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Analysis of Factors Influencing Decision and Level of Participation in Sorghum Contract Farming: A Case in Laikipia County

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Abstract
Contract farming (CF) can be a panacea that can solve the issues of sorghum productivity in sub-Saharan Africa (SSA). In Kenya, farmers who engage in CF have increased the productivity of their sorghum enterprises. This study assessed factors behind low farmers' participation in CF in Laikipia county, despite the recorded benefits. A multistage sampling was used to select the 192 respondents that were included in the sample. A double hurdle model (DH) approach to analyze the factors influencing decision to participate in CF and the intensity of participation. Land tenure, land size, distance to a major town, belonging to a social group, and extension contacts were significantly influencing the decision to participate in CF. Farming experience, access to extension education, credit access, and land tenure were significantly influencing the intensity of CF participation. The study concludes that the County Government of Laikipia and the East Africa Malting Limited agents should beef up extension services to enhance more sorghum CF participation and intensity. The County government through the Department of Social Services to strengthen informal and formal farmer groups to increase their farmers' access to government services such as extension and credits.
Keywords: Contract farming, Sorghum, Participation, Decision, Intensity, Double Hurdle
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1. Introduction

Smallholder farmers in sub-Saharan Africa face many challenges that limit their productivity and profitability. Contract farming (CF) can be vital in reducing these challenges (Oya, 2012). For a long time in sub-Saharan Africa, written formal contracts have not been used especially by farmers. Informal agreements have been used over years and are still accepted in many of these countries (Fafchamps, 2003). Over the years this is changing and formal contracts are been used to enhance commercial farming. CF is proving to be successful for many African countries in enhancing productivity, profitability, and diversification; it is not necessarily the solution for many market failures in agriculture (Wainaina *et al*., 2012).

More than 230,000 households in Kenya were in CF arrangements for tea, sugarcane, oilseeds, tobacco, and horticultural commodities by the mid-1980s. It is estimated that more than 1 million out of 4 million farming households in Kenya were contract farmers by the year 2010 in coffee, tea, dairy cattle, barley, sugarcane, vegetable crops, and maize (Oya, 2012). Since over 70% of the population in Kenya lives within the rural setup and depends on agriculture for livelihood, improving smallholder farmers' access to markets both internationally and locally could be a great strategy in achieving better livelihoods for the smallholder rural farmers.

There is an increased demand for sorghum mainly in brewing yet the amount produced by farmers is too low to satisfy the current market demand (Okuthe, *et al*., 2013). Sorghum production in Kenya rose from 140,000 metric tons in 2016 to 150,000 metric tons in 2017 representing an increase of 7.14%. However, in the same year, 94.4 Kt worth 18.7 million dollars of Sorghum was imported to meet the demand shortfall mainly from the United States, India, Tanzania, and Uganda (Njuguna, 2018).

In Laikipia County, canola, soya bean, sunflower, Rhode grass, and sorghum have mainly been grown under CF for the last five years (Ministry of Agriculture Livestock and Fisheries, 2015). However, sorghum has proved to yield better results due to its drought-tolerant nature and this has seen a tremendous rise in the number of farmers growing the cereal in Laikipia. Sorghum farmers, therefore, have a higher advantage compared to other crops as they can meet the demand of the contracting agency.

Contract farming is a scheme also to enhance forward and backward market linkage for agricultural production. There are proof and evidence where CF has a positive impact on productivity and improved farmers' welfare (Okuthe et al., 2013; Oya, 2012; Wainaina et al., 2012). In Laikipia, the County Government and other stakeholders like the East African Malting Limited are implementing a program on CF for sorghum farmers to increase the productivity and profitability of the smallholder farmers. Despite the recorded benefits, the Department of Agriculture (2017) reported few farmers (500) who participated in the CF scheme in Laikipia

county. Low farmers' participation and profitability in sorghum contract farming in Laikipia is not clear. The study filled the existing knowledge gap.

2. Methodology

2.1 Study area

Laikipia County is in the South Rift region of the country and covers an area of 9,462km^2. The county's population was 541,985 persons by 2018 according to the 2019 population census projections (County Government of Laikipia, 2019). Out of the total landmass, arable land constitutes 1,984km2, non-arable land constitutes approximately 7,456km^2, and urban areas 243.3 Km^2 with the average landholding been 3.33 Ha. The county receives an average of 400mm and 700mm rainfall annually and means annual temperatures of between 16^{0}c and 26^{0}c (Ogega, 2017).

2.2 Sampling Procedures and Data Collection

The smallholder sorghum farmers in Laikipia are estimated at 3,500 (Ministry of Agriculture Livestock and Fisheries, 2015). Cochran's formula was used in calculating a sample size from the population according to is Yamane (1967) as follows:

$$n = \frac{N}{1+N(e^2)} \quad (1)$$

This is at 95% confidence level while p = 0.5, n is the size of the sample, N is the population size, and e is the level of precision of 7%. The study sample was 192 farmers from the calculation of the sample size as follows;

$\frac{3500}{1+3500(0.07^2)}$ = n= 192

Multistage sampling was used to select the respondents that were included in the sample. To begin with, Laikipia West and East sub-counties were selected using purposive sampling. Secondly, wards within the two sub-counties were selected by random sampling. Checklists from the County Department of Agriculture were used to identify small-scale farmers who grow sorghum within the wards. Data from respondents for this study were collected using semi-structured questionnaires. The enumerators were subjected to training prior to the onset of the survey. Most of them understood the local dialect that the majority of the farmers in Laikipia county use. The government agricultural officers with knowledgeable village elders assisted the enumerators in accessing households. The research experienced only four cases of nullified questionnaires due to many unanswered questions.

2.3 Analytical Framework

This study used a double hurdle model (DH) approach to analyze objective two. The method assumes a parametric generalization of the Tobit model developed by Cragg in 1971. According to Cragg (1971), participation decision and its level are in two levels; first, a farmer has to decide whether to participate or not to participate, and second is the intensity of participation. The model by Cragg is as follows:

$D^*_i = \alpha Z_i + V_i$ (2)

$Y^*_I = \beta X_i + U_i$ (3)

where Di = {1, if Di* > 0; 0 if Di* ≤ 0} and Yi = {Y*, if Y_i > 0 and Di*> 0; 0, if otherwise}

Di* – latent variable if a farmer participates in CF and makes the level 1and 0 if otherwise

Zi – vector of variables explaining the participation decision in CF (age, education, gender, farm size, access to credit, contact with extension services, and land size, etc.)

Y^*_I – latent variable describing the level of farmer participation in CF i.e., acreage allocated to sorghum growing under CF;

Xi – vector of variables that explain the level of participation in CF (see Table 1).

Vi and Ui are stochastic error terms

Table 1: Variables used in the Double Hurdle model and their description

Variable	Description of each the variable	Measurement unit	The variable type
	Research dependent variables		
PARTPC	Whether a household participates in sorghum CF	1= Yes 0=No	Dummy
PLVL	Level or intensity of participation in CF	Acres	Continuous
	Independent variables		
AGE	Age of the HH head	In Years	Continuous
GENDER	Gender of the HH head	1=Male 0=Female	Dummy
EDUCLVL	Education level	1=None 2=Primary 3=Secondary 4=Tertiary 5=Adult literacy	Dummy
LANDCT	Total area household cultivates	Acres	Continuous
EXTAC	Number of agricultural extension visits for the past year	Number of times	Continuous
GRPMB	Whether a farmer was a group member and active or not	1=Yes 0=No	Dummy
MRKDT	Distance of the household from the nearest market/collection centre	Kilometers	Continuous
TWNDT	Distance of the household from the nearest town	Kilometers	Continuous
LNDTNR	Land tenure	1=Owned title 0=Leased	Dummy
LANDSZ	The total land size owned by a household	Acres	Continuous
HHSIZE	The number of members in a household	Persons	Continuous
EXPRC	Farming experience of		
CDTAC	Whether a farmer sought credit	1=Yes 0=No	Dummy

3. Results and Discussions

3.1 Socioeconomic characteristics among smallholder sorghum farmers in Laikipia County

The descriptive statistics results for the socioeconomic characteristics (continuous variables) of the sorghum smallholder farmers in Laikipia County are presented in Table 2. A t-test was run on the socioeconomic characteristics to detect differences among the participants and non-participants of contract farming.

Table 2: Descriptive statistics results of the socioeconomic characteristics for continuous variables

Variable	CF Non- Participants (N=105)		CF Participants (N=83)		P-Value
	Mean	Std. Dev	Mean	Std. Dev	
Age of the household head	45.81	12.93	46.34	10.76	0.765
Education level	3.27	0.82	3.45	0.72	0.119
Farming experience	9.13	6.12	9.04	5.66	0.912
Land size (acres)	3.95	3.00	6.73	6.09	0.000***
Land under sorghum (acres)	1.34	0.09	2.24	1.99	0.004***
Distance to market (Km)	4.41	2.56	3.79	2.19	0.084*
Distance to town (Km)	27.10	12.11	12.94	8.03	0.000***
No. of extension visits	0.029	0.218	2.012	1.581	0.000***

***, **, *** statistic is significant at 10%, 5% and 1% level respectively**

The mean age of the household head for the CF non-participants and participants was approximately 46 years. The majority of the farmers who had attained secondary school and tertiary education participated in the CF scheme. The farming experience among the two groups was 9 years. These are the number of years when individual sorghum farmers in Laikipia County made independent decisions to engage in sorghum production as an enterprise. Experienced farmers also understand technology improvement over the years. For instance, they

have embarked on improved sorghum varieties (ISV) such as Gadam, Sila, Serena, and Seredo (see Figure 1).

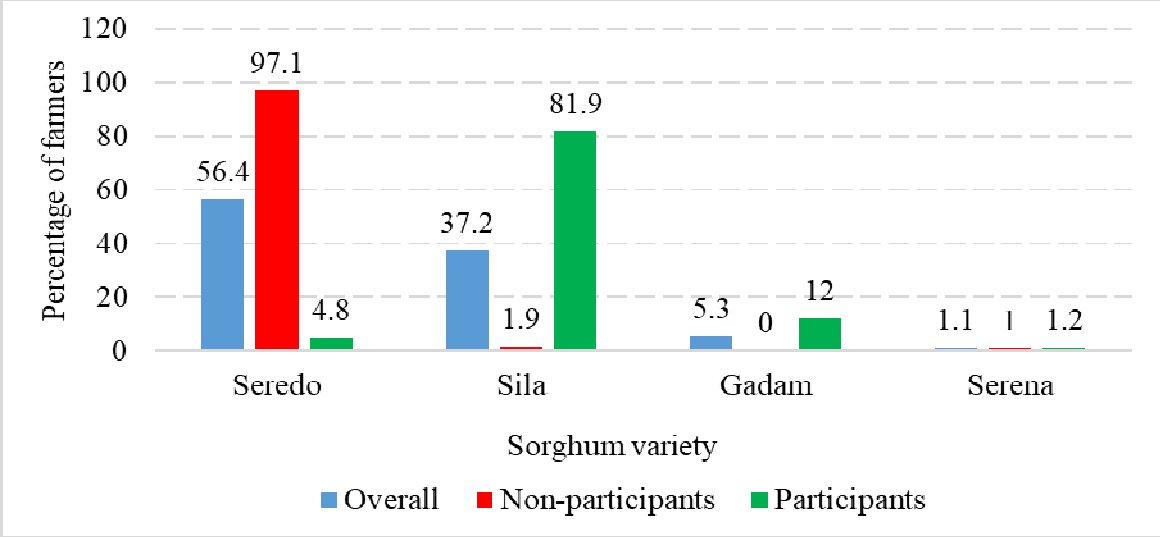

Figure 1: Sorghum variety grown in Laikipia county

A strong significant difference existed in total land acreage and acreage under sorghum varieties ($p<0.01$). The significantly higher acreage among CF participants over non-participants in the current study reveals the benefits these groups of farmers accrued from CF in Laikipia County. The CF participants of sorghum farming were about 13 Km from the nearest towns which was significantly ($p<0.01$) shorter than the 27 Km that non-participants traveled to access the towns. The non-participants of CF in sorghum production accessed significantly ($p<0.01$) fewer extension services than their participating counterparts.

Table 3: Descriptive statistics results of the socioeconomic characteristics for the dummy variables

Variable	CF Participation				
	Outcome	**Non-participants (N=105)**	**Participants (N=83)**	**Pearson Chi²(1)**	**P-value**
Gender of HH head	Female	30 (28.6%)	20 (24.1%)		
	Male	75 (71.4%)	63 (75.9%)	0.476	0.490
Group membership	No	52 (49.5%)	10 (12%)		
	Yes	53 (50.5%)	73 (88%)	29.46	0.000***
Access to credit	No	83 (79%)	54 (65.1%)		
	Yes	22 (21%)	29 (34.9%)	4.588	0.032**
Awareness on CF	No	79 (75.2%)	0 (0%)		
	Yes	26 (24.8%)	83 (100%)	107.71	0.000***
Ownership of title	No	104 (99%)	15 (18.1%)		
	Yes	1 (1%)	68 (81.9%)	130.84	0.000***
Off-farm income	No	86 (81.9%)	60 (72.3%)		
	Yes	19 (18.1%)	23 (27.7)	2.471	0.116

***, **, *** statistic is significant at 10%, 5% and 1% level respectively**

The CF non-participants who headed their families among the sorghum smallholder households and were male were 75 and their number was not significantly different from 63 of those men who headed their families among the participants. The CF non-participants that belonged to organized social groups were 53 while the participants were 73. The difference in their participation in organized groups among CF non-participants and participants was statistically significant at 1% level ($p<0.01$). Sorghum CF non-participants who accessed credit for sorghum enterprises was lower than that of the participants who accessed credit in Laikipia County. The difference in credit access among participants and non-participants was significant at 5% level ($p<0.05$). The CF non-participants (26) who were aware of CF significantly differed ($p<0.01$) from that of participants (83). The number of sorghum CF non-participants who owned land and had their title deeds was significantly ($p<0.01$) lower than that of participants. Off-farm income did not significantly ($p=0.116$) differ between participants and non-participants of contract farming of sorghum (Table 3).

3.2 Econometric model results

The subsection gives the results of the econometric modeling of the Cragg's double hurdle (DH) model.

3.2.1 Model specification tests

To check on the specification errors in Cragg's double hurdle model, the analysis looked for the significance of

hat squared (_hatsq). The results of this test (see Appendix 1) shows that the value of _hatsq was 0.1909 and was insignificant which confirms the correctness of the model specification. Appendix 2 confirms the absence of multicollinearity because both individual and mean VIF values were below 10. The results in Appendix 3 reveal no problem with the influence of outliers in the model because the mean, minimum and maximum values of Cook's D were less than one (D<1). A leverage test was run to see if an observation influenced the regression coefficients. If the value of leverage is above 0.5 and closer to 1 ($0.5 \leq x \leq 1$), then a problem of an observation influencing regression coefficients exists in the model. The problem did not exist in the model as indicated in Appendix 4.

3.2.2 Factors influencing decision and intensity to participate in sorghum CF among smallholder farmers in Laikipia County

The results of the first hurdle in Cragg's model are in Table 4 reveal that five explanatory variables including land tenure, land size, distance to a major town, belonging to a social group, and extension contacts were significantly influencing the decision to participate.

Table 4: Probit estimates on the decision to participate in sorghum contract farming among smallholder farmers in Laikipia County

Variable	dy/dx	Std. Err.	z	P>z
Age	0.001	0.002	0.62	0.534
Education level	0.025	0.024	1.04	0.299
Gender	-0.001	0.032	-0.03	0.977
Land tenure	0.228	0.051	4.45	0.000***
Farming experience	-0.005	0.004	-1.2	0.232
Land (acres)	0.014	0.004	3.15	0.002***
Distance to market	-0.004	0.004	-0.88	0.378
Distance to town	-0.003	0.001	-1.9	0.058*
Off-farm income	-0.043	0.044	-0.99	0.323
Group membership	0.093	0.051	1.82	0.068*
Credit access	-0.040	0.036	-1.1	0.270
Extension education visits	0.177	0.045	3.92	0.000***
Model summary				
N	188			
Log likelihood	-23.219			
LR chi^2 (18)	211.61			
Prob. > χ^2	0.000			
Pseudo R^2	0.8200			

Note: *, **, * statistic is significant at 10%, 5% and 1% level respectively and dy/dx denotes marginal effects**

Land tenure (p<0.01) positively influenced the probability of participating in contract farming among smallholder sorghum farmers in Laikipia County. The marginal effect value depicts that as a farmer acquires a title deed (freehold tenure), the probability of deciding to participate in sorghum CF would increase by 22.8% while holding other factors at *ceteris paribus*. This means that the leasehold regime significantly reduces the probability of sorghum farmers participating in contract farming. Ogeto *et al*. (2013) found that majority of the farmers who did not participate in sorghum production in Nakuru County were those under leasehold tenure regime. The research noted that leasehold contributes to tenure insecurity which in return negatively influences the effectiveness of farming activities. Dlamini and Masuku (2011) confirmed that tenure security contributes to the improvement of land through access to facilities such as credit.

Land size significantly (p<0.01) influenced participation in sorghum CF. An additional acre in sorghum production increased the probability of farmers participating in CF by 1.4% *ceteris paribus*. Many studies have shown that an extra acreage under the control of a farmer increases the probability of adopting yield and profit-enhancing schemes and technologies (Akpan, Nkanta, & Essien, 2012; Okoffo, Denkyirah *et al*., 2016; Teshome & Tegegne, 2020; Timu *et al*., 2014). The findings concurred with those of Katengeza *et al*. (2012), Akumu, Odongo, & Mugonola (2020), Mbaabu & Mbugua (2019), and Okeyo *et al*. (2020b) but contradict those of Abdulai & Al-hassan (2016) and Leung, Sethboonsarng, & Stefan (2009). Abdulai & Al-hassan (2016) explained that farmers with smaller farm sizes are pushed to adopting contract farming due to their frantic situations that keep them off commercial farming.

Distance to a major town had a significant (p<0.1) negative influence on the decision to participate in sorghum CF. An additional kilometer reduced the probability of a sorghum farmer participating in CF by 0.3%. Several authors show the advantages of farmers being closer to towns (Akpan *et al*., 2012; Kunzekweguta, 2016). According to these authors, farmers close to the market have a higher probability of accessing production inputs and updated market and technology information more than their counterparts in areas far from towns.

Group membership was a positive determinant of participation in sorghum contract farming in Laikipia County. The influence was weak and significant at 10% level ($p<0.1$) where a participant of CF is more likely to have belonged to a group than the non-participating counterparts by 9.3%. The findings compare well with those of Ogeto *et al*. (2013). It is expected that membership to an organized group or association would increase farmer's decision to adopt new technologies or participate in new schemes such as contract farming because of the increased uptake of new information that is shared within the group (Ogeto *et al*., 2013).

Extension contacts had a positive influence on smallholder sorghum farmers' participation in contract farming. The influence was significant at 1% level ($p<0.01$) in which an additional contact between an agricultural officer and a sorghum farmer increased the probability of the farmer deciding to participate in contract farming by 17.67%. Comparable findings were reported by Abdulai and Al-hassan (2016), Mbaabu and Mbugua (2019), and Rondhi *et al*. (2020). The researchers found out that farmers who participate in contract farming are taught various agricultural management skills in crop production that enable them to increase their yields such that they are capable of meeting the quantities required by the contracting company.

The second hurdle determined factors that influence the intensity of CF participation by smallholder sorghum farmers engaged in the scheme in Laikipia County. The intensity of participation was assessed through the acreage of land that was allocated for sorghum production under contract farming. The truncation model showed that four explanatory variables including farming experience, access to extension education, credit access, and land tenure were significantly influencing the intensity of CF participation. The results are presented in Table 5.

Table 5: Truncated model estimates on the intensity of participation in contract farming among smallholder farmers in Laikipia

Variable	Coef.	Std. Err.	z	P>z
Age	-0.053	0.056	-0.94	0.349
Gender	-0.243	0.933	-0.26	0.795
Farming experience	0.193	0.111	1.75	0.081*
Education level	0.920	0.728	1.26	0.207
Distance to market	-0.151	0.011	-1.39	0.016**
Land (acres)	0.035	0.076	0.46	0.643
Distance to town	-0.015	0.052	-0.28	0.777
Group membership	0.982	1.620	0.61	0.544
Extension education visits	2.170	1.266	1.71	0.086*
Credit access	2.149	0.830	2.59	0.010***
Land tenure	-2.682	1.103	-2.43	0.015**
Off-farm income	-0.060	0.986	-0.06	0.952
Model summary				
Log-likelihood	-155.386			
_cons	2.421	4.012	0.6	0.546
/Sigma	2.548	0.340	7.51	0
Wald $chi^2(13)$	26.320			
Prob. > χ^2	0.015			

Note: *, **, * statistic is significant at 10%, 5% and 1% level respectively and dy/dx denotes marginal effects**

The farming experience was a positive determinant of the intensity of CF participation among the participants. The influence was significant at 10% level ($p<0.1$) which indicates that an additional year in sorghum farming increased the intensity of CF participation by 0.19%. The farming experience was also found to influence the intensity of participation in the adoption of new technologies among sorghum farmers (Musara *et al*. 2019). In the current research, a plausible explanation for the positive influence of sorghum farming experience is that farmers had at least 9 years of farming experience. The experience enhances farmer's capability of commercializing sorghum production due to their ability to use and process any relevant information for the enterprise. With the experience, farmers are confident that they can produce the quantity of produce in the contractual agreement.

Distance to the market negatively influenced of the intensity of CF participation among the participants at 5% level ($p<0.05$) implying that an extra Kilometer to the sorghum collection center reduced the intensity of CF participation by 0.15%. The findings concur with those of Musara et al. (2019) and Mwangi et al. (2020a). Musara et al. (2019) attribute the influence the to the extra cost involved in the transportation of the produce to the collection centers of the contacting agency.

Access to agricultural extension education significantly increased the intensity of participation in CF at 10% level ($p<0.1$). The findings imply that among the CF participants, smallholder sorghum farmers who accessed extension education increased the acreage of the crop under contract farming by 2.17%. In the current study, it

was expected that as CF participants access agricultural education, they would increase acreage under sorghum produced through contract farming. Several studies found similar findings (Dlamini & Huang, 2019; Katengeza *et al*., 2012; Musara *et al*., 2019; Mwangi *et al*., 2020; Rondhi *et al*., 2020). They allude that due to the extension information flow that would enlighten sorghum farmers about CF and good agricultural practices, farmers would increase their intensity of participation in the scheme by allocating more land acreage to sorghum production under contract.

Credit access positively influenced the intensity of CF participation among the participants at 1% level (p=0.01). The findings imply that a CF sorghum producer who accessed credit increased the farmer's intensity of participation in the scheme by the allocation of more land to sorghum production. The findings are consistent with those of Nonvide (2020) in Benin. Nonvide (2020) asserts that access to credit enables a farmer to afford and make the purchases of inputs in time. In this line of argument, sorghum CF participants can expand their land under sorghum since they can meet the costs associated with the expansion process. However, the findings of the current study contradict those of Hiko *et al*. (2020) and Mwangi *et al*. (2020) in sorghum and improved sorghum varieties production in Ethiopia and Kenya respectively. These studies found that as farmers accessed credit, the intensity of sorghum production reduced significantly. According to Mwangi *et al*. (2020), a negative influence of credit access on land allocated to sorghum means that farmers may use the money on other farm and non-farm activities at the expense of sorghum enterprise.

Land tenure negatively influenced the intensity of CF participation at 5% level ($p<0.05$). The findings imply that as CF participants acquire security of tenure, they reduce the acreage under sorghum by 2.68%. These findings are unexpected and contradict those of Ogeto *et al*. (2013) who assert that farmers who own land are likely to expand sorghum production at their discretion. In the current study, the negative influence of land tenure on the intensity of participation in CF could be attributed to the fact that a farmer has the discretion to switch to other more fashionable and valuable crops that may fetch good prices due to market dynamics.

4. Conclusion and policy implication

Farmers with bigger land are encouraged to produce under CF due to reduced risks of the market since the contracting company offers a ready market for their produce. Distance to town reduces the probability of farmers participating in CF due to reduced access to government and private sector services. Many farmers in groups gained more benefits from farmer groups such that they did not switch to contract farming. Extension officers had a great influence on farmers participating in contract farming and increasing the intensity of participation. Access to credit aided in increasing the intensity of participation in CF probably due to the ability of farmers to expand their land under sorghum since they were able to meet the costs associated with the expansion process. Land tenure did not favor the intensity of participation in CF since a farmer has the discretion to switch to other more fashionable and valuable crops.

The County Government of Laikipia could improve on the extension services to augment those offered by the East Africa Malting Limited agents so that more farmers can join the scheme. This is underpinned by the fact that the majority of farmers who did not receive information about CF and training about sorghum farming did not engage in the CF initiative. The County government through the Department of Social Services to strengthen informal and formal farmer groups. In this regard, farmers in welfare and farmer groups should be trained to allow more ideas about contract farming to increase the probability of more farmers joining the CF to gain the benefits associated with the scheme.

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Conflict of Interest
No potential conflict of interest was reported by the authors.

Appendices
Appendix 1: Checks on Specification Errors

```
. linktest
```

Source	SS	df	MS	Number of obs =	188
				F(2, 185) =	376.66
Model	37.2165849	2	18.6082924	Prob > F =	0.0000
Residual	9.1397981	185	.049404314	R-squared =	0.8028
				Adj R-squared =	0.8007
Total	46.356383	187	.247898036	Root MSE =	.22227

CFParticia~n	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	.8158906	.1293806	6.31	0.000	.5606396	1.071142
_hatsq	.1909472	.1287389	1.48	0.140	-.0630379	.4449323
_cons	.0063747	.0232543	0.27	0.784	-.039503	.0522523

Appendix 2: Checks on multicollinearity

```
. vif
```

Variable	VIF	1/VIF
ExtensionAc	4.32	0.231389
NoTyms	2.85	0.350783
Age	2.72	0.367385
FarmExper	2.71	0.368731
LandTenure	2.71	0.368763
DistTown	2.01	0.497970
LandAcres	1.61	0.621961
EducationL~l	1.53	0.651818
SocialGrp	1.42	0.702088
DistMkt	1.40	0.712481
Offfarminc~e	1.27	0.789321
CreditAc	1.19	0.838792
Gender	1.13	0.885472
Mean VIF	2.07	

Appendix 3: Measures on how much an outlier influences the overall model or predicted values

```
. predict D, cooksd

. sum D
```

Variable	Obs	Mean	Std. Dev.	Min	Max
D	188	.0080622	.0215657	7.01e-09	.1875363

Appendix 4: Measures on how much an observation influences the overall model or predicted values

```
. predict lev, leverage

. sum lev
```

Variable	Obs	Mean	Std. Dev.	Min	Max
lev	188	.0744681	.0362311	.0288574	.221339