Do food certification standards guarantee small-sized farming enterprises access to better markets? Effectiveness of marketing contracts in Kenya

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Castro N. Gichuki
China Center for Food Security Studies, Nanjing Agricultural University College of Economics and Management, Nanjing, China
Simon K. Gicheha
Department of Agricultural Economics, Bioeconomy and Rural Development, Justus Liebig University, Giessen, Germany, and
Charles Wambu Kamau
Department of Community Development and Environmental Management, Co-operative University of Kenya, Karen, Kenya

Abstract

Purpose – The purpose of this paper is to investigate the influence of GLOBALGAP standards certification on farmer's preference for marketing contract choices including written contracts, oral contracts and spot contracts, as well as to establish the impact of marketing contracts on net returns from snap bean production in Kenya.

Design/methodology/approach – In this study, we use a data collected from 446 Snap bean farmers in Kenya. Using a two-step selection Bourguignon Frontier and Gurgand (BFG) model and Propensity Score Matching (PSM), we analysed determinants of Global Gap Certification and other farming characteristics that influence smallholder farmers preference for marketing contracts and net returns from snap beans venture.

Findings – Results indicate that attending GLOBALGAP training, GLOBALGAP subsidy support, membership to GLOBALGAP farmer's groups, and selling beans to GLOBALGAP certified GLOBALGAP buyers would significantly influence better returns underwritten marketing contracts. Producing snap beans underwritten marketing contracts would get farmer's net returns of between 1.8 and 8% while producing under oral and spot market contracts would earn farmer net returns of between 0.2 and 0.08 %.

Originality/value – To the best of the authors' knowledge, this study is the first to examine the influence of GLOBALGAP standards certification on marketing contract choices and net returns from snap bean production, while accounting for selectivity biasness.

Keywords Marketing contracts, Food safety compliance, Market linkage, Smallholder farmers, Global gaps

Paper type Research paper

Introduction

In the face of increasing global food prices, smallholder farmers in most of the emerging markets are faced with the hard choices of selling their produce at prices that are below the international market price (Oya, 2012). The increase in agricultural productivity and growth can be realised when marketing value chains are open and offer smallholder farmers fair returns to their investments(Priscilla *et al.*, 2012). Prior studies take note that contract farming has mechanisms of dealing with transaction costs challenges resulting from market imperfection and failures in

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food value chains(Khan *et al.*, 2019). However, in Sub-Sahara Africa, agricultural supply chains continue to suffer from severe price discovery information barriers, lack of public reporting systems and the absence of enforceable commercial laws(Abdul-Rahman *et al.*, 2019). Most often, smallholder farmers are vulnerable when negotiating for marketing contracts.

In Sub-Sahara Africa, smallholder farmers are motivated to get farming contracts when producing perishable and high valued crops such as fruits, vegetables and traditional cash crops such as tea, cocoa and coffee. In recent time's agricultural food contracts have gone a step further to ensure producers meet safety and quality requirements as demanded by consumers. Chege, Andersson, and Qaim (2015) noted that consumer's demand for quality safe food had increased considerably in the last decade. Presently smallholder farmers face exclusion from farming contracts that demand compliance to food safety and quality production standards (Khouryieh *et al.*, 2019; Maertens *et al.*, 2009). Past studies show that stringent food safety and traceability standards have led to the marginalization of smallholder farmers from lucrative markets(Thongpalad *et al.*, 2019). Most of the marketing firms offer unfavorable contracts to smallholder farmers expecting them to check on food safety standards. To meet food safety demands, most farmers are encouraged to engage in contract arrangements (Adebisi *et al.*, 2019).

In Kenya, snap bean production has always been an important commodity in the economy, the bean accounts for 60% of all vegetable exports and 21% of horticultural exports. (Priscilla *et al.*, 2012). Also, snap bean smallholder farmers are required to attain food safety production certification standards from agencies such as Global Good Agricultural Practices (GAPs). However, smallholder snap bean farmers risk losing their European Union market share and reduced farm income for non-compliance to GLOBALGAP(Okello, 2011). Consequently, a sound understanding of the role GLOBALGAP standards certification and dynamics that influence farmer's preference for marketing contracts would provide useful insights to facilitate in food safety compliance and welfare-enhancing policies. Against this background, the study will establish GLOBALGAP certification standards and related factors that influence farmers preference for marketing contracts. Also, the study will examine and compare influence of different types of marketing contracts on net returns from snap bean production in Kenya.

Conceptual theoretical work

In the global society, contracts have become an important aspect of alleviating conflicts between agents and principles. In general, principle agency theory is based on the assumption that agents work for the principle, and the utility of the agents depends on the amount of work done (Masten and Saussier, 2000). Under the assumption of agency theory, a complete contract can be established between the agent and principal. Based on the theory, it is deduced that i principal (farmer) will always prefer to maximize the utility. Given the assumption of the full information environment, Kivistö and Zalyevska (2015) argue that agents strictly emphasis the need for producers to meet the required food standards. Hence the sharing arrangement of the contract is denoted as $w(\pi)$ and expressed in the form of incentive compatibility constraint;

$$a \in \operatorname{argmax} \int U(w(\pi) - c(a))dF(\pi|a) \tag{1}$$

In a case where the principle is risk-neutral then agent remuneration schedule is given as;

$$\frac{1}{U'(w(\pi) - c(a))} = \lambda + \mu[r(\pi|a) + \eta(w(\pi) - c(a))c_a] \tag{2}$$

Where μ is the nonnegative multiplier associated with agents incentive compatibility, while $\eta(\cdot)$ is the agent's measure of relative risk aversion. While $\pi|a$ denotes principles optimum sharing condition and the outcome that depicts the degree of risk an agent might expect.

In this study, we suppose that the marginal cost denoted as θ is the farmer's private information. We further assert that buyers offer farmers oral contract denoted as $(\underline{c}^*, \underline{f}^*)$ and written contract$(\bar{c}^*, \bar{o}^*)$. Under the assumption that farmer θ will prefer $(\underline{c}^*, \underline{f}^*)$ marketing contract and farmer i will select $(\bar{c}^*, \bar{o}^*)$. Laffont and Martimort (2002) argues that both contracts $\{(\underline{c}^*, \underline{f}^*)(\bar{c}^*, \bar{o}^*)\}$; are enticing and compatible on the conditions that $(\bar{c}^*, \bar{o}^*)$ (oral contract) is weak preferred to $(\underline{c}^*, \underline{f}^*)$ (formal written contract) by farmer $\underline{\theta}$. Also $(\bar{c}^*, \bar{o}^*)$ is weakly preferred to $(\underline{t}, \underline{q})$ by farmer $\bar{\theta}$. Based on the assumptions, we can represent incentive compatibility constraints as:

$$\underline{t} - \underline{\theta}\,\underline{q} \geq \bar{t} - \bar{\theta}\bar{q} \tag{3}$$

and;

$$\bar{t} - \bar{\theta}\bar{q} \geq \underline{t} - \bar{\theta}\underline{q} \tag{4}$$

As previously argued incentive compatibility constraints arise when a farmer $\underline{\theta}-$ and $\bar{\theta}$ are faced with choices between types of contracts. In this case however, the assumption made is that there is no prior communication between farmer and the buyers. In simulating the standard consumption theory preference argument, farmers will accept either oral or written contracts only if they yield to ascertain opportunity level (C^*_{ij}). The participation can be as satisfied as follows;

$$\bar{t} - \bar{\theta}\bar{q} \geq 0, \tag{5}$$

and;

$$\underline{t} - \underline{\theta}\,\underline{q} \geq 0 \tag{6}$$

Thus we can hypothesize that snap bean returns margins can be determined by farmer's preference for marketing contracts, where; (Cf_{ij}) an indicator variable that equal i when a farmer uses formal contract and 0 for (Co_{ij}) for oral contract or marketing contract (see Figure 1).

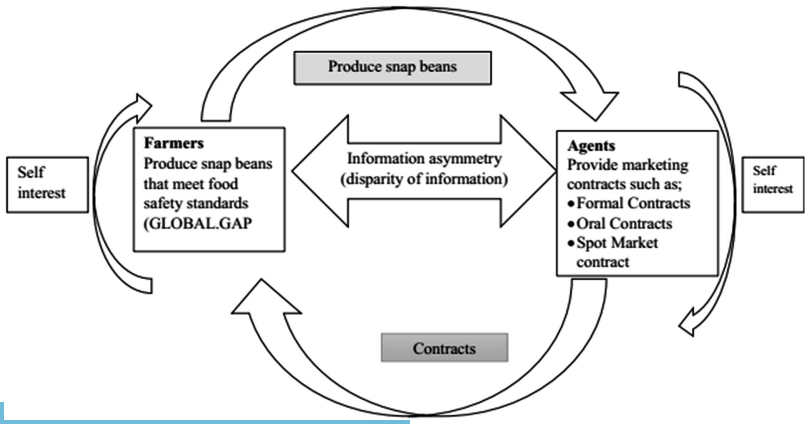

Figure 1.
Contract Farming frame work

Methods and data

Study area and sampling technique

A household survey on snap beans farming was conducted in Kirinyaga, Muranga and Embu Counties Kenya (see Figure 2) between June 2018 and September 2018 after obtaining a research permit from Kenya National Council of Science and Technology. The selected counties produce 60% of the country's snap beans. Agricultural District Office provided a sampling frame of registered smallholder snap beans farmers. Farmers were then proportionately drawn from nine sub-counties drawn from the three counties. The random sampling technique was used to select the actual 446 farmers who participated in this study. The survey collected information on input–output at the plot level, marketing contract knowledge, farmer's demographic characteristics, farm characteristics, asset ownership, access to capital and farmer's social network and infrastructure.

Estimation procedure and technique

The model framework used in the study is based on the theoretical assumption that farmers are faced with a mutually exclusive choices of selecting makerting contacts as previously discussed in the theoretical framework section. Previously, the Heckman model has been applied in some studies because it allows for selection bias. However, the Heckman model framework is designed to handle limited depend variables and is not applied in randomly selected samples studies (Marchenko and Genton, 2012). Therefore, the model is not applicable in the present study where farmers are faced with the selection of wide selection of mutually exclusive contract marketing choices such as selling beans using written contracts, oral contracts or spot market contracts). In such as case, two-step selection Bourguignon Frontier and Gurgand (BFG) model is recommended to address the issue of selection bias based on MNL model (Ma and Abdulai, 2016).

Two-step selection BFG model is best applied when addressing the issue of non-random nature of choice situation. In the first stage, J sector must be required to establish J-1 selection terms. However, the model is limited in evaluating a model with strong maximum likelihood estimators, with complete information (Street *et al.*, 2005). Such is the case where we assess the influence of marketing contracts on snap bean returns. As illustrated in Figure 1, a farmer's are presented by agents with the options of either choosing a written contract ($j = 1$), oral contract ($j = 2$) or marketing contract ($j = 3$). In such a case, Bourguignon (2007) considers

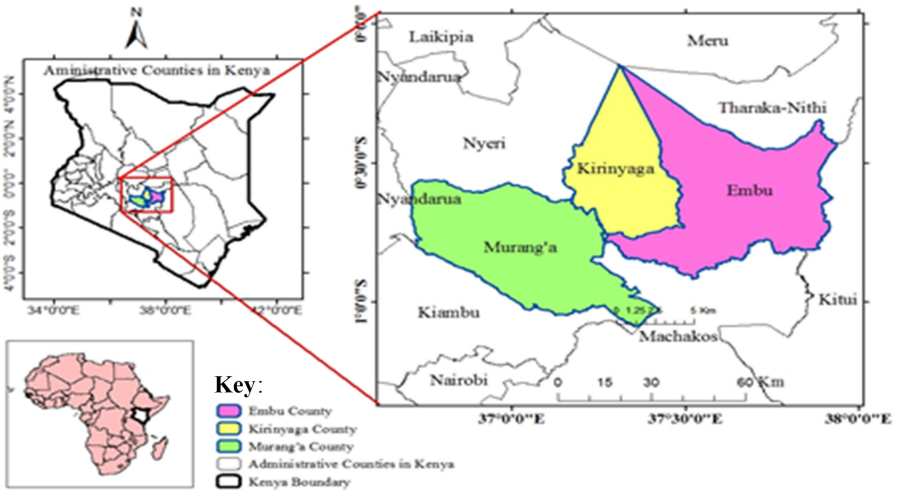

Figure 2.
Map of the study area

that selection bias follows a polychotomous normal model, allowing correlations between alternatives across groups. The study adopts two selective bias correlation models to examine the influence of GLOBAL GAP on farmer's preference for marketing contracts. In the model, the variable y can take value $j = 1, 2, 3, \ldots\ldots\ldots J$, J, in this case, is a positive integrator. We denote that the following equation can determine the probability of choice contract: (see Figure A1)

$$p(y_i = k \lfloor x_i) = \frac{\exp(\beta_k x_i)}{\sum_{j=1}^{J} \exp(\beta_j x_i)}, \qquad j = 1, 2, 3 \ldots \mathrm{J} \tag{7}$$

In the equation above, k is none of j subcategories grouped, $(y = k)$ is the probability that the ith farmer selects the key subgroups while x_i describes farm characteristics and farmer's personal characteristics when there are more than two groups. In a non-linear model such as Multinomial Logit (MNL) the parameters can be difficult to explain because neither the sign nor the magnitude has a direct meaning. However, marginal effects for independent variables (x_k) provide a better understanding of the choice of contract probability j (Sandor and Wedel, 2001). It can be observed that a more direct interpretation of parameters estimates is gained by looking at the log of the odds ratio given as;

$$\frac{\vartheta log(P_j / P_i)}{\vartheta x_k} = \beta_{jk} - \beta_{ik} \tag{8}$$

Where i is the comparative reference category, a positive parameter B_{jk} for explanatory variables implies that a farmer choosing contract j increases the relative probability of I.

In the second stage, we use Ordinal Least Square (OLS) regression to examine and compare the influence of marketing contracts on net returns from snap bean production. However, OLS may result in biased estimates when estimating returns from contracts preferred by farmers (Greene, 2012). For this reason, the selectivity correlation terms estimated in the first stage are concurrently included to obtain unbiased and consistent estimation (Katchova and Miranda, 2004). In applying the model, the first type of contract option chosen is $(j = 1)$, while for net returns are given as y_1, the specified equation as:

$$y_1 = x\beta_1 + \sigma_1 \left[p_1^* m(p_1) + p_2^* m(p_2) \frac{p_2}{p_2 - 1} + p_3^* m(p_3) \frac{p_3}{p_3 - 1} \right] + w_1 \tag{9}$$

From the equation above $m\,(p_1)$, $m\,(p_2)$ and $m\,(p_3)$ are the conditional expectations of nn1, Zn2 and Zn3, which are used to correct for selectivity effects. While p represents correlation coefficients between μ and η; σ is the standard deviation of the disturbance term from the net returns equation, and w_1 is the error term (Lokshin and Sajaia, 2004).

Propensity score matching

To provide for robustness checks and selection biases, we use Propensity Score Matching (PSM) to compliment the OLS model to further establish the impact of contract farming on snap beans returns. Dehejia and Wahba (2002) recommend that before identifying the probability model to be used for estimation, it would be necessary to decide the matching algorithm to choose and determine the region of common support. In addition, it is of much importance to devise ways of addressing choice-based sampling and when to measure the sensitivity of estimated treatment effects on unobserved heterogeneity (Smith and Todd, 2005). We applied the Probit model to compare the outcomes of treated Propensity Scores of oral and written contracts preferred by some farmers and controlled for returns from snap beans. The applied Probit model used to estimate propensity scores can be specified as;

$$ATE_1 = \frac{1}{N_1}\sum(Y_{1i} - Y_j) \tag{10}$$

$$ATE_1 = \frac{1}{N_2}\sum(Y_{2i} - Y_j) \tag{11}$$

While the Average Treatment Effects on the treated group can be estimated as follows

$$ATT = E(E(Y_{t,\text{treatement}} \mid T_t = 1, p(x))) \tag{12}$$

$$Y_{T\text{control}} \mid T_t = 0, p(x) \mid T = 1 \tag{13}$$

Definition of variables

Table I shows the description of the variables used in the empirical model. The study dependent variables are conceptualized as (1) written contracts that refer to pre-harvest agreements ratified by a written document signed by the buyer and farmer. (2) The oral contract; refers to agreement characterised by regularly repeated transactions based on trust. (3) Spot market refers to selling snap beans at the farm gate or the market. Snap beans' returns are defined as profit gained from the agri enterprise venture. The explanatory variables include household head social demographic characteristics and farm production characteristics, and GLOBAL GAP characteristics.

Results and discussions

Table II presents descriptive statistics of social demographic and GLOBALGAP and farm characteristics included in the empirical estimations. The results show that farmers with written contracts have a higher education level. Similarly, Asfaw *et al.* (2010) observe that farmers with higher education levels understand the uncertainties of market risks hence opt to secure rewarding contracts for their produce. Indeed high education level helps farmers to negotiate contracts fairly and easily comprehend the legal risks of not honoring contracts (Otsuka *et al.*, 2016). The results show that having written contracts enabled farmers to have higher returns of 80,255 Ksh, while preference for the oral contract would earn farmers 53,567 Ksh. We further note that farmers selling the beans at the spot market earned 28,415 Ksh less.

Most notably, 60% of farmers with written contracts attended more GLOBALGAP training compared to farmers with oral contracts (40%) and spot market (25%). Our study findings reveal that mainly, farmers with written contracts (69%) sell their products to certified GAP buyers while only 30% with oral agreements sell to GAP certified buyers. In comparison to farmers with a preference for spot market and oral contracts, 55% of the farmers with written contracts receive GLOBAL GAP subsidy support. With regard to household decision making, we observe that the majority of the households are male-headed who make major decisions regarding marketing and GLOBAL GAP certification. The finding also reveal that farmers written contracts are more likely to access credit and participate in GLOBAL GAP affiliated farmers groups. In the study, farmers are considered as smallholder because they owned an average of 2.3–1.3 ha of farm size. Strohm and Hoeffler (2006) observe that most of the export buyers prefer to offer farmers contracts when they agree to plant a maximum of 1 kg of snap beans per planting. This is based on three assumptions; (1) most smallholder farmers produce the beans under irrigation. (2) Snap bean farming is labor-intensive; thus, farmers should opt to

Variable	Explanation	Expected sign of variables
Dependent variables		
Choice of marketing Contract	1 = written contracts 2 = oral contracts 3 = no contracts (i.e. spot market sales)	
Snap beans returns	Snap bean profits output in Ksh	
Explanatory variables		
Age	Age of the household head (years)	+
Education	The education level of the household head (years)	+
Land size	Total land size under snap bean in hectares	+
Membership to GLOBAL GAP farmers groups	1 if a farmer is a member of GLOBAL GAP certified farmers group or 0 otherwise	+
HH Decision making on GAP	1 HH makes decision 0 otherwise	+
HH Decision making on Marketing	1 HH makes decision 0 otherwise	+
GAP cost	Amount in Ksh invested in compliance	
Farmer is fully GLOBAL GAP certified	1 Global certified 0 otherwise	+
GLOBAL GAP Subsidy support	1 if farmers access GLOBAL GAP Subsidy 0 otherwise	+
GLOBAL GAP training	No of time farmer attended Global Gap training	+
Years of GAP certification	No of GLOBAL GAP certification	+
Off-farm income	The total amount of off-farm income (Ksh)	+
Access to credit	1 farmer access credit, 0 otherwise	+
Distance to market	Distance to the nearest market in Km	+
Certified GAP buyer	1 buyer is certified 0 other wide	+-
Quantity kg per ha	Quantity of snap bean sold kgs	+-
Price	Average snap bean selling price Ksh/kg	+-

Table I.
Description and measurement

use family labor rather than incur the cost of labor (3) with small farm size, farmers can easily monitor quality aspects, especially during crop spraying and planting period.

Factors influencing farmers preference for marketing contracts

Using first stage Bourguignon, Gurgand and Fournier (BFG) estimation, we empirically estimated farm characteristics, GLOBALGAP characters and farmer's demographic factors in determining snap bean farmer's choices for marketing contracts. The dependent variable is farmer's choice for marketing contracts; we use the oral contract as the base group for comparison between written and spot market contracts. As outlined earlier, marginal effects were used to interpret the magnitude factors influencing farmer's choice of contracts. Most notably, the observations presented in Table III reveal that to membership to GLOBALGAP farmers group is a positive effect and is statistically significantly influence farmers to preference for written contracts. The significant role of farmer groups in facilitating farmers to access better markets and negotiate better prices has been widely documented (Kleemann *et al.*, 2014). Furthermore, farmers are more likely to comply with food quality standards such as GLOBALGAP when farmers group associations.

The study findings reveal that attending GLOBALGAP training has a positive and significant influence on farmer's preference for written contracts. GLOBALGAP training provides farmers with information on the safer application of pesticides, grading and processing of the beans but also provides market information on potential certified GLOBALGAP buyers. Further, we observe that investing in GLOBALGAP certification would positively and

Variable	Written contract (n = 223) Mean	SD	Oral contract (n = 189) Mean	SD	Spot market (n = 34) Mean	SD
Age of the household head (years)	45.96	12.74	43.06	12.47	43.18	14.50
Household head education (Years)	10.78	2.407	9.558	2.627	9.363	3.417
Gender of household head (Male = 1)	0.862	0.344	0.871	0.336	0.909	0.291
GAP training attend (1 = Yes)	0.601	0.499	0.403	0.492	0.254	0.505
House household decision making on Marketing (1 = House hold head)	0.708	0.707	0.730	0.694	0.727	0.719
GAP certification status (1 = Yes)	0.781	0.414	0.343	0.476	0.333	0.478
Household head decision on GAP (1 = if yes)	0.681	0.712	0.722	0.724	0.666	0.692
Membership to GLOBAL GAP Farmers groups (1 = Yes)	0.800	0.400	0.716	0.452	0.757	0.435
Access to farming credit (1 = Yes)	0.418	0.814	0.271	0.446	0.272	0.452
Walking Distance to Nearest Market (KM)	4.146	3.320	4.748	3.379	4.196	3.297
Total Snap beans output in kg per ha	1,511	3,027	896.7	1756	749.8	718.6
Total Net Returns	80,255	17,957	53,567	1,104	28,415	39,118
Off farm Income (1 = Yes)	0.690	0.463	0.687	0.465	0.545	0.505
Farm size (ha)	2.370	5.231	1.303	1.056	1.322	1.004
Climate Variability a threat (1 = Yes)	0.480	0.509	0.417	0.494	0.484	0.507
Number of years GAP certified	13.90	10.60	11.52	7.246	10.72	10.63
Sell beans to certified GAP Buyer	0.693	0.501	0.306	0.462	0.272	0.452
GLOBAL GAP Subsidy support	0.551	0.498	0.392	0.489	0.303	0.466

Table II.
Farmer and farm-level characteristics

significantly influence farmer's preference for a written contract or oral contract. The magnitude coefficient for receiving GLOBAL GAP subsidy support is positive and significant for farmers with preference towards written contracts and oral marketing channels. This suggests that buyers who provide farmers with input subsidies are more guaranteed to buy quality products when they have an agreement with farmers, a similar argument has been put by Alvarez and Von Hagen (2011). With regard to the social-demographic characteristics of the farmers, we notice that the marginal effects of education level are significant and negative for farmers with preference for spot market contracts.

Influence of marketing contracts on net returns

Table IV provides estimates of snap beans returns based on the type of contract preferred by farmers. The returns are estimated using BFG second stage, where the selection bias correction term derived from MNL model is included in the OLS model in Table IV. Also, the marketing contract types generated selective correction term denoted by Mills Ratio. To reduce heteroskedasticity, the estimators are bootstrapped with 100 replications, as recommended by Huesca and Camberos (2010). We observe that attending GLOBALGAP training positively and significantly impacted on the net returns when choosing written contracts. This is expected as the training enables farmers to; (1) observe food safety in production, (2) break market information barriers, (3) effectively compete with large holder farmers, (4) identify cost-effective agricultural technologies that reduce production cost (Okello *et al.*, 2011). Interestingly, the study results show that subsidy support provided a positively impact on returns when farmers have written contracts. In most of the cases, the technical support provided includes extension services, credit, input supplies, grading centers and farm produce transport. The finding is consistent with earlier studies by Pieters *et al.* (2016) where formal intergraded contracts that financed inputs and provided extension services improved returns to farmers.

Table III. Marketing contract choices

Variables	Written contract (n = 223)			Oral contract (n = 189)			Spot market (n = 34)		
	Marginal effects	Coeff	Std-err	Marginal effects	Coeff	Std-err	Marginal effects	Coeff	Std-err
Age of the household head	0.004**	0.013	0.016	−0.003*	−0.004	0.017	−0.038	0.004	0.017
Household head education	0.005	0.046	0.077	−0.003	0.027	0.079	−0.002**	−0.027	0.079
Farm size (ha)	−0.017	−0.084	0.189	0.013	−0.015	0.189	0.035	0.015	0.189
Membership to GLOBAL GAP Farmers groups	0.033**	0.070	0.461	−0.042	−0.249	0.465	0.091	0.249	0.465
GLOBALGAP certification	0.125***	0.631	0.570	0.161*	0.631	0.570	−0.035	−1.420	1.160
Household head decision on GAP	−0.009	0.440	0.565	0.040*	0.564	0.586	−0.030	−0.564	0.586
House household decision making on marketing	0.006	−0.401	0.590	−0.034	−0.503	0.609	0.027**	0.503	0.609
GLOBAL GAP Subsidy support	0.135**	0.896	0.447	−0.092**	0.403	0.455	−0.043	−0.403	0.455
Attend GAP training	0.017**	0.118	0.388	−0.027	−0.221	0.392	0.010	0.221	0.392
Access to farming credit	−0.100	−0.431	0.451	0.083	−0.030	0.450	0.017	0.030	0.450
Distance to market KM	−0.007	0.008	0.060	0.009	0.046	0.059	−0.001	−0.046	0.059
Sell beans to certified GAP buyer	0.177***	0.881	0.432	0.142***	0.174	0.442	−0.035	−0.174	0.442
Snap beans output (log)	0.002	0.001	0.001	−0.001	0.003	0.001	−5.050	−0.003	0.001
Snap beans sells (log)	5.86	6.310	5.400	−2.34	4.640	5.450	−3.520	−4.640	5.450
_cons		0.048	1.116		1.194	1.150		−1.194	1.150
Pseudo R2	0.177								
Prob > chi2	0.000								
Log likelihood	−306.6								

Note(s): base group is oral contract; *, **, ***indicate statistically significant at the 10%, 5%, and 1% levels respectively

Interestingly, membership to GLOBALGAP affiliated farmers groups papers appears to positively and significantly influence on the net returns from snap beans under a written contract. This is partly explained by the fact that GLOBALGAP compliance requires intensive capital investments that can be unaffordable to smallholder farmers. However, purchasing farming equipment collectively in groups would ultimately reduce production costs and increase beans returns. From the BFG selection model, we can confirm that the amount of snap beans sells significantly determined the returns on investment under written contract. However, farmers selling direct to the spot market are likely to get less of the returns on investments in snap bean venture. Our results correspond to Suzuki *et al.* (2011) findings where rural farming households tend to gain more income benefits from marketing contracts that are vertically coordinated. Also, we note that having written contracts with GLOBALGAP certified buyers positively and significantly impact on the returns. Previous studies (Narayanan, 2014) show that farmers targeting the export market are skeptical of engaging in vertical coordinated contracts because of biased terms, delayed payments and lack of compensation for crop failure. With regard to famer's demographic characteristics, we note that only education level would positively and significantly influence the net returns irrespective of contract choice. In general, the estimates coefficient of unbiased selection *(mills)* predicts positive returns for written marketing contracts. To further understand the magnitude of the correlation between snap beans returns and marketing contracts, we employ the PSM model. Considering that we find no significant selectivity effects in the spot market contracts, we only use the written contract and oral contract for PSM estimation in Table IV as recommended by Dehejia and Wahba (2002).

Impact of marketing contract on net returns: PSM estimation

The PSM technique, with two steps, is used to ascertain the causal effect of choosing particular contracts on the net returns of snap beans. Propensity score marching compares the outcomes between a farmers' preference towards particular marketing contract X

Variables	Written contract (n = 227) Coeff	Std-err	Oral contract (n = 189) Coeff	Std-err	Spot market (n = 34) Coeff	Std-err
Age of the household head	−0.010	0.010	−0.003	0.015	−0.055	0.053
Household head education	0.106*	0.061	0.018**	0.057	0.284**	0.125
Farm size (ha)	0.010	0.123	0.178	0.211	0.450	0.363
Membership to GLOBAL GAP Farmers groups	0.668**	0.393	−0.585*	0.331	1.154	1.288
GLOBALGAP certification	0.206**	0.380	0.037	0.76	0.037	0.07
Household head decision on GAP	0.446	0.313	0.143*	0.422	0.930*	0.920
House household decision making on Marketing	0.511*	0.304	−0.390	0.429	−1.059	0.770
GLOBAL GAP Subsidy support	−0.272	0.286	−0.066	0.340	0.172	0.765
GAP training attend	0.272**	0.252	0.044*	0.317	0.620	1.004
Access to farming credit	−0.274	0.263	−0.084	0.373	0.795	1.155
Distance to Market KM (log)	0.710***	0.161	2.268***	0.408	−4.871*	2.624
Certified GAP Buyer	0.027**	0.247	0.014	0.215	0.370	0.722
Snap beans output (log)	0.146	0.122	0.253**	0.102	−1.662***	0.524
Snap beans sells (log)	0.266**	0.109	−0.114	0.118	−0.478	0.305
Mills 1	0.122**	1.760	−6.975	1.810	0.513	3.637
Mill 2	−7.50	1.524	−5.855	1.497	1.717	3.338
Mills 3	−6.798	1.530	−5.552	1.450	2.125	3.234

Table IV.
OLS net returns

Note(s): *, **, ***Indicate statistically significant at the 10%, 5%, and 1% levels respectively

("treated") and those using other marketing contract alternatives *y* (controlled). The contracts are considered to be similar in terms of observable characteristics, thus reducing the bias that would otherwise occur when the two groups are systematically different. Smith and Todd (2005) note that PSM involves a trade-off between bias and variance. The first stage of PSM is a Probit model, presented in Table V, we consider treatment as the choice between written and oral marketing contract, while the independent variables are listed in the model. Just as previously noted, selling snap beans to certified GAP buyer significantly influence better returns when farmers select written contracts. Likewise, GLOBALGAP subsidy support would influence positive net returns for farmers with written contracts. More importantly, the results reveal that written contact offered better snap beans prices in comparison to vertically coordinated contracts, an observation also shared by Roy and Thorat (2008) and Okello (2011) (see Table VI).

According to Caliendo and Kopeinig (2008) the ATT estimation can take into account both observable and unobservable factors while obtaining unbiased treatment effects. ATT is estimated using Nearest-neighbor matching (NNM) and kernel-based matching (KBM). After matching we observed that preference for the written contract would get a farmer net returns of between 1.46% and 0.18% from, while farmer's preference for the oral market would get

Variables	Written contract (n = 227) Coeff	Std-err	Oral/Spot market contract (n = 187) Coeff	Std-err
Age of the household head	0.005	0.005	−0.006	0.010
Household head education	0.016	0.025	0.016	0.038
Farm size (ha)	0.009	0.064	−0.002	0.116
Membership to GLOBAL GAP Farmers groups	0.023**	0.157	−0.077	0.259
Household head decision on GAP	0.121*	0.186	0.206*	0.290
House household decision making on Marketing	−0.059	0.190	−0.184	0.299
GLOBALGAP certification	−0.003	0.046	−0.867	0.047
GLOBAL GAP Subsidy support	0.327**	0.138	0.2788	0.253
GAP training attend	0.062***	0.131	−0.173**	0.227
Access to farming credit	−0.288*	0.153	0.002	0.257
Distance to Market KM	0.415	0.137	0.049*	0.259
Certified GAP Buyer	0.063***	0.080	−0.078**	0.160
Snap beans output	0.030	0.045	−0.056	0.085
Snap beans sells	0.110**	0.050	0.113	0.081
Cons	−2.027	0.587	0.039	0.971
Pseudo R2	0.067		0.045	
Prob > chi2	0.006***		0.899	
Log likelihood	−257.6		−81.49	

Note(s): *, **, ***Indicate statistically significant at the 10%, 5%, and 1% levels respectively

Table V.
Probit estimates for PSM for choice of marketing contracts

Written contract Marching algorithm	ATT	S.E	*T*-stat	Number of treated	Number of control
Kernel-based Matching	81,963.7	16,089	14.6	210	187
Nearest Neighbor Matching	78,544	21,830	0.18	210	187
Oral/Spot market Contract					
Kernel-based Matching	49866.0	24482.8	−1.85	139	32
Nearest Neighbor Matching	52245.7	51798.3	−0.51	139	32

Table VI.
Effect of ATT Contract Choice on Net Returns (*PSM estimation*)

returns of between −1.85% and −0.51%. Previous studies claim that contract farming impact on rural economies by improving household incomes positively (Maertens *et al.*, 2009; Michelson, 2013; Neven *et al.*, 2009).

Conclusion

The role of contract farming in ensuring food safety standards and promoting better farm returns for smallholder farmers in developing countries remains relevant issue in the global food market. This paper contributes to the empirical literature by establishing GLOBALGAP factors that influence farmer's choice of marketing contracts and the respective net returns. In general, the results on BFG first stage model showed that GLOBALGAP factors such as participation in GLOBALGAP farmers groups, receiving GLOBALGAP subsidy support, attaining GLOBAL GAP certification and selling beans to GAP certified buyers significantly influenced farmers to preference for a written contract. However, we noted that GLOBALGAP certification and membership to GLOBAL GAP farmers groups discouraged farmers from selling their snap bean at the spot market. This indicates that returns from the snap bean venture are best realized under written contracts.

In general, the results on BFG s stage OLS model indicate that selective correction term was unbiased and significant for a written contract. This implies that returns from the snap bean venture are best realised under written contracts. Theoretically, farmers will always prefer contracts that provide better returns on investments. However, we observed that oral and spot market contracts would get lower returns. This can be attributed to factors such as (1) lack of training on GLOBALGAP production standards, (2) low participation in GLOBALGAP farmers groups, (3) lack of GLOBALGAP subsidy support (4) selling beans to Non-GAP certified buyers. In conclusion, we note that to effectively participate in modern supply chains that demand high food safety standards, farmer's investments are best realized when they have a formal written contract. Also, GLOBALGAP subsidy support agricultural policy should expand to smallholder farmers that have limited access to GAP certification and GAP training. This seems to limit farmers from getting written contracts that have high returns. We recommend future research to focus on the effects of global food safety policies and global food prices performance impact on the integration of smallholder farmers into export makert value chains and even returns.

Notes

1. GLOBALGAP compliance and certification cost include; using costly approved pesticides, investment in equipment (grading shed, protective gear, shower rooms, disposal pits, incinerators, hessian cooler, crates) soil testing and water testing, production records and blood tests.
2. Role of farmers groups; help in investing in lumpy assets hence reducing cost, provide technical advice when negotiating for contracts, provide credits, help farmers to establish food quality systems.
3. Subsidy support programs- assist farmers to comply with GLOBALGAP, Capacity building training on GLOBALGAP, financial support on certification, soil and water testing.
4. Ksh is Kenyan currency unit (1$ = 98 Ksh).

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Appendix

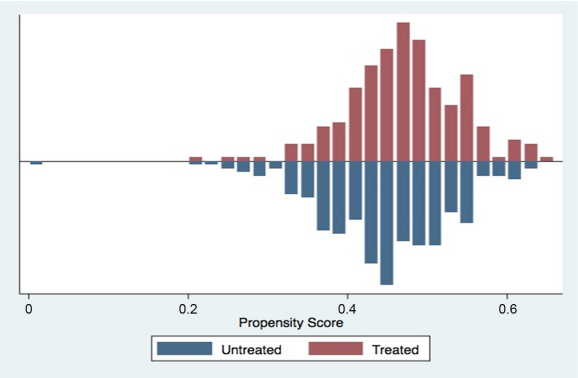

Figure A1.
Propensity score distribution and common support for estimation

Corresponding author
Castro N. Gichuki can be contacted at: ngumbucg@yahoo.com