana were presented in the questionnaire for farmers to select. These crops were fruits, grains, legumes and oilseeds, root crops and tree nuts.

The participation separation question was posed to classify farmers as participants or nonparticipants in inter-organizational relationships. The general question posed was, "Do you currently participate in any formal relationship with any buyer?" The response required

a dichotomous answer of yes or no. The formal relationship was defined here as those that involved a written agreement or agreement in principle to perform specific tasks in exchange for specific benefits that were known before sale transactions occurred. For example, farmers could be required to produce a specific quality or quantity of crop(s) in exchange for a premium price. Farmers motivating factors covered the various transactions of cost-reducing factors. The farmers who participate in relationships were asked the following question, "To what extent did the following factors motivate you to participate in a formal buyer relationship?" The nonparticipating farmers were asked the following question, "What is the likelihood that the following factors would motivate you to participate in a formal buyer relationship?" The factors presented to the farmers included questions on price-related factors, quantity-related factors and information-related factors. Price-related factors are all factors that have the price as their foundation. Quantity-related factors are those that have quantity as their foundation. Information-related factors are those that have information as their foundations as indicated in Table 1. Risk and uncertainties regarding the demand and supply of agricultural products could subject market exchanges to the adverse effects of opportunism as well as the costs in trying to prevent it. This makes the market generally very costly to use (Williamson, 1985; Frank and Henderson, 1992). There are also costs associated with trading partners trying to attain information parity. This is because the market is more prone to having agents who offer information for opportunistic gains (Williamson, 1973).

The demographics information of farmers included questions for the farmers' farm and off-farm income, age, farming experience, formal education and gender.

Categories of variables	Variables	Type of variable
Dependent	Participation	Binary (Yes/No)
Independent		
Farmers' characteristics	Age, education, farming experience, farm and off-farm income, gender, full-time farmer	Continuous binary (Yes/No)
Transactions cost		Categorical
Price factors	Assured price (1); Price premium (2); Knowing price ahead of sale (3); Opportunity to improve the price when market conditions change (4); Decreased price variability during the season (5)	Extremely likely (1); Somewhat likely (2); Neither likely nor unlikely (3); Somewhat unlikely (4); Extremely unlikely (5)
Quantity factors	Guaranteed sale (6); Avoidance of spoilage resulting from of delay in sales (7); Matching production to planned sale (8); Reduction in overproduction (9); Opportunity to sell all production (10)	
Information factors	Knowing buyers' desired product specifications ahead of production (11); Knowing the quantity the buyer needed from me (12); Knowing the quality the buyer expected from me (13); Knowing the delivery times for my product (14); Knowing the delivery location for my products (15); Better communication with buyer allows me to better plan (16); On-time payment by partner (17)	
Crop enterprise	Fruits (1); Grains (2); Roots (3); Tree nuts (4)	Binary (Yes/No)

Table 1.
Variables for the binary logit model

To understand the farmers' participation decision, we used the binary logit regression. The farmers' decision was treated as a binary choice variable, P_i, with participation as the outcome of interest. The question posed to the farmer is: "Do you currently participate in any formal relationships with any buyer?" Farmers' responses were coded as 1 if "yes" and 0 if "no." Hence, the probability, π_i, that a farmer chooses to participate is defined as a function of a vector of explanatory variables, X_i, encompassing farmers' socioeconomic and demographic characteristics, crop enterprises and associated transactions costs (see Table 1) with coefficient estimates, β, given as:

$$\pi_i = \text{Prob}(P_i = 1) = F(X_i'\beta) = \frac{e^{X_i'\beta}}{1 + e^{X_i'\beta}} \tag{1}$$

The underlying assumptions of the binary logit regression are the standard logistic distribution and the existence of an unobservable latent response variable, P_i^*. This latent response variable is a continuous random variable that can be any value in the real line. This assumption presupposes that the farmers' decision to participate in formal relationships or not, P_i, is a manifest response that occurs if and only if P_i^* exceeds a certain threshold. To identify the model, we standardize P_i^* to have a threshold of 0 and a standard deviation of 1.

Given that the outcome of interest occurs when P_i^* exceeds 0, we can write the probability, π_i, that a farmer chooses to participate as:

$$\pi_i = \text{Prob}(P_i = 1) = \text{Prob}(P_i^* > 0) \tag{2}$$

Suppose now that the farmers' participation depends on X_i, we model the latent variable as:

$$P_i^* = X_i'\beta + U_i \tag{3}$$

where U_i is a vector of systematic random error terms assumed to have the standard logistic distribution with a cumulative distribution function $F(u)$. β is the vector of coefficients of X_i, which constitutes seven farmers' characteristics (F_i), four crop enterprises (C_i) and 17 transactions cost variables (T_i), represented as:

$$X_i'\beta = \{F_i';\ C_i';\ T_i'\}\beta \tag{4}$$

Under this model, the probability, π_i, that the farmer chooses to participate is given as:

$$\pi_i = \text{Prob}(P_i = 1|X_i) = \text{Prob}(P_i > 0) \tag{5}$$

$$\pi_i = \text{Prob}(P_i = 1|X_i) = \text{Prob}(U_i > -X_i'\beta) \tag{6}$$

$$\pi_i = 1 - F(-X_i'\beta) \tag{7}$$

To estimate the relationship in Equation (1), we use a likelihood function L defined as:

$$L = \Pi_{Y_i=0} F(-X_i'\beta)\Pi_{Y_i=1}\{1 - F(-X_i'\beta)\} \tag{8}$$

We can then estimate the closed-form expression in Equation (1) as follows:

$$\pi_i = \text{Prob}(P_i = 1) = F(X_i'\beta) = \frac{e^{X_i'\beta}}{1 + e^{X_i'\beta}}$$

This probability can be expressed in terms of odds ratio which is the probability of the farmer choosing to participate, $P_i = 1$, relative to the probability of choosing not to participate, $P_i = 0$. The odds ratio is given as:

$$\frac{P}{1-P} = e^{X_i'\beta} \tag{9}$$

The principal component analysis (PCA) was used to derive a succinct number of variables, principal components (the transactions cost categories in this case), from the 17 transaction cost variables that capture the main information given by these variances and correlations or covariances (Jolliffe, 2002).

To obtain m number of principal components with the largest variances and have more stable estimates, the maximum eigenvalue for inclusion was set to unity (Jolliffe, 2002). The principal components were used in the binary logit regression in place of 17 variables themselves. Principal components are uncorrelated, and hence, multicollinearity issues are avoided. The value (score) of the principal components for each observation is given by:

$$Z = TA \tag{10}$$

where the *(i, k)*th element of Z is the value (score) of the kth principal component for the ith observation, T is an $(n \times 17)$ matrix and A is a (17×17) orthogonal matrix whose kth column is the kth eigenvector of $T'T$ (assumed to be proportional to the correlation matrix of the 17 variables). Since A is orthogonal, $T'\beta$ in Equation (4) can be rewritten as:

$$T'AA'\beta = Z_m'\gamma \tag{11}$$

where $\gamma = A'\beta$, Z_m' is an $(n \times m)$ matrix, and $m < 17$. Equation (4) can, therefore, be rewritten as:

$$X_i'\beta = \{F_i';\ C_i';\ Z_m'A'\}\beta \tag{12}$$

The empirical specification of the binary logit model of the probability of farmers choosing to participate ($p = 1$) is given as:

$$\text{Prob}(P = 1) = \alpha_0 + \beta F' + \beta C' + \gamma Z_m' \tag{13}$$

$$\begin{aligned}\text{Prob}(P = 1) = {} & \alpha_0 + \beta_1 Age + \beta_2 Educ + \beta_3 Fminc + \beta_4 Offinc + \beta_5 Gen + \beta_6 Occ + \beta_7 Fmexp \\ & + \beta_8 Frt + \beta_9 Grn + \beta_{10} Rt + \beta_{11} Nt + \beta_{12} Veg + \gamma PC^m + e\end{aligned} \tag{14}$$

where *Age, Educ, Fminc, Offinc, Gen, Occ* and *Fmexp* represents the farmers' age, educational level, farm income, off-farm income, gender, occupation – full-timer/part-timer –and farming experience. The farmers' crop enterprises are represented by *Frt, Grn, Rt and Nt* which indicates fruits, grains, roots and tree nuts. PC^m represents m number of principal components (which is less than 17), and the regression error term is defined by e. STATA/IC 14.2 was used to determine the estimates of the covariates. The dependent variable in Equation (14) defines the farmers who participate as $p = 1$ and those who do not participate as $p = 0$.

The relevant summary statistics are presented in Table 2. It shows that about 79% of the farmers were male, and the farmers' average age was about 48 years. The average years of formal education are approximately 9.5 years with a standard deviation of about 4.6 years. This implies that the average education of the farmers is about a junior high school level. Also, farmers had an average farming experience of about 20 years; however, not all the farmers identified themselves to be full-time farmers because only 53% of farmers identified as full-time farmers. The average monthly farm income of the farmers was approximately

Variable	Mean	SD	Min.	Max.
Age (Years)	48.263	11.540	19	83
Education (Years)	9.533	4.614	0	20
Gender (1 = Male; 0 = Female)	0.793	0.406	0	1
Full-time farmer (1 = Yes; 0 = No)	0.533	0.500	0	1
Farming experience (Years)	19.941	10.956	2	50
Farm income (GHS/month)*	2,725.110 ($524)	15,356.850 ($2953.24)	33 ($6.35)	260,156 ($50,030)
Off-farm income (GHS/month)*	2,258.234 ($434.28)	2,770.117 ($532.71)	10 ($1.92)	25,000 ($4807.69)
Fruits (1 = Yes; 0 = No)	0.181		0	1
Grains (1 = Yes; 0 = No)	0.605		0	1
Roots (1 = Yes; 0 = No)	0.470		0	1
Tree nuts (1 = Yes; 0 = No)	0.543		0	1
Participation (1 = Yes; 0 = No)	0.520		0	1

Table 2. Summary statistics of farmers (N = 304)

Note(s): Author's survey data
*US Dollar equivalent in parentheses based on World Bank average 2019 exchange rate at $1 = GHS5.2
Source(s): https://data.worldbank.org/indicator/PA.NUS.FCRF?locations=GH

GHS 2,725 (USD 524) while the average monthly off-farm income was GHS 2,258 (USD 434). The results also indicate that the farmers were engaged in the following crop enterprises: fruits, grains, root crops and tree nuts. The respective proportions of farmers producing these crop enterprises were 18%, 61%, 47% and 54%. That the sum of these proportions exceeds 100% implies that some farmers selected multiple crop enterprises as crops they were producing (see Table 3). The table shows that no more than 14% of farmers produced either fruits only, grains only, root crops only or tree nuts only. Contrarily, as high as 31% of farmers produced grains and tree nuts, while 24% produced root crops and tree nuts. This is not surprising since tree nuts are essentially produced for their commercial value, while grains and root crops often have dual uses, serving commercial objectives as well as household food supply objective. About 52% of the farmers participate in inter-organizational relationships while 48% do not participate in inter-organizational relationships.

While only 2% of the respondents were involved in four-crop enterprises, 47% of them were involved in two-crop enterprises, and 37% were involved with only one-crop enterprise (see Figure 2). This distribution is not an accident because multiple crop categories may act as a risk management strategy for farm income and household expense management by the production of crops that serve dual purposes – domestic consumption and commercial farming.

	Fruits	Grains	Roots	Tree nuts
Fruits	8%	6%	7%	6%
Grains		14%	*26%*	*31%*
Roots			7%	*24%*
Tree nuts				10%

Table 3. Proportion of farmers engaged in multiple crops enterprises (N = 304)

Note(s): Italics indicate the crop enterprise mix with the highest proportion of farmers
Source(s): Author's survey data

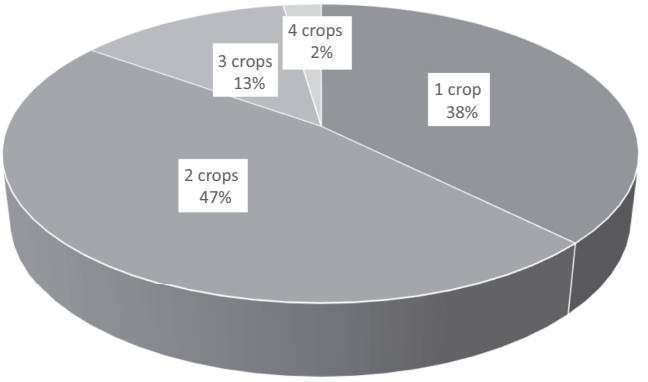

Figure 2.
Distribution of respondents by number of crop categories in which they are involved ($N = 304$)

5. Results and discussion

It was argued from the conceptual framework in Figure 1 that the farmers' socioeconomic, crop enterprises and their motivating factors (which are based on transaction costs) play a role in shaping farmers' decision to participate in inter-organizational relationships. The binary logit regression results are presented here to give an understanding of the determining factors for the farmers' participation choice. For ease of interpretation, these results are presented as odds ratios that represent the ratio of the probability of participating over the likelihood of not participating.

The transaction cost variables (Table 1) were reduced to three variables using the PCA by setting the maximum eigenvalue for inclusion to unity. Table 4 shows the variables and the factor loadings generating orthogonality. These three principal components, which indicate the classification of the transactions cost factors, had an orthogonal varimax rho of 0.8286, indicating that they explained about 82.9% of the variance in the 17 variables. The overall Kaiser–Meyer–Olkin measure of sampling adequacy was 0.9057, which is described as "marvelous" (Kaiser, 1974).

The loadings of 17 transaction cost variables in Table 1 were used to classify the components as follows: information availability, sales certainty and price certainty in Table 4. Table 4 shows the mean rating of the extent to which the 17 variables motivated the farmers to participate in inter-organizational relationships. Where ratings range from 1 (extremely likely) to 5 (extremely unlikely). The values of the mean ratings indicate that the 17 transactions cost variables was either extremely likely or somewhat likely to motivate them to participate in inter-organizational relationships. The first principal component, information availability, loaded the variables 11–17 as they had the largest numbers shown with bold underlined font. The second principal component, sales certainty, loaded variables 6–10; while the third principal component, price certainty loaded variables 1–5. These three principal components defined the transaction cost variables used as predictors of the farmers' decision to participate or not participate in inter-organizational relationships.

The results of the binary logit regression in Table 5 show that a unit increase in information availability increases the odds ratio of choosing to participate in relationships by 1.5 times more than choosing not to participate. This suggests that farmers value unbiased knowledge of product quality, quantities, delivery times and location as well as better communication to achieve their economic objectives. Also, a unit increase in sales certainty increases the odds ratio of choosing to participate in relationships by 1.884 times more than

	Transaction cost variable	Mean	SD	Component factors: Information availability	Sales certainty	Price certainty
1	Assured price	1.89	1.34	−0.03	0.02	*0.49*
2	Price premium	1.66	1.09	0.08	−0.26	*0.36*
3	Knowing price ahead of sale	1.95	1.31	−0.02	0.00	*0.49*
4	Opportunity to improve price when market conditions change	2.11	1.32	0.01	0.02	*0.45*
5	Decreased price variability during the season	2.32	1.34	−0.06	0.10	*0.39*
6	Guaranteed sale	2.13	1.57	−0.01	*0.44*	0.02
7	Avoidance of spoilage resulting from of delay in sales	2.38	1.59	−0.02	*0.41*	0.05
8	Matching production to planned sale	2.42	1.51	0.02	*0.43*	−0.02
9	Reduction in overproduction	2.68	1.49	0.03	*0.40*	−0.01
10	Opportunity to sell all production	2.09	1.57	0.00	*0.45*	0.00
11	Knowing buyers' desired product specifications ahead of production	1.90	1.29	*0.39*	−0.02	0.00
12	Knowing the quantity, the buyer needed from me	2.27	1.48	*0.29*	0.12	0.09
13	Knowing the quality, the buyer expected from me	1.81	1.22	*0.41*	−0.04	−0.03
14	Knowing the delivery times for my product	2.13	1.34	*0.33*	0.03	0.11
15	Knowing the delivery location for my products	2.00	1.34	*0.35*	0.03	0.08
16	Better communication with buyer allows me to better plan	1.63	1.20	*0.42*	−0.01	−0.05
17	On-time payment by partner	1.57	1.20	*0.43*	−0.01	−0.10

Note(s): Italics loadings indicate the transaction cost variables that are loading specific component factors
Source(s): Authors' survey data

Table 4.
Principal component loadings after varimax rotation for components with minimum eigenvalues = 1 (N = 304)

Odds ratio	Participation (1 = participant)	Std. Err	Z	$P > z$
Information availability	*1.500***	0.171	3.580	0.000
Sales certainty	*1.884***	0.207	5.890	0.000
Price certainty	*1.278***	0.153	2.160	0.040
Gender (1 = male)	1.005	0.448	−0.100	0.990
Education (years)	1.047	0.040	1.150	0.231
Farming experience (years)	1.010	0.020	0.300	0.628
Age (years)	0.992	0.019	−0.240	0.689
Full time farmer (1 = yes)	1.006	0.366	0.130	0.986
Farm income (GHS)	1.000	0.000	1.560	0.127
Off-farm income (GHS)	1.000	0.000	−0.210	0.763
Fruits (1 = yes)	*3.676****	1.744	3.190	0.006
Grains (1 = yes)	0.920	0.331	0.340	0.816
Roots (1 = yes)	1.302	0.433	1.140	0.428
Tree nuts (1 = yes)	0.593	0.213	−1.240	0.145
Intercept	0.810	0.758	−0.560	0.822
LR $\chi^2(14)$				163.98
Prob > χ^2				0.000

Note(s): Italics indicate the significant values where *** and ** represents 1% and 5% significance levels, respectively
Source(s): Author's survey data

Table 5.
Binary logit regression results for farmers' participation decision (N = 304)

choosing not to participate. These estimates are statistically significant at 1%. This suggests that farmers value a guaranteed sale, avoidance of spoilage resulting from delay of sales, matching production to planned sale, reduction in production and every opportunity to sell all products. The table also shows that a unit increase in price certainty increases the odds ratio of choosing to participate in relationships by 1.278 times more than choosing not to participate, and it is statistically significant at 5%. This suggests that farmer's value: an assured price, price premium, knowledge of price ahead sale, opportunity to improve the price when market conditions change and decreased price variability during the season.

These results imply that transaction cost variables explain farmers' decision to participate in such relationships with the buyer and therefore confirm our prior hypothesis. However, in terms of the magnitude, the certainty of selling farm products is a significant motivator for farmers to participate in inter-organizational relationships. This indicates that when farmers are uncertain about whether they would sell, and to whom they would sell all their products, it may pose a challenge in inventory management as well as other production decisions. Uncertainty of product sale would also expose farmers to the adverse effects of opportunism (Williamson, 1985; Frank and Henderson, 1992) as perishable products tend to deteriorate in value the longer they stay. Farmers overcome these challenges by participating in inter-organizational relationships to provide certainty for the sale of their products.

Information availability is the next big motivator for farmers to participate in inter-organizational relationships. Knowing what to produce in terms of quality, quantity and delivery times are therefore important to farmers. The preferences of buyers keep changing due to ever-evolving consumer preferences and concerns (Fisher and Hartmann, 2010). In the presence of information asymmetry where farmers and buyers are not at par with information, the famous situation of "the market for lemons" becomes apparent (Akerlof, 1970). Farmers in a spot market would not be willing to produce a premium quality, as buyers would not be willing to pay the premium, especially where credence attributes are involved because they cannot verify it. There are costs associated with trading partners trying to attain information parity. This is because the market is more prone to having agents who offer information for opportunistic gains (Williamson, 1973). Farmers are therefore motivated to overcome this challenge by participating in inter-organizational relationships with buyers so that they can be at par with information regarding the quality, quantity, delivery time and location of what is to be produced.

Price certainty has the least magnitude but provides a significant motivation for farmers to participate in inter-organizational relationships to sell their produce. This indicates that farmers are interested in and place value on what price they would receive for their produce. The seasonal characteristics, as well as variability of output due to weather, pests and diseases, may pose a natural tendency for price fluctuations in the spot market. This makes farmers uncertain about prices and open to the cost of opportunistic behaviors from buyers. Farmers would prefer to participate in relationships with buyers that offer certain prices compared to selling in the spot market.

The farmers' socioeconomic characteristics are, however, not statistically significant, overall. For example, the odds ratio of choosing to participate in relationships, or not, neither increase nor decrease statistically for farmers who are 1 year older, more educated, or more experienced in farming. Also, a farmer being male, full-time or having a unit higher income (farm and off-farm) neither increases nor decreases the odds ratio of participating as compared to females, part-time farmers or farmers with a unit lower income. These results indicate that factors explaining farmers' decision to participate in relationships may not be statistically related to their socioeconomic characteristics.

The results for the crop categories in Table 5 indicate that the odds ratio of fruit farmers choosing to participate in relationships is 3.676 times higher than non-fruit farmers choosing to participate. This is statistically significant at 1%. The fruit enterprise increasing farmers'

likelihood of participation, again, confirms our hypothesis that high perishability of crop products increases the likelihood of farmers' participation in inter-organizational relationships. The table also shows that the odds ratios of participation for farmers who produce grain, root crop and tree nut are not significantly different from farmers who do not produce them. This indicates that producing grains, roots or tree nuts neither increases nor decreases the odds ratio of choosing to participate compared to the farmers who do not produce them. This is attributable to the nature of these crops that the grains are dry and durable; tree nuts are also dried after harvest, and therefore, they are not highly perishable. Roots crops allow for staggered harvesting; hence, they are durable if they remain in the soil. Therefore, producing these crops may not influence the farmers' decision to participate in inter-organizational relationships to sell the produce.

6. Conclusion, implications and limitation of study

This study was carried out to provide an understanding of the factors that motivate farmers to participate in relationships with buyers. The decision of how to sell farm produce is an economic imperative for the farmer. Farmers may sell their products through the spot market after the harvest or they may have a relationship with an agro-processor, or distributors before production to sell. Recent agricultural policies in Ghana seeking to reduce farmers' market risks and ensure buyers access to farm products has sparked interests in farmer–buyer relationships. However, the coexistence of spot markets and relationships, by the transaction cost and human action theories, indicates that farmers must be having some gains with the choice they make. An understanding of the farmers' gains from such relationships would enable policy makers to better help farmers to achieve their economic objectives while minimizing the challenges they present.

The study's results indicate that about half of the farmers participate in some relationship with buyers to sell their farm products and the others sell their products in the spot market. Transaction costs were defined as information availability, price certainty and sales certainty. The results showed that increasing information availability, price certainty and sales certainty increased the likelihood of farmers engaging in formal relationships with buyers. However, the odds ratio of the socioeconomic characteristics was not statistically significant indicating that the factors explaining farmers' decision to participate in relationships may not be statistically related to their socioeconomic characteristics. Because fruits are highly perishable, getting selling agreements in place reduces fruit farmers' risks. Therefore, fruit farmers are more likely to participate in formal relationships. On the other hand, grains, such as maize and legumes, have long shelf lives, and therefore, farmers of these commodities have less motivation to participate in formal relationships. The results showed that the odds ratio of fruit farmers relative to non-fruit farmers choosing to participate in relationships was 3.7 times higher at the 1% significance level.

This study's results suggest that policy initiatives to support relationships between farmers and buyers must focus on promoting information availability as well as ascertaining sales and prices of participating farmers. It must also, specifically, aim at farmers of perishable commodities like fruits. This study has provided the understanding that information availability, price and sales certainty, as well as the perishable nature of commodities, motivate farmers to participate in inter-organizational relationships. This also indicates that, alternatively, the traditional spot market which has the role to provide market signals could be influenced by these factors to become efficient. Public–private partnerships could be harnessed to provide information on product attributes and supply requirements, develop the measurement of the attributes and link prices to those attributes. These policy initiatives should, therefore, enhance the gains of farmers in inter-organizational relationships as well as farmers who decide to use the spot market.

The study, however, has some limitations. The study was analyzed at the farmer level; however, some farmers produced multiple crops. This means that the farmers who participate in inter-organizational relations with buyers for one crop enterprise may be nonparticipant with the other crop(s). Future studies could consider further investigations in this field at the crop level while accounting for the transactions cost related to those crops. This study could not make considerations to that because of the granularity of the data when such nuances are considered. A large dataset would be required to overcome this limitation. Second, the transactions cost perspective of the farmers' motivation to participate in inter-organizational relationships may not be limited to information availability, price certainty and sales certainty. Future studies could, again, explore other strands such as market structure and power disparities that may polarize a small farmer.

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