DETERMINANTS OF PARTICIPATION IN CONTRACTING FARMING AMONG YAM FARMERS IN THE MION DISTRICT OF THE NORTHERN REGION OF GHANA

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ABSTRACT

The nature of risk and uncertainty associated with farming, particularly, rain-fed Agriculture, makes it less preferred by banks and other financial institutions in the provision of credit and other forms of financial services. Because of that, many farmers in the Mion District of the Northern Region of Ghana resort to informal financial sources of financing their farming enterprises including contract farming arrangements. Through multi-stage sampling techniques, 400 yam farmers in the Mion District were sampled to assess the driver of farmers' decision to enter a contract farming arrangement. Data was collected from the sampled farmers through interviews and focus group discussions. Descriptive and inferential statistics were applied in analysing the data. The study found socio-economic characteristics such as age, literacy, income, membership of the farmer-based organisation and farm size, and institutional factors such as access to credit, extension contact, and access to market as significant drivers of yam farmers' participation in contract farming. Young and educated yam farmers who belonged to farmer-based organizations were found more likely to be engaged in contract farming arrangements. Also, farmers with large farm sizes and those who have access to extension services and alternative income sources were also found more likely to be engaged in contract farming. However, farmers with access to credit and ready market were found less likely to be engaged in contract farming arrangements. It is recommended to the Department of Agriculture in the Mion District to facilitate farmers to more formalized contract farming schemes to help protect the interest of farmers.

Keywords: *contract farming, yam farming, northern region, yam productivity, and agricultural financing*

INTRODUCTION

Yam (Dioscorea spp.) which is believed to have originated in the Far East and spread westwards is now being widely cultivated in West Africa with Nigeria being the larger producer and Ghana the leading exporter (Nkere et al., 2020; Nweke, Aidoo & Okoye, 2019; Seal et al., 2014). Yam production accounted for roughly twenty-four per cent (24%) of total roots and tubers production in Ghana between 2017 to 2019 (Wumbei et al., 2019). The distribution of yam cultivation across Ghana is heavily influenced by weather, climatic and edaphic factors (Senanayake, 2019).

Yams do best in regions where yearly rainfall is between 1000 and 1500 mm and is evenly spread throughout six to seven months of the growth season (Aighewi et al., 2020). Ghana's highest-producing districts are situated in the country's middle belt and northern regions. Yam is grown in every region except the Central, Greater Accra, and Upper East. About 76% of yam production is concentrated in the Brong Ahafo, Northern, and Eastern Regions while Upper West, Ashanti, Volta, and Western Regions accounted for the remaining 24% (MOFA, 2016).

Yam is grown in Ghana in a variety of types. 'Pona' (white yam), 'Dente', 'Asana', and 'Serwa' are among them. Ghana's Crop Research Institute (CRI) has released new high-yield cultivars, such as the Mankrong and Kukrupa, in recent years. White yam/Pona, on the other hand, continues to be the most popular kind in both home and international markets (Yahaya, 2011; Millennium Development Authority [MDA], 2017). Most of the yam production in Ghana is done by smallholder farmers with rudimentary farm tools. As a result, yam farming in Ghana is labour-intensive, particularly in terms of land preparation. Between 2000 and 2005, the total yam output in Ghana increased by 16 per cent, owing primarily to an increase in acreage rather than in yam yield gains. However, between 2005 and 2010, both yields and total harvested area increased, resulting in a fifty-two per cent (52%) rise in total yam production (Salisu, 2016).

Yams provide a significant contribution to Ghana's socioeconomic development (Obidiegwu & Akpabio, 2017). Ghana exports about 12,000 tonnes of yams each year (Essegbey & MacCarthy, 2020). Not only in Ghana, but throughout Africa, the crop plays an important role in food security and famine alleviation (Fonjong & Gyapong, 2021). In Ghana, yam is mostly utilized for human consumption in the form of yam balls, mashed yam, yam chips, pounded yam, and cooked yam, among other yam dishes. Yam provides a pathway for poverty reduction and nutrition for the countries underprivileged. Since its production is mainly undertaken by smallholder farmers in the poorest areas of the country (Aighewi et al., 2020; Senanayake, 2019) yam production is seen as a pathway to poverty alleviation. Yam farming is a common practice in Ghana, where it plays an essential role in the people's nutritional, social, cultural, and economic lives.

The production, transportation, processing, and selling of yam give employment and income to rural smallholder farmers, particularly women, who play an important role as yam aggregators and marketers, contributing significantly to the rural economy in Ghana's primary producing areas. The crop (yam) is quickly becoming an important export commodity in Ghana, functioning as a foreign exchange earner and a source of cash for the government, as well as a raw material for starch and pharmaceutical enterprises (Sam & Dapaah, 2009). Ghana was the biggest exporter of the product in 2008, exporting 20,841 metric tons to Europe, the United States, and other African countries.

Despite its importance, yam output in Ghana has been declining, amid rising demand for both domestic consumption and export. High labour demand and high cost and scarcity of yam setts, unstable sources of financing, pests, and diseases, deteriorating soil quality and increasingly unpredictable weather conditions are the major constraints facing yam production in Ghana (ElDidi, Bidoli & Ringler, 2020).

Ghana faces several obstacles and opportunities when it comes to improving yam production. On one hand, due to declining land availability in the Brong Ahafo Region, where much of the production occurs, expanding yam production through the expansion of harvested area is limited (Mariwah, Evans & Antwi, 2019). On the other hand, it is thought that yam production can be raised by improving yields and reducing post-harvest losses. However, the lack of better yam setts poses a significant barrier to higher yield. Furthermore, despite the Ministry of Agriculture's target of reducing postharvest losses to approximately twelve per cent (12%), post-harvest losses for yam in Ghana are still high at 24% - two folds higher than the target (Mariwah, Evans & Antwi, 2019; MoFA, 2016). Weight loss owing to evapotranspiration exacerbated by sprouting, rotting due to fungal and bacterial infections, and insect infestation are the main sources of postharvest losses associated with yam production.

However, the country's capacity to capitalize on its comparative advantage and the increasing demand for yam globally is hampered by poor access to capital and a lack of a cost-effective production financing regime being experienced by yam farmers (efficient & Kwoseh, 2021). The cost of acquiring yam planting material is estimated to be as high as fifty per cent (50%) of the entire production cost in several cases (Udoh et al., 2016). As a result, growers save around 30% of their harvested tubers for the following planting season, lowering the overall yam output for consumption and commercialization (Udoh et al., 2016). Yam farmers in Ghana, therefore, need efficient input and output marketing regime that would help them meet their cost of production at an affordable rate and reduce post-harvest losses. Contracting farming in recent times is becoming the preferred financing option for farmers in Ghana (Nordjo and Adjasi, 2019; Azumah et al., 2017).

Contract farming engagement provides an institutional arrangement under which an agribusiness firm contracts the production of agricultural commodities out to farmers (Bellemare & Novak 2017). The trend towards contract farming is also evident in sub-Saharan Africa (SSA) where the institutional arrangement is considered a mechanism for helping

farmers to overcome pervasive market failures. Indeed, recent estimates based on multi-country surveys suggest that about 5 per cent of smallholder farmers in SSA are involved in contract farming arrangements (CFAs) and the number is increasing (Khan, Nakano & Kurosaki, 2019). Agribusiness firms and individuals in agricultural financing and produce marketing are increasingly engaging with smallholder farmers in contract farming arrangements for mutual interest (Bijman, Mugwagwa & Trienekens, 2020).

The participation of smallholder farmers in modern supply chains is considered a crucial contributor to rural economic development and poverty reduction (Rob & Cattaneo, 2021). However, smallholder market access is usually limited due to inefficiencies in input and output markets, and farm production is associated with high levels of risk. Market failures and risks lead to an underinvestment in inputs, technologies, and higher-value crops (Jones et al., 2019). Contract farming has emerged as an institutional response to market failures, with the potential to reduce risk, increase smallholder investments in inputs and technologies, and thus contribute to higher productivity and income as observed in many studies (Wood et a., 2021; Liverpool-Tasie et al., 2020; Gramzow et al., 2018; Mwambi et al., 2016).

Contract farming has become an increasingly popular institutional tool to ensure a regular supply of quality inputs or raw materials for processors, exporters, distributors, and supermarkets (Ragasa et al., 2018), while at the same time helping smallholder farmers overcome financial bottlenecks in production (Wood et a., 2021; Gramzow et al., 2018). Contract farming arrangements are potentially a win-win strategy for both buyers and farmers especially, in developing and transitional countries that experience a variety of market imperfections and poor public institutions (Oya, 2012). Contract farming may connect farmers to markets thereby increasing agricultural productivity across the world. It has the potential to bridge the gap created by governments' liberalization without warranting access to basic farming institutions and services including technologies, credit, and other inputs as observed in Ncube (2020) and Ragasa et al. (2018).

Contract farming is hailed by many researchers and development practitioners to be passive progress for the agricultural revolution in developing countries by solving the two major constraints of agricultural financing and marketing (Soluri, 2021; Ton et al., 2018; Alemu, Guinan & Hermanson, 2020; Maertens & Veide, 2017). Liverpool-Tasie et al., (2020) asserted that contract farming arrangements have the potential to address market failures and improve technology adoption, productivity, and welfare. In Ghana, governments, and donors for about a decade now have used contract farming as a strategy for increasing the adoption of new agricultural technologies and developing value chains (Poulton & Macartney, 2012).

Mion district is one of the major yam-producing districts in the northern region of Ghana. In 2016 the district cultivated 85,047 hectares of yam (MDA, 2017). The huge volumes of yam produced in the district draw the attention of agribusiness firms and market men and women providing contract farming services to the district. Some yam farmers in the district have been accessing the services of contract farming for many years. Some of the contractual arrangements are informal in which yam farmers make arrangements with middlemen who provide input or cash support to farmers with the agreement for them to sell their produce to them at a pre-determined price. Apart from the lack of informal sources of agricultural financing, some empirical studies have identified farmers' socioeconomic background and market factors as predictors of farmers' decision to participate in contract farming arrangements (Soluri, 2021; Guinan & Hermanson, 2020; Liverpool-Tasie et al., 2020). It is unclear whether these factors account for yam farmers in the Mion district participation in contract farming. Because most of the studies on contract farming focused on cash and high-value crops, unlike yam which is largely a food crop with low national and international market premiums. This study, therefore, investigated the factors influencing smallholder yam farmers in the Mion district participation in contract farming.

METHODOLOGY

This section focuses on a brief description of the study area, instruments used to collect needed data for this study, it also presents the research design, sampling procedure, data collection, and data analysis.

The study was conducted in the Mion District of the Northern Region of Ghana. The district is situated in Ghana's Northern Region, between 90° and 35° north latitude, 00°, and 30° west latitude, and 00° and 15° east latitude. The district is bordered by the Tamale Metropolis, Savelugu Municipal, and Nanton District (Fig 1). The district has a population density of 30.1 people per square kilometre and an area of 2,714.1 square kilometres (GSS, 2014).

The district has a generally dry climate, with only one rainy season that runs from May to October. Annual rainfall fluctuates between 750 and 1050 millimeters. The dry season runs from November to March/April, with the highest temperatures near the end of the season and the lowest temperatures in December and January. The Harmattan winds, which blow from December to early February, have a significant impact on the district's temperatures, which can range from 14°C at night to 40°C during the day. The Guinea Savannah woods, which are characterized by drought-resistant trees like the acacia, Shea, and dawadawa, is interspersed with shrubs and grassland across the district (GSS, 2014). The district is agrarian with 90% of its active labour force engaged in agriculture and other related activities for their livelihoods (GSS, 2016).

Figure 1: Map of Mion District Source: Ghana Statistical Service, (2014)

Research design and data collection

This study adopted a descriptive survey design in carrying out the study because the focus of the study was to describe the type of contract farming operating in the district and the factors influencing the participation of yam farmers in contract farming arrangements. As observed by Aggarwal & Ranganathan (2019) descriptive survey design is a basic type of inquiry that aims to observe (gather information on) certain phenomena, often at a single point in time using a cross-sectional survey to examine a situation by describing important factors such as demographic and socio-economic, attitudes, experiences, behaviours, and knowledge.

Records obtained from the Mion district department of agriculture revealed that the population of yam farmers in the district is 51,109 (Feed the Future Ghana District Profile Series - February 2017 and district MOFA office, 2020). Cochran's (1977) sample size determination formula was applied to determine the most representative and scientific sample size to use as:

n = $n = \frac{N}{1+Ne^2}$ ……………………………………………………………… (1)

Where n = sample size

N = target population of yam farmers

e = marginal error (5%) Thus N = 51,109

= $\frac{51,109}{1+51,109\ (0.05)^2}$ = 396

Adjusting for correction factors and unforeseen circumstances, the target sampled size was increased to 400 yam farmers. The study then employed a multi-stage sampling technique. Due to the special interest in contract farming participation. The Mion district was purposely selected because of the high level of yam production in the district and the widespread operation of contract farming in the area. At the second stage, ten (10) major yam producing communities with evidence of contract farming operation there were purposively sampled. The sampled communities are Kayong, Sang, Zanduli, Sakpeh, Sambu, Paanting, Dabogni, Zakpalsi, Tensung and Bofoyili. From the list of yam farmers in each sampled community, stratified random sampling was used to stratify the list of farmers into participants of contracting farming and non-participants. This was then followed by a simple random sampling of 239 participants of contract farming and 161 nonparticipants based on proportional representation.

Both quantitative and qualitative data from primary and secondary sources were collected. Primary data were obtained from yam farmers in the district. Secondary data were acquired from the department of agriculture, records of NGOs as well as published and unpublished sources. The Four hundred (400) yam farmers sampled were interviewed using an interview guide. Also selected experience yam farmers, operators of contract farming schemes and extension officers were interviewed as key informants for the study. Ten (10) focus group discussions, one in each sampled community, were also held to gather data on broad issues relating to yam farming, contract farming and other related matters. This was used to crosscheck and validate information obtained from the personal interviews conducted.

Data Analysis

The study adopted the Random Utility Theory (RUT) based on yam farmers' decision to participate in contract farming. The underlying economic theory of factors that influence the decision to participate in contract farming assumes that yam farmers are motivated by utility maximization (Shakya and Flinn, 1985; Zinnah, 1993). In other words, farmers

expressed rational choice of participating in contract farming if they think they stand a better chance of maximizing their profit.

The RUT is based on the following assumptions:

A) The generic decision-maker I, in making a choice, consider m_i mutually exclusive alternative that forms his or her choice as I^i. The choice set may differ based on the decision maker.

B) Decision-maker I assign to each alternative j in his or her choice of a set of perceived utility, $U_j^{i,}$ and select the alternative that maximizes this utility.

C) The utility assigned to each choice alternative depends on the number of measurable characteristics or attributes of the alternative itself and of the decision-maker; $U^i_j = U^i (X_j^i)$,

Where $X^i_{j\ is}$ the vector of attributes relative to alternative j and to decision-maker I.

Based on the above assumptions, the utility a farmer derives from participating in contract farming can be represented as having two components: a utility function of observed characteristics known as the deterministic component of utility and the unobserved component known as the random component. The deterministic component is exogenous and includes farmers' characteristics and product characteristics and a set of linearly related parameters and the random component may result from missing data/variables (omitted variable), measurement errors and misspecification of the utility function Yam farmers form expectations of the cost and benefit through analysis of contract farming arrangements. In line with Marenya and Barrett (2007) and Nkamleu and Adesina (2000), it is assumed that farmers behave consistently with utility (profit or gains) maximization and that yam farmer's participation in contract farming expected utility is greater than nonparticipation in contract farming. The utility (profit or gains) a yam farmer can derive from a product can be represented as having two components: a utility function of observed characteristics known as the deterministic component of utility and the unobserved component known as the random component.

The deterministic component is exogenous and includes yam farmers' characteristics and product characteristics and a set of linearly related parameters and the random component may result from missing data/variables (omitted variable), measurement errors and misspecification of the utility function.

This function is specified below:

ASij = Xβ +e ………………………………………………………………………...……………… (1)

Where,

$X\beta = \nu$ ……………………………………………………………………………… (2)

where ASij is the maximum utility attainable when alternative j is chosen by yam farmer i; Xβ is the deterministic component of the utility function, X is a vector of observable socio-demographic and economic characteristics, product-specific factors that influence utility, β is the unknown parameter vector to be estimated and e is the error term. For empirical purposes, the expected utility of participation Y can be construed from a yam farmer's observed binary choice of participation in contract farming which implies a probit regression model is preferred (Villegas, 2013).

The explicit probit regression model is expressed thus:

Y = F (ω + aXi) = F (Zi) ………………………………………………………… (3)

where Y is the discrete choice variable of participation in contract farming, F is a cumulative probability distribution function, is a vector of unknown parameters, X is a vector of explanatory variables as in (1) and Z is the Z-score of the Z area under the normal curve. The expected value of the discrete dependent variable in equation 2 is conditional on the explanatory variables, and given as:

E [Y/X] = 0 [1-F (a'X)] + [F(a'X)] = F9 a'X) ……………………..……………… (4)

The marginal effect of each explanatory variable on the probability of participation in contract farming is given by:

$\frac{\partial E[Y/X]}{\partial x}$ = = Ǿ (a'X)a ………………………………………………. ….. (5)

Where Ǿ (.) is the standard normal density function (Fufa and Hassan, 2006).

Following the above, the empirical model can be specified as:

Yi= βo +β1 X1i+ β 2 X2+…………………… β n X n +Ɛ ……………………...…(12)

Where;

Y =The dependent variable was Participation in contract farming X_1……….

X_n = independent variable as shown in Table 3.1

a = Intercept (constant) term; β1... βn=Standardized partial regression coefficients for independent variables. Ɛ = The error term

Table1 Description, measurement and hypothesized sign of variables used in the probit regression model

Variable	Description	Measurement	Hypothesized sign (a priori expectation)
Dependent Variable			
	Participation in contract farming	Dummied as Yes =1, no = 0	+
Independent Variables			
X_1	Age of respondent	Years	+
X_2	Sex of respondent	Dummied as 1= Male, 0= Female	+/-
X_3	Education	Years in school	+
X_4	Farm size	Acres	+
X_5	Experience in farming	Years in farming	+
X_6	Credit access	Dummied as Yes =1, no = 0	-
X_7	Farm ownership	Dummied as Yes =1, no = 0	+/-
X_8	Labour availability,	Dummied as Yes =1, no = 0	+
X_9	Household size,	Number of people	+
X_{10}	Other work,	Dummied as Yes =1, no = 0	+
X_{11}	Cultivation of other crops	Dummied as Yes =1, no = 0	+/-
X_{12}	Access to ready market	Dummied as Yes =1, no = 0	+
X_{13}	Access to extension service	Dummied as Yes =1, no = 0	+
X_{14}	FBO membership	Dummied as Yes =1, no = 0	+/-
X_{15}	Availability of contract farming opportunities	Dummied as Yes =1, no = 0	+

RESULTS AND DISCUSSION

Types of contract farming arrangements available for yam farmers

Two main types of contract farming arrangements are operating in the district. These are input support (Seed, fertilizer, and ploughing services) and financial support. This confirms the observation made by Bijman, Mugwagwa and Trienekens (2020), that there are several forms of contract farming arrangements for smallholder farmers and commercial farmers. These types are input support, technical support, financial support, guarantee market for farm produce, and market connections to buyers. Though, other types of contract farming opportunities or arrangements were available such as market connections to buyers, technical support, and a guaranteed market for farm produce. However, only a few of the yam farmers in the study area alluded to the fact that these contract farming arrangements or opportunities existed in their communities.

Analysis of farmers' response to which type of contract farming arrangement is available in the district for them to access is presented in Figure 2. As shown in the figure all the four-hundred farmers surveyed said they were aware of input support such as fertilizer, tractor ploughing services, seeds, and weedicides being provided by contract farming operators in the district. Also, 325 respondents (representing 81.2%), said they knew of financial support being offered by contract farming operators, and only 64 and 55 respondents respectively said technical support and market connections to buyers were available in the district.

Similar views abound in the analysis of responses gathered from the interview of key informants and the focus group discussions conducted. Another form of contract farming is labour outsourcing arrangement, where farmers provide labour in return for tractor services as was explained by a key informant in the Sang village:

"In the planting season, some of the tractor operators would plough either two or four acres for us and then plough either one or two acres for themselves. With the understanding that we would not pay for the ploughing, but we in return would provide labour for raising the yam mounds and weed the farm twice in the season to offset the cost of the ploughing services ……." (Key informant interview, Sang, Mion district, Ghana, 2021).

Another key informant at Sanbu village said;

> "for some time now, people bring yam setts for us to plant and pay back with yam after harvest. It is most difficult to get yam setts during the planting season, so we are forced to accept yam setts at higher cost" (Key informant interview, Sambu, Mion district, Ghana, 2021).

Analysis of information gathered at the various focus group discussions revealed how participants accept either cash or input supports, and sometimes both cash and inputs, from market queens and other middlemen with agreed terms to be repaid with yams. They explained that they are sometimes compelled to accept such offers at a high rate of exchange with their products because they have no other form of financing for their production. A key informant at Sambu village explained that:

> "During the planting season, the Accra Market Queens give us some amount of money, depending on the size of our farms to help us plough. We later pay back with our products at the price mostly lower than the current market price…" (Key informant interview, Sambu, Mion district, Ghana, 2021).

Another key informant from Zakpalisi lamented that:

> "For us, we are given money by the market women for us to cultivate the yam during the planting season because we don't usually have money to farm during that period. After, harvest, they are then giving the first option to buy, before we can sell the rest to other buyers……." (Key informant, Zakpalisi, Mion district, Ghana, January 2021).

The above views of participants suggest that farmers in the Mion district in one way or another have access to some level of contract farming opportunities for their farming business.

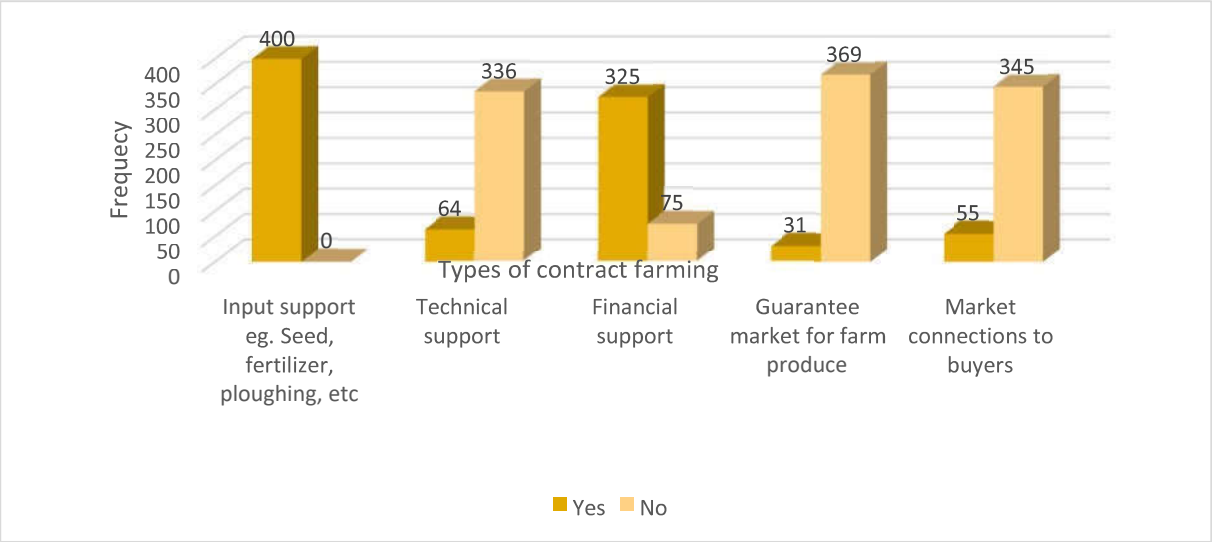

Figure 2: Types of contract farming arrangements available for yam farmers
Source: Field Survey Data, (2021)

Types of contract farming arrangements preferred by yam farmers

Yam farmers were asked which types of contract farming arrangements they would prefer to participate in. Analysis of their responses is presented in figure 3. As shown in figure 3, it was evident that all 400 (100.0%) of the yam farmers interviewed for the study were of the view that they preferred input support (Seed, fertilizer, and ploughing services) and financial support for their yam farming activities. Also, a greater proportion of yam farmers said they preferred the 'market connections to buyers' 311 arrangement (77.8%) while 239 (59.8%) said they preferred the 'guarantee market for farm produce' arrangement. However, none of the yam farmers preferred technical support as a contract farming arrangement.

A key informant, who is also one of the leaders of the district yam farmers association said;

> "Last year, we had support from agro-house to cultivate yam for export, the registered farmers were given yam setts and money which were helpful. But uncomradely we didn't hear from them this year. The other operators here only give financial support and some fertilizer and weedicide, but we need yam seeds and technical support regarding best production practices and how to access a better market for our produce…." (Key informant interview; Mion district, Ghana, January 2021)

From the above, it is perceived that most of the contract farming arrangements in the district are mostly cash and yam planting material. Farmers who benefit from such are forced to go by what these contractors proposed. This finding was not surprising because most farmers in developing countries like Ghana are resource poor. According to Wang (2021), it is usually poor farmers who go into input support and financial support under contract farming arrangements.

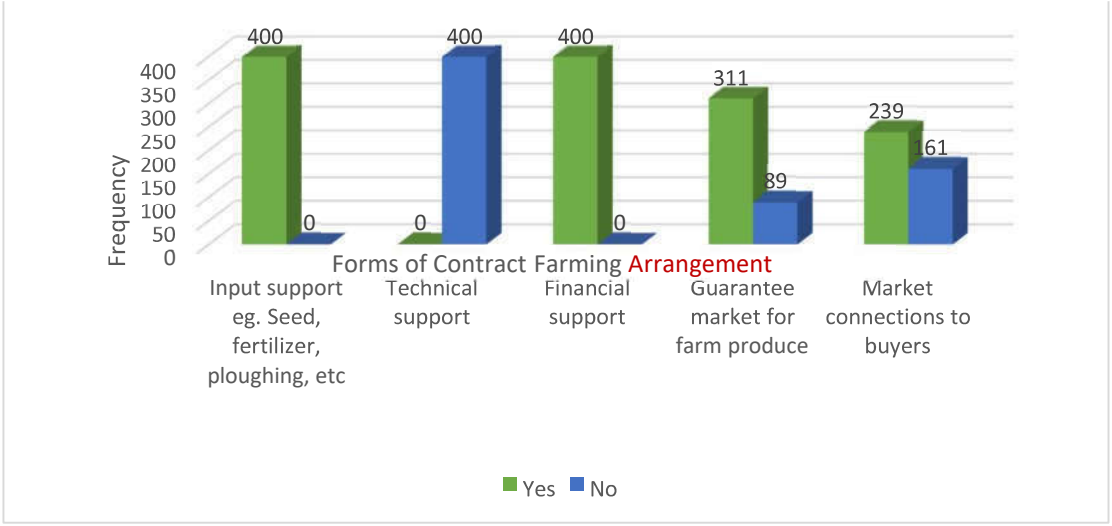

Figure 3 Types of contract farming arrangements preferred by yam farmers Source: Field Survey Data, (2021)

Factors influencing yam farmers' participation in contract farming

This section presents the results and discussion on the factors that are likely to influence yam farmers' participation in contract farming arrangements in the study area. The dependent variable participation in contact farming is a binary outcome measured as 1 if engaged in contract farming and 0 if otherwise. And this informed the use of the probit regression model as a binary choice model in assessing factors affecting participation in contract farming. The independent variables included in the model were socio-demographic characteristics such as sex, age, literacy status, household size, and income; farm characteristics such as farm size, labour, cultivation of other crops, and FBO membership and institutional factors such as extension contact, access to credit and market.

The probit regression results in Table 2 found socio-demographic characteristics such as age, literacy, and income and farm characteristics such as farm size, and FBO membership, and institutional factors such as access to credit, market, and extension contact as significant determinants of yam farmers' participation in contract farming. Specifically, age, farm size, and market access were significant at a 1% level of significance while credit access was significant at a 5% level of significance. However, literacy, FBO membership, extension contact, and income were all significant at a 10% level of significance.

Age of Respondents

The age of respondents was found to have a negative influence on yam farmers' participation in contract farming with a coefficient of -0.0025382. This implies that when age increases by one year, the likelihood that a yam farmer will vary his/her status of participation will be 0.0025382, holding all other variables at their mean values. This confirms Moges and Taye (2017) assumption that age is a determinant of contract farming participation. Also, Som et al. (2018) asserted that younger farmers were more likely to be attracted to agriculture if provided with contract farming arrangements. Rigg et al. (2020) also explained that as a person grows, there is an increase in risk aversion and hence older farmers' less desire to engage in contract farming. Also, the theory of older farmers being reluctant to change as explained by Dessart, Barreiro-Hurlé & van Bavel (2019) could account for the negative relationship between age and participation in contract farming.

Literacy

Literacy or ability to read and/or write was found to positively influence yam farmers' participation in contract farming with a coefficient of 0.0249428. This means that when a yam farmer can read and/or write, there is the likelihood that the farmer would participate in contract farming all things being equal. A similar finding was established in Azumah, Donkoh, and Ehiakpor (2016), that younger and more educated farmers with larger families and fewer assets were more likely to join contract farming.

Farm size

Farm size was found to have a positive influence on yam farmers' participation in contract farming with a coefficient of 0.0119225. This implies that yam farmers with large farm sizes are more likely to participate in contract farming than yam farmers with small farm sizes. Furthermore, farmers with large parcels of farmland would like to venture into

contract farming arrangements to access agricultural inputs and utilize their farmlands. This result is expected because one can argue that an increase in farm size makes one easily access contract farming opportunities. This finding agrees with Mishra et al. (2018) who found a positive association between contract farming and farm size. Also, an increase in land ownership leads to extra investment in the farming business as argued by Coggan et al. (2021).

FBOs membership

FBO membership among yam farmers was found to have a positive significant influence on yam farmers' participation in contract farming with a coefficient of 0.1152511. This implies that yam farmers who belonged to FBOs are more likely to participate in contract farming than non-members of FBOs if all things remain the same. Farmers belonging to FBOs are more likely to influence each other in terms of decision-making regarding participation in contract farming opportunities (Bello, Baiyegunhi & Danso-Abbeam, 2020). Also, a study by Baiyegunhi, Majokweni and Ferrer (2019), reports that during meetings of FBOs members in the groups try to influence each other positively in terms of financial opportunities. Additionally, group members also tend to influence each other especially individuals within the group who have been victims of a violation of contracts by contracting firms or buyers (Di Marcantonio, Ciaian & Fałkowski, 2020).

Market Access

Access to a ready market was found to negatively influence yam farmers' participation in contract farming with a coefficient of -0.1265822. This implies that yam farmers who do not have better market access were more likely to participate in contract farming than yam farmers with efficient market access. According to Bezabeh et al. (2020) participation in contract, farming is farmers' response to market failures and as such where farmers have better access to efficient input and output market, they will be less attracted to contract farming schemes. Also, Polimeni, Iorgulescu and Mihnea (2018), reported that farmers without market access would prefer to have an already determined buyer for their goods before producing. Though, Vamuloh, Kozak, and Panwar (2020) presented a contrary view arguing that contract farming presents opportunities for farmers in developing countries to access financial, input, and output markets for improved production planning and productivity.

Credit Access

Access to credit was found to negatively influence yam farmers' participation in contract farming arrangements with a coefficient of -0.0000565. This means that when a yam farmer has access to credit, there is a high likelihood that such a yam farmer might not participate in contract farming. According to de Janvry and Sadoulet (2020), most farmers may not necessarily be interested in contact farming opportunities, but lack of credit would force them into taking up contract farming opportunities. Also, most farmers do not have access to credit facilities due to the systemic weakness of agricultural institutions in developing countries.

Extension contact

Access to extension services, particularly farmers having direct contact with extension agents or channels of agricultural information delivery was found to have a positive significant influence on yam farmers' participation in contract farming with a coefficient of 0.0142475. This means that when a yam farmer has access to extension services, there is a high likelihood of such a farmer participating in contract farming than otherwise. This study is supported by Sifundza (2019) that farmers who have constant access to extension services are likely to be well-informed on the prospects and challenges of contract farming. Thereby, leading to a positive decision in terms of participation in contract farming opportunities.

Other sources of income

Other sources of income available to yam farmers had a positive influence on participation in contract farming with a coefficient of 0.5804056. This is explained by the fact that yam farmers with other sources of income have the resources and the incentive to invest in contract farming and ensure timely delivery of the yam to buyers. In addition, farmers with higher other sources of income are more willing to take part in contract farming due to the assurance of income in case contract farming fails. On the other hand, farmers with low other sources of income are reluctant to take the risk of contract farming since other products are their main source of income hence, they feel they have low security. Though, Azumah et al. (2016) also reported a different view that other sources of income had a negative effect on contract farming meaning that a decrease in one unit of another source of income would increase the probability of a farmer participating in contract farming as a compensatory mechanism.

Table 2: Factors influencing yam farmers' participation in contract farming

Participation	Coefficient	Std. Error	Z	P>|z|

Sex	-0.1673599	0.1971198	-0.85	0.396
Age	-0.0025382***	0.0055249	-0.46	0.006
Literacy	0.0249428**	0.0147482	1.69	0.091
Household size	0.0069737	0.0158875	0.44	0.661
Farm size	0.0119225***	0.0241213	0.49	0.001
FBO membership	0.1152511*	0.1456695	0.79	0.039
Extension contact	0.0142475*	0.2029297	0.07	0.044
Access to credit	-0.0000565**	0.1600742	-0.00	0.016
Market Access	-0.1265822***	0.2262561	-0.56	0.006
Access to labour	0.114114	0.2168647	0.53	0.599
Cultivation of other crops	-0.1116444	0.2894015	-0.39	0.700
Other sources of income	0.5804056*	0.3238895	1.79	0.073
Perception of contract farming	-0.142662	0.2003574	-0.71	0.476
Attitude towards contract farming	-0.2043435	0.2955597	-0.69	0.489
Cons	0.0841408	0.29555	0.10	0.918
Number of observations	400			
LR chi^2 (17)	11.37			
Prob > chi2	0.000			
Pseudo R2	0.680			
Log pseudo-likelihood	-263.92132			

***, ** and * denote that the variable is significant at less than 1%, 5% and 10% respectively Source: Field Survey Data, (2021)

Conclusion and Recommendations

Provision of financial support to yam farmers to invest in their farming and/or provision of input supports such as yam seeds, fertilizer, tractor services, weedicide, and other agro-chemicals, in return for farmers paying with their yam produce at agreed terms are forms of contract farming arrangement available to yam farmers in the Mion district of the northern region. Age, literacy, Farm size, FBO membership, Credit access, Extension contact, Market Access and other income sources were significant determinants of yam farmers' participation in contract farming. Young and educated yam farmers who belonged to farmer-based organizations were found more likely to be engaged in contract farming arrangements. Also, farmers with large farm sizes and those who have access to extension services and alternative income sources were also found more likely to be engaged in contract farming. However, farmers with access to credit and ready market were found less likely to be engaged in contract farming arrangements.

It is recommended to the department of agriculture in the Mion district to facilitate farmers to more formalized contract farming schemes to help protect the interest of farmers. Also, the district assembly and department of agriculture in the district should encourage the establishment of the farmer-based organization as it helps in the speedy dissemination of agricultural information and availability of agricultural inputs and other services support. It is also, recommended that farmers should pay more attention and do broader consultations before signing up to some of the terms of agreement put forward by operators of contract farming schemes.

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