

# Logistic Analysis of Factors Motivating Smallholder Farmers To Engage In Contract Farming Arrangements With Processing Firms In Ghana

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## Abstract

Contract farming can be viewed as an embedded marketing and financial service mechanism employed by agribusinesses in developing countries to minimize input-output market imperfections particularly between producers and processors. Most smallholder farmers often do not have access to high end markets due to poor resources, lack of capacity and quality constraints. On the other hand, agri-food processing firms require consistent and reliable supply of adequate amounts and quality raw materials in a timely fashion to meet consumer demand. This underlying paradox has given rise to the study, which focuses on the contract relationship between smallholder farmers and fruit processing firms in Ghana. The study sought to analyze the factors that influence farmers to enter into contracts with processors. A logit model was used to analyze the factors that motivated/influenced smallholder farmers to enter into contracts with processing firms in Ghana. Both random and purposive sampling technique was used to select 140 smallholder farmers (contract and non-contract) from three major horticulture growing belts in Ghana. A Friedmans Test ranking showed that the key considerations for farmers to engage in contracts initially were type of crop produced, credit support and production experience whiles the need for assured markets and guaranteed price influenced their continued participation in contracts. The logit analysis indicated that farmers who cultivated small plots of land, had access to labor, and whose farms were further away from the firm were more likely to enter into contract arrangements with processing firms.

**Key Words:** Smallholder Farmers, Processors, Contract Farming, Motivation.

## 1.0 INTRODUCTION

Studies throughout the developing world have shown a potentially strong relationship between agro-industrial investments and growth in smallholder agriculture and poverty reduction (Jaffee and Morton, 1995; Dorward *et al*, 1998; Delgado, 1999). The agro-industrial sector is characterized by the need for regular and reliable flow of raw materials in the right quantities, quality, timeliness of supply at affordable cost throughout the year in order to realize economies of scale, meet planned utilization of plant capacity and also the demand of consumers in down-stream markets. Many agro-industrial firms – processors and exporters, for the obvious reasons of management and transactional cost may not be vertically integrated but instead seek alternate mechanism for sourcing raw materials. For these firms, sourcing raw materials through contracts instead of spot markets represents the most viable option. On the other hand, smallholder farmers who typically form the majority of the producers within the high value agricultural product (HVAP) sub-sector in Ghana cultivate on marginal plots of fragmented

farmland with production basically being rain-fed. Such farmers according to (KIT *et al*, 2006) are constrained by difficulties posed by nature (poor soils, destructive crop pests and diseases, and erratic rainfall); poor infrastructure such as bad road network transport and storage; and lack of capital to invest in modern technology. At the heart of these constraints is the inability of farmers to access high- value markets. This is evident in the poor quality of produce, lack of information on prices and poor bargaining power. Consequently these smallholders are trapped within subsistence agriculture, and serve only as mere producers with very little orientation towards the market. For these resource-poor farmers, contract farming is potentially a way of overcoming market imperfections, minimizing transaction costs and gaining market access.

Contract Farming can be viewed as an embedded marketing mechanism employed by agribusinesses in the value chain to mitigate production and market risk. Contract Farming has been defined as an agreement between one or more farmer(s) and a contractor for the production and supply of agricultural products under forward agreements, frequently at predetermined prices (Eaton and Shepherd, 2001). Development agencies such as the World Bank and USAID during the 1990s have been enthusiastic in their support for contract farming as a way to promote smallholder development (Baumann, 2000). Contracts tend to be more favourable for smallholders when the processor is heavily dependent on the smallholder for a steady flow of raw material. An example of such a contract is the Mumias sugar project in Kenya, and the ‘Contract du Planteur’ at Palm industrie in the Ivory Coast, where 88% and 40% of raw materials respectively, needed by processors are supplied by smallholders for raw material (CDC, 1989). Similarly in Ghana, Blue Skies relies on its out-growers for about 90% of its raw materials supply (Technoserve, 2002).

Most contract farming projects do appear to contribute to smallholder welfare and improve farmer incomes, at least in the short term. Several comparative studies of income from contract farming in Africa have recorded average increases in income for between 30–40% (moderate) and 50–60% (high) proportion of participants, Little and Watts (1994). Reviews and studies of contract farming suggest that these arrangements do allow small farmers to achieve higher yields, diversify into new crops, and to increase incomes, and that these can deliver wider benefits through, for example, stimulation of demand for hired labour (see for example Stringfellow, 1996; Kirsten and Sartorius, 2002; Singh, 2002; Singh, 2005).

Producer-processor contracts may reduce but do not definitely eliminate risk for both parties. The potential difficulty within contractual arrangements is the likelihood of opportunistic behaviour by both parties (farmers and processors) through for example side-selling, diversion of inputs by producers and exploitative tendencies and manipulation of quotas based on quality by processors. These notwithstanding, contract farming has far and large been hailed as a ‘necessary evil’ at least in the developing world as a means to deal with the market imperfection, high transaction cost and input-output market constraint. The issue here is to what extent are smallholder farmers linked up to high-value markets through contract mechanism? What factors motivate resource-poor farmers engaged in the production of high value fruits to link up with processors?

Masakure and Henson (2005) in exploring the decision by small-scale producers to grow non-traditional vegetables under contract for export in Zimbabwe found four factors that motivated contracting, to be market uncertainty, indirect benefits (e.g. knowledge acquisitions), income benefits, and intangible benefits (e.g. status). Guo *et al.* (2005), in their study of fifteen contract farming cases in a number of eastern provinces in China, found that farmers enter contract farming arrangements to obtain the following advantages: price stability, lucrative

international market access, and technical assistance to improve product quality.

According to studies from Lajili *et al.* (1997), Rehber (2000), Sartwelle *et al.* (2000) and Key (2003), a farmer's discrete choice to join contract farming scheme is influenced by the household's characteristics, operational features, product categories, market attributes of product and underlying environmental condition. Zhu *et al.* (2005), found in a study of contract arrangement in China, that farmers' decisions to enter into contract with their sponsors were influenced by government support, distance from the target market, specialization and commercialization in production. In a study of contract farming in transitional economies of Eastern Europe, Swinnen (2005), found that the most important factors that influenced farmers to enter into contracts, in order of importance were; guaranteed product sales, avoidance of price uncertainty, higher price offers, pre-payment offers, input supply and technical assistance and some form of credit.

In a detailed study of contract farming in poultry, fruits and vegetables in Bali and Lombok province of Indonesia, it was revealed that factors that the important considerations and motivating factors for farmers were the distance and accessibility of the area; past experience in working with government and agribusiness; education levels credit constraints and strong borrowing histories. The contracts were more appealing to less well-capitalized smallholders who were well educated, were credit constrained but who had strong borrowing histories (Patrick, 2004).

The main objective of this paper is to analyze the factors that motivate smallholder farmers to engage in contract farming mechanisms with processing firms in Ghana.

## 2.0 METHODOLOGY

### 2.1 Theoretical Framework – Motivation to Participate in Contract Farming Arrangement

To analyze the socio-economic factors that influence farmer's decision to enter into contract agreements with processors, a logistical regression was used to determine the impact of those factors on farmers' decision to contract. Farmers decision to participate in any production activity or not, are influenced in part by the perceived balanced of benefits, opportunities and constraints. Discrete choice models are used to identify and quantify the factors that affect the likelihood of a farmer participating in a production and/or marketing institutional arrangement. These models include the linear probability, Probit, Logit and Multinomial Logit models. This study opts for the logit model because the sample size is sufficiently large for normality to be assured and also econometric packages such as E-views make for ease of computation, an advantage logit model would have had over the others.

#### 2.1.1 The Logit Model – Analytical Model and Model Specifications

Since the participation decision is a dichotomous choice problem, it can be modelled either by a logit, probit or tobit model, of which the results yield an inverse Mills ratio for each case (i.e. farmers) (Greene, 2000). The logit model is used in this analysis for reasons already stated above. The Logit model is based on the cumulative logistic probability function and is specified as:

$$P_i = F(Z_i) = F(\alpha + \beta X_i) = \frac{1}{1 + e^{-z_i}} = \frac{1}{1 + e^{-(\alpha + \beta X_i)}} \quad (1)$$

In this notation, e represents the base of the natural logarithms,  $P_i$  is the probability that an individual will make a

certain choice, given  $X_i$ .

This is redefined by Pindyck and Rubinfeld (1991) as:

$$\text{Log} \frac{P_i}{1 - P_i} = Z_i = \alpha + \beta X_i \quad (2)$$

A logistic regression is employed to assess the probability that a farmer chooses to participate in contract farming arrangement with a sponsor (processor). The farmer's response is coded as 1 if he/she was willing to participate in the contract and as 0 if otherwise. Following Zhu *et al* (2004) and Gulati (2005), the probability ( $P_i$ ) that the  $i$ th farmer is willing to participate in contract arrangement can be specified using a logit model as follows:

$$P_i = \frac{1}{1 + e^{-z}} \quad (3)$$

Where,  $P_i$  is the probability that the  $i$ th farmer is willing to participate in contract;  $Z_i$  is an index that is linearly related to an array of socioeconomic, demographic and other variables influencing farmers' willingness to contract. More specifically, the relationship between these variables and  $Z_i$  may be specified as follows:

$$Z_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots \beta_n X_{ni} \quad (4)$$

Where,  $\beta$ 's are parameters of the logit model to be estimated; and  $X$ 's are the hypothesized explanatory variables influencing the farmers' willingness to participate in contract arrangements.

In the discrete choice model, farmers or farm households choose to participate in contract farming depending on the following explanatory variables: farmer household's characteristics (H) that are reflected by age, gender, level of education, family size; the extent of specialization/commercialization in the farmer's production (R) that are reflected by off farm income, farm size or area cultivated; and lastly market attributes (T) represented by the distance from target market.

The general model takes the form:

$$C_i = f(H_i, R_i, T_i; \beta_i) + u_i \quad (5)$$

The above specification fits the range of binary logistic model and  $C_i$  is binary choice in which 1 denotes participation in contract farming and 0 non-participation. The model is estimated by the Maximum Likelihood method. We use  $x_i$  to stand for all of explanatory variables and rewrite the model as follows:

$$\Pr(Y = 1) = f(P_i) = \frac{\exp(\beta'x_i)}{1 + \exp(\beta'x_i)} \quad (6)$$

and individual likelihood for observation  $i$  becomes;

$$P(y_i) = f(P_i)^{y_i} [1 - f(P_i)]^{(1-y_i)} \quad (7)$$

### 2.1.2 The Empirical model

Qualitative response models, which are strongly linked to utility theory, have been widely used in economics to investigate factors affecting an individual's choice from among two or more alternatives (Amemiya 1981; Greene, 2000). The model aims at determining the probability that, given a set of attributes about the individual farmer and other demographic characteristics, the individual will choose either to enter into contract or not.

Following the theoretical framework and the choice variables specified in studies by Lajili *et al.* (1997), Rehber (2000), Sartwelle *et al.* (2000) Zhu *et al.* (2001), Key (2003), and Gulati *et al.* (2005), decision to enter into contract arrangement in this study could be described as a function of personal characteristics of the farmer, household's characteristics, operation features, product categories, and market attributes. These factors have been decomposed into the explanatory variables shown in the empirical model below. The empirical model is specified as follows:

$$PICA_i = \delta_0 + \delta_1 AGE + \delta_2 GENDER + \delta_3 EDUC + \delta_4 FSIZE + \delta_5 TCULT + \delta_6 ALAB + \delta_7 OFY + \delta_8 PEXP + \delta_9 EXTCONTACT + \delta_{10} FTFDIST + \delta_{11} FTMKTDIST + \epsilon_i \quad (8)$$

Where G\_FMR denotes the gender of farmer, EDU\_S denotes educational status of farmer, A\_LAB denotes availability of labour, F\_EXP denotes farmers experience, T\_FSIZE denotes total farm size T\_CULT denotes total farm size cultivated by farmer, D\_FTF denotes the distance from farm to firm, D\_FTM distance from arm to market and FUL\_T full time farmer.

The variables used in the empirical model are presented in Table 1. The variable measurement and a priori expectation follow the table.

Formulation of the model is influenced by a number of working hypotheses. It is hypothesized that a farmer's decision to participate in contract arrangement with firms is influenced by the combined (simultaneous) effects of a number of factors related to the farmer's objectives and constraints. The *a priori* expectations on the effect of each of the explanatory variables on the likelihood of a farmer engaging in a contractual arrangement are stated in the following sections.

## 2.2. A priori Assumptions and Expectation.

**Age:** An older person being less mobile is expected to participate much more in schemes that made marketing available at his doorsteps. It is expected that age will have a positive effect on choice variable or decision.

**Gender:** Literature suggests that in Ghana, cash crop production is a male dominated activity (Okali and Mabey, 1975; Takane, 1997). This is because women are disadvantaged in terms of access to productive resources (Balla, 1991; Daddieh, 1989) and are therefore less likely to adopt production of cash crops. We therefore expect that males are more likely to enter in contracts readily than females would.

**Farm size:** Large farm size is an indicator of wealth and perhaps a proxy for social status and influence. It is expected to be positively associated with the decision to participate in contract arrangement. Patrick (2004) and Zhu *et al.* (2005) reported that farmers with access to large farm size had a positive effect on contract participation.

**Experience:** The length of a farmer's experience can either generate or erode confidence. With more experience, a farmer can become more or less averse to the risk contract farming arrangement in our case. This variable can thus have either a positive or negative effect on a farmer's decision to enter into contract.

**Education:** Probability of adoption (participation) increases with level of education of household head (Shakaya and Flinn, 1985; Akinola; 1987). Education should increase a farmer's ability to obtain, process, and use information relevant to the adoption of contract especially if it involves the introduction of new crops.

**Access to Labour:** It is hypothesized that farmers with more surplus labour are more likely to join contract farming schemes because of the labour-intensive (Gulati *et al.* 2005) nature of the commodities selected. Thus, labour size is expected to have a positive influence on the adoption of contract.

**Distance of target market:** If the distance of the farm to the local commodity target market is long then, it is likely

that, farmers will be compelled to enter into contract with agribusiness firms to reduce the level of associated spoilage. Studies by Zhu *et al* (2001) and Patrick (2004) indicated that farmers are more likely to participate in contract where farms are remote distant from market centres, especially for highly perishable food.

**Distance of firm to farm:** It is hypothesized that farmers whose farms are farther away from the firms' plant have the tendency to contract with firm in order to share the cost of transport, Patrick (2004), Zhu *et al* (2005) and Gulati *et al* (2005).

### Statement of Hypothesis

The following null hypotheses (H<sub>0</sub>) were tested against the alternative (H<sub>a</sub>).

The specific *a priori* expectations on the estimated parameters of equation (6) are:

$$\delta_1 - \delta_6 > 0; \quad \delta_7 < 0; \quad \text{and} \quad \delta_8 - \delta_{10} > 0$$

$$(i) H_0: \delta_1 - \delta_6 = 0, H_a: \delta_1 - \delta_6 > 0$$

where

H<sub>0</sub>: there is no effect of age on farmers' decision to participate in contract.

H<sub>a</sub>: there is a positive effect of age on farmers' decision to participate in contract.

H<sub>0</sub>: there is no effect of gender on farmers' decision to participate in contract.

H<sub>a</sub>: there is a positive effect of gender on farmers' decision to participate in contract.

The hypothesis is repeated similarly for  $\delta_3 - \delta_7$  and for  $\delta_9 - \delta_{10}$ .

$$(ii) H_0: \delta_8 = 0; \quad H_a: \delta_8 < 0$$

where,

H<sub>0</sub>: there is no effect of experience on the decision of farmer to participate in contract.

H<sub>a</sub>: there is a negative effect of experience on farmers' decision to participate in contract.

### Validation of Hypothesis:

The Z statistic is used to measure the level of significance for each of the estimated coefficients. The goodness of fit statistic is the McFadden R-squared. The likelihood ratio (LR) test is computed to determine the joint significance of the independent variables in the model. The LR test follows a standard chi-square ( $\chi^2$ ) distribution the degrees of freedom to the number of independent variables used in the model. The higher the percentage prediction, the greater the predictive power of the model. The discussion of results is based on the log-odds ratio. The log-odds

$$\text{is given as } \delta[\log Y_i / 1 - Y_i] / \delta X_i \equiv \partial M / \partial X_i = \beta_i \quad (9)$$

The marginal effects of the independent variables are also estimated. These are given as

$$\delta Y_i / \delta X_i = \beta_i [Y_i (1 - Y_i)] \quad (10)$$

where  $Y_i$  represents probabilities.

### 2.3 Description of Data Source, Sampling Method and Study Area.

Primary data was collected from farmers producing under contract and also from non-contract producers. A combination of purposive and random sampling technique was employed in the data collection. A purposive sampling technique was adopted to capture contract and non-contract farmers. This was achieved by gathering a list

of contract farmers from their partners (processing firms), and from this list a total of one hundred farmers was randomly selected from within the various farming communities. Fifty non-contract farmers who also grow the same commodities in the community were also selected randomly for the survey. The sampled farmers were interviewed to collect the required data, using pre-tested questionnaires, specifically prepared for each case or category in the study. Survey data was based on recall from memory of the farmers and supplemented with the records of activities maintained by both contract and non-contract producers. The survey instruments were in two parts. The first part gathered information about the socio-economic characteristics of the sample farmers, experience in crop production, reasons for not contracting or contracting, yield levels, labour use, association/group membership, marketing, and method of acquiring information for various activities. The second section of the survey was relevant only to contract farmers. It was designed to gather information about the contract between the producer and the processor. In particular, this section gathered information about the nature of contractual arrangement, the form and specification of contract, the motivation for contracting, the actual benefits and also challenges in contract.

A list of processing firms was obtained from the Ministry of Food and Agriculture MoFA and Ghana Export Promotion Council, GEPC. From this list, three firms who are actively engaged in contract farming arrangements with smallholder farmers were purposely selected for interview. The southern horticultural belt of Ghana which contributes more than 90% of fruits and vegetable exports was the focus area covered in the survey. Major communities covered included Akramang, Fotobi, Pokrom, Obourdaka, Somanya, Mankessim, Sogakope and Adidome.

### **3.0 RESULTS AND DISCUSSIONS**

#### **3.1 Socio-economic Characteristics of Smallholder Farmers**

The survey was conducted in several farming communities within three regions of Ghana involving a total of 141 fruit producing farmers. The survey elicited information about farmers including age, gender, experience in fruit production, total farm size under cultivation, labour used, extension contact etc. Table 2 and 3 presents a summary of the socio-economic characteristics of contract and non-contract farmers. Survey participants were generally homogeneous with regard to household characteristics. Out of the 141 respondents only ten, representing 7% were female with the remaining 93% being males. All the respondents were literate and had some form of education or formal training. Indeed more than half of the respondents (54%) had received secondary school education and above, indicating a relatively good level of literacy among fruit farmers. The survey also revealed that most fruit producers, about 74% are full time farmers engaged basically in growing and managing their crops. It is therefore not surprising to find from the results that while 42% indicated they earned off-farm income, 58% of the farmers declared that their sole source of income was from fruit production. The major sources of off-farm income and activity that the other farmers engaged in were trading, driving, teaching and employment as civil servants. Seventy six (54%) out of the 141 respondents declared that they had one form of extension contact or the other. The extension contact either came from the regular government source MoFA or from the processing firm or from NGOs.

Table 3 presents the socio-economic profile of contract and non-contract farmers. Eighty six (61%) out of the 141 farmers had contract arrangement with processing firm. The ages of both categories of farmers ranged from 24 to 65 years with a mean age of 44 years. There was no significant difference between the years of farming experience in the survey area with a mean of 13.65 years. Contract and non-contract farmers generally differ significantly in terms of their endowments with labour. Farmers participating in contracts used more labour, an

average of eight (8) per head compared to the average of three (3) labourers by non-contract farmers. This confirms the results from a similar study by Gulati *et al* (2005) that contracting is a generally labour intensive endeavour. Similarly, farmers participating in contracts tended to cultivate comparatively large acreages, an average of about 18.67 acres while non-contract farmers cultivated on average of 7.35 acres. This result suggests that indeed availability of land is an incentive or a major determinant of a farmer's decision to participate in contract farming arrangements.

### **3.2 Willingness of Non-Contract Farmers to Participate in Contract Farming**

Table 4 shows the results obtained from the 55 non-contract farmers in the survey with respect to their willingness to participate or otherwise in contract arrangement. When farmers with no contracts were asked if they were willing to engage in contract farming arrangements, an overwhelming 43 (78%) responded in the affirmative. The results suggest that most farmers tend to respond positively and have a strong desire to engage in contract arrangements if they were offered the opportunity. From the results it can be inferred that fruit farmers in Ghana generally have a positive or favourable attitude towards contract farming.

### **3.3 Reasons for Non-Participation in Contract Farming**

The survey went on further to ascertain what reasons accounted for the non-participation of farmers in any arrangements with processing firms. The results presented in Table 5 show that majority of the farmers, about 42%, indicated lack of opportunity to participate as their reason for not being involved in contract farming scheme. Approximately 18% of attributed their non-participation in contracts to the fact that they did not perceive any tangible benefits/rewards while 24% attributed non-participation to the complicated nature of the process. Only 9 (16%) of farmers attributed their non-participation to lack of interest expressed by buyers/processors. These responses are not the least surprising, as indeed at least one of the processing firms involved in the survey required their out-growers to be EurepGAP certified in order to qualify to participate in contracts. This may explain in part the perception of some farmers that the contract process is complicated or burdensome. Many small-scale farmers obviously are not likely to be able to meet these conditions given that it may entail some financial commitments.

### **3.4 Incentives to participate in contract farming arrangements.**

Small scale fruit producers are motivated by several factors to engage in contract arrangements with processors. Table 6 shows the potential incentives (personal considerations) cited by contract producers as motivating them to participate in contract farming in the first instance (initial motive). The personal consideration of farmers which motivated them to consider participation was ranked using the Friedman's Test. The results of the means score of ranking showed that the type of crop produced, the need for credit and experience in crop production were the major factors that farmers considered in arriving at a decision to get into a contract in the first place. The factors least mentioned as influencing farmers decision were proximity to firm and availability of family labour. Obviously farmers engaged in the production of fruits-pineapples, papaya, oranges and mangoes are more likely to consider contract arrangements with a typical fruit processing firm compared to non-fruit growing farmers.

When farmers were asked to indicate the factors that motivated them to remain or continue in contract participation after initial stage, they indicated that the assurance of a ready market and guaranteed price for produce were the most important motives as confirmed from the Friedman's Test of rankings of agreements. This finding is

very much consistent with similar results obtained by Gulati *et al* (2005) in India and Zhu *et al* (2003) in China.

It is worth noting from the results that, credit which was ranked as the second most important motive for entering into contracts initially (Table 6) now appears to be an insignificant motive for continued participation (Table 7). Indeed none of the processing firms surveyed provided credit of any kind to their out-growers/suppliers. Consequently farmers did not expect or relied any longer on sponsors for credit support but instead sought for an assurance that their products would be purchased and at a guaranteed price.

### 3.5 Logistic Results on Factors that Influence Farmers to Participate in Contracts

A logistic regression analysis on the 141 observations in farmer data set was run using the Econometric-views 3.1 software to determine the effects of the factors that influence farmers' participation in contract farming.

Table 8 presents the results of the estimated logistic regression of the model presented in equation (8). The McFadden  $R^2$  value of 0.222 is acceptable, particularly for logit models where evidence of goodness of fit points to a range of 0.20 to 0.40 (Sonka *et al* 1989; Harper *et al* 1990.). The  $F$ -statistic 41.662, which tests the overall significance of the model, is significant at the 1% level.

The availability of labour exerts a positive influence on a farmer's decision to participate in contract farming since fruit crop production is a labour intensive venture and this meets a priori expectation. The total farm size available to a farmer also has positive effect on participation, and significant at 10% level. However, the total size cultivated by farmer though significant exerted a negative influence on choice probabilities. The negative relationship between total farm size cultivated and choice probabilities could be due to the fact that smallholder farmers, who are predominantly resource-poor, are more vulnerable to market and price distortions and therefore tend to seek contract as a remedy to these challenges. The influence of a large proportion of smallholder farmers cultivating small areas of farmland may have accounted for the results obtained. On the other hand, farmers cultivating large acreages of fresh fruits tend to have better access market, either through their own export or through selling to other exporters. The distance from farm to processors firm is another important factor that drives farmers to engage in contracts. This factor impacted positively on farmers' decision to engage in contract farming, was statistically significant at 1% and was consistent with *a priori* expectation. Most processors purchase products by signing contracts with local farmers in order to ensure high quality, lock in adequate supplies and ensure timeliness of deliveries of fresh produce for processing. In fact response from one particular processing firm indicated that they sourced for pineapple, passion fruits and mangoes from as far as Burkina Faso, Mali and even far away South Africa albeit to meet shortfalls in local supply. Gender plays an important role in contract participation decision. At 5% significance level this variable met the *a priori* expectation and impacts positively on the decision of male farmers to engage in contract arrangement. Female farmers who are more resource-poor and have little or no access to land may be excluded from engaging in contracts with of high value horticultural produce.

Farmer's education level EDU\_S, years of farming experience F\_EXP and distance from farm to market centre D\_FTM do not impact significantly on the choice probabilities. It was expected that there would be a positive relation between farmer's education level and participation in contract farming contrary to observation by (Shakaya and Flinn, 1985; Akinola; 1987). The *a priori* expectation was not met neither was the variable statistically significant. The reason for this observation might probably lie in the fact that most well-educated farmers are more likely to have access to alternate source of marketing their produce other than through contract arrangements hence

they may not necessarily rely on processors or sponsors. The effect of distance of farm to the market centre D\_FTM was not statistically significant, and the direction is not consistent with *a priori* expectation. It was expected that farmers whose farms are farther away from market centre are more likely to participate in contract. This observation can be attributed to the fact that market access and competitive price offered for produce go hand in hand and this was consistent with observations made by Zylbersztajn (2003), Asenault (2004) and Zhu *et al* (2005).

#### 4.0 CONCLUSION

The study shows that there is a generally positive relationship between processors and producers of fruits in Ghana through contract farming. Smallholder farmers in Ghana generally showed a high desire and willingness to participate in contract farming arrangement with processors as a major partner in order to secure good market. However lack of opportunity, unperceived benefits, and the complicated nature of contract specifications prevented some farmers from engaging in contract arrangements. The personal considerations/factors that motivate fruit producing farmers to engage in contract arrangements with fruit processing firms in Ghana are basically the need for a reliable/assured market and guaranteed price for their produce. The motivation for farmers' participation in contract farming was influenced by the availability of labour, the gender of farmer, the total farm size possessed by the farmer, the area cultivated and the distance from farm to processors firm. From the study, it can be concluded that by virtue of the very high quality requirements by processing firms, smallholder farmers who are males, have available labour, who possess large farm sizes, cultivate small acreages and have their farms relatively distant from processing firms are more likely to participate in contract arrangement.

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**Table 1: Description of Variables in Empirical Model**

Variables	Definition
PICAI	Participate in contract arrangement (1=participate, 0= otherwise)
AGE	Age of farmer in years
GENDER	Sex of participant (1=male, 0=female)
EDUC	Educational level of farmer (1= secondary and above, 0=otherwise)
FSIZE	Total size of farm possessed by farmer measured in hectares
ALAB	Labour force available to farmer (in man days)
OFY	Off farm income (1= yes, 0= no).
PEXP	Previous experience in contract farming (1=yes, 0=no)
FTFDIST	Closeness of farm to firm (1=close, 0= otherwise)
EXCONTACT	Contact with extension officer (1=has contact, 0= has no contact)
FTMKTDIST	Distance from farm to the market (1=far, 0=close) (1-35km=close; >35km= far)

Distance chosen is adopted from Zhu *et al.*

**Table 2: Summary of Socio-economic Characteristics of Fruit framers**

Socio-economic Characteristics		No of farmers	% farmers
Gender	Male	131	93
	Female	10	7
Educational Status	Basic	65	46
	Secondary & above	76	54
Full time Farming		104	74
Earn off farm income		59	42
Extension contact		76	54

Source: Authors computation

**Table 3: Socio-economic Characteristics of Contract farmers and Non-contract Farmers**

Characteristics	Mean	Mean (CF)	Mean (NCF)
Age	44.10 (9.24)	43.99 (9.98)	44.29 (7.99)
No. of Years in farming	13.65 (9.60)	13.49 (9.69)	13.90 (9.70)
No. of labour used	6.10 (15.35)	8.21 (19.21)	2.67 (1.72)
Total farm size	14.36 (34.60)	18.67 (43.52)	7.35 (5.98)
Total farm size cultivated.	9.97 (27.96)	12.64 (35.16)	5.62 (4.74)

Source: Authors computation

Standard deviations are in parenthesis

CF= Contract farmers      NCF=Non-Contract farmers

**Table 4: Willingness to Participate in Contract Farming System**

Degree of Willingness To participate	Willing to participate	Not willing to participate	Total
Magnitude	43	12	55
Proportion %	78.2	21.8	100

Source: Authors computation

**Table 5: Reasons for Farmers Non- Participation in Contracts**

A variety of Reasons	No Opportunities	No Obvious Benefits	Complicated Process	Buyers show no interest	Total
Magnitude	23	10	13	9	55
Proportion %	41.8	18.2	23.6	16.4	100.0

**Table 6: Incentives to Engage in Contract Farming (Motive for First Entry)**

Motive	Type of produce	Credit/support	Experience in Crop	Proximity to firm	Household labour
Mean Score	1.16	3.21	3.25	3.36	4.02
Rank	1	2	3	4	5

Source: Authors computation

**Table 7: Motive for Continued Participation in Contract Farming**

Motive	Assured market	Guaranteed price	Training/ service	Credit	Input Supply
Mean Rank	1.30	1.80	4.20	4.44	4.57
Rank	1	2	3	4	5

Source: Authors computations

**Table 8: Logit Results of Factors Influencing Farmer’s Decision to Participate in Contract Farming**

Variable	Coefficient	Std. Error	z-Statistic	Prob.
PICA <sub>i</sub>				
C	-4.211	1.386	-3.037	0.002
<b>G_FMR</b>	<b>2.126</b>	<b>1.017</b>	<b>2.090</b>	<b>0.036</b>
EDU_S	-0.513	0.436	-1.178	0.238
<b>A_LAB</b>	<b>0.498</b>	<b>0.140</b>	<b>3.543</b>	<b>0.000</b>
F_EXP	-0.018	0.019	-0.938	0.347
<b>T_FSIZE</b>	<b>0.032</b>	<b>0.019</b>	<b>1.662</b>	<b>0.096</b>
<b>T_CUL</b>	<b>-0.063</b>	<b>0.028</b>	<b>-2.226</b>	<b>0.026</b>
<b>D_FTF</b>	<b>1.796</b>	<b>0.615</b>	<b>2.919</b>	<b>0.003</b>
D_FTM	0.275	0.446	0.617	0.536
Mean dependent var	0.607	S.D. dependent var		0.490
LR statistic (8 df)	41.66151	McFadden R-squared		0.2220
Probability(LR stat)	1.57E-06			
Obs with Dep=0	55	Total obs		140
Obs with Dep=1	85			

**Source: Authors computation**

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