



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search  
<http://ageconsearch.umn.edu>  
[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*



## **Smallholder Choice of Compliance Arrangements: The Case GlobalGAP adoption by French Bean Farmers in Kirinyaga, Mbooni and Buuri/Laikipia Districts**

**By:**

**Mary Nthambi, Dr. John Mburu, Dr. Rose Nyikal**

*Invited paper presented at the 4<sup>th</sup> International Conference of the African Association  
of Agricultural Economists, September 22-25, 2013, Hammamet, Tunisia*

*Copyright 2013 by [authors]. All rights reserved. Readers may make verbatim copies of  
this document for non-commercial purposes by any means, provided that this copyright  
notice appears on all such copies.*

**111- Smallholder Choice of Compliance Arrangements: The Case GlobalGAP adoption by French Bean Farmers in Kirinyaga, Mbooni and Buuri/Laikipia Districts.**

**MARY NTHAMBI\***

Student, Department of Agricultural Economics, University of Nairobi, Kenya.

**Dr. JOHN MBURU**

Department of Agricultural Economics, Senior Lecturer, University of Nairobi, Kenya.

**Dr. ROSE NYIKAL**

Department of Agricultural Economics, Senior Lecturer, Coordinator CMAAE, University of Nairobi, Kenya.

## **Abstract**

Horticultural crops such as fruits and vegetables are commonly grown in Sub-Saharan Africa by smallholder farmers as a way to increase export earnings and create jobs in order to reduce poverty levels. These opportunities presented by horticultural crops to smallholder farmers have been retarded by increased public and private food safety standards. GlobalGAP is one such standard, which possesses a threat to smallholder farmer's welfare by undermining their ability to compete in the market. This paper assesses smallholder choice of compliance arrangements with GlobalGAP standards adoption among smallholder french bean farmers in Kirinyaga, Mbooni and Buuri/Laikipia districts. Three Multinomial logit models were run to obtain information on the estimated coefficients and marginal effects of independent variables and dependent variables and their p values. Findings were that extension services, input and credit subsidies and group formation should be encouraged to reduce costs of compliance among smallholder farmers. Policy to ensure reduced transaction and production costs such as government provision of conducive investment environment for NGO's and exporters that support French bean farmers should be availed.

**Key words: Multinomial logit, GlobalGAP, Smallholder**

## 1. Introduction

In Sub-Saharan Africa horticultural crops such as fruits and vegetables are commonly grown by smallholder farmers as a way to increase export earnings in order to reduce poverty levels. These crops have a higher value and fetch higher prices in the market than traditional crops. In addition, they are labour intensive and hence create employment opportunities that lead to increased income in developing countries (Wollni, 2012; Mbithi, 2008; Subervie and Vagneron, 2012).

However, these opportunities presented by horticultural crops to smallholder farmers have been retarded by increased public and private food safety standards. These standards have undermined the competitiveness of farmers and exporters, leading to a lower ability to benefit from such high-value food market opportunities in developing countries. Some farmers have even exited the international market due to their inability to comply with the standards because the appropriate costly investments and financing mechanisms are unavailable (Subervie and Vagneron, 2012; Dolan and Humphrey, 2000).

In this paper we focus on French beans (*Phaseolus vulgaris L.*) ; which form the greatest percentage of exported fresh vegetables in developing countries. Particularly, in Kenya, they are mainly grown in Kirinyaga, Athi River, Meru and Naivasha ( Monda *et al.*, 2003). Other areas of interest are Mbooni and Laikipia. Kenya has built its reputation and commercial success with french bean and peas export to the international market. French beans increases farmer's income and this has in turn been used in Kenya to improve smallholder farmers livelihoods through enhanced productivity, crop diversification, and improved market access (USAID, 2012).

Farmers who export french beans are required to comply to GlobalGAP. GlobalGAP is one of the most important Food Safety Standard in the field of fresh produce which was created by a Consortium of European retailers in 1997. The framework of Good Agricultural Practises (GAPs) has since broadened to encompass environmental protection, workers' health, animal welfare and traceability of produce to the consumer (Kersting and Wollni, 2012; Subervie and Vagneron, 2012).

The adoption of GlobalGAP requires a producer to invest heavily in technology and upgrading. In developing countries, such as Kenya, resource poor farmers are unable to afford the financial investments, unless they access credit facilities or other sources of money. Failing to comply with GlobalGAP will lead to exclusion of smallholder farmers in Kenya from accessing the European market and other related income earning opportunities such as employment. This is likely to have a negative impact on the improvement of households' welfare. Smallholder farmers comply with GlobalGAP either through exporter-individual farmer or group-based institutional arrangements. Previous studies have focused on either group or individual compliance arrangements (Okello and Swinton, 2005; Muriithi, 2008). Further, farmers usually adopt different variants of group compliance (mainly contract and scheme groups) that have not

been considered. A similar study was carried out in Kirinyaga by Nyota (2011) on group compliance vs individual compliance but the usefulness of the study was limited due to sampling deficiencies. This study comes in to fill in the sample size gap by exploring a larger area; Mbooni and Buuri/Laikipia in addition to Kirinyaga.

In addition, the smallholder choice of compliance arrangements with GlobalGAP by French Bean Farmers in Kirinyaga, Mbooni and Buuri/Laikipia Districts are unknown. Further, the effect of the hidden and visible transaction costs to each of these arrangements are also not known. These deficiencies have negatively impacted the formulation of policies to advise farmers on the best choice of compliance arrangements.

The existence of GlobalGAP standard poses a great threat to smallholder farmers' accessibility to international markets. Lack of compliance not only leads to loss of opportunities such as foreign exchange earnings, loss of employment opportunities but also leads to unsustainable livelihoods for both exporters and smallholder farmers. GlobalGAP compliance is hence useful in reducing poverty levels among smallholder farmers especially in rural areas where poor infrastructure and poor market conditions for their produce coexist.

The government of Kenya recognizes the importance of access to international markets for horticultural export which has in turn proposed the development of marketing infrastructure, assisting farmers to meet high quality standards and improving access to credit facilities as some of the ways of meeting the challenges of complying with GlobalGAP (GoK, 2004). Stakeholders in the horticultural sub-sector are also pursuing the goal of improving the smallholder farmer's livelihoods as one of the major goals of attaining vision 2030. This study is necessary as it complements these government efforts to facilitate the compliance with GlobalGAP and especially in the planning stage. It will also contribute in the understanding of whether compliance with GlobalGAP really focuses on the millennium development Goal one of eliminating poverty and/or meeting vision 2030 poverty eradication issues.

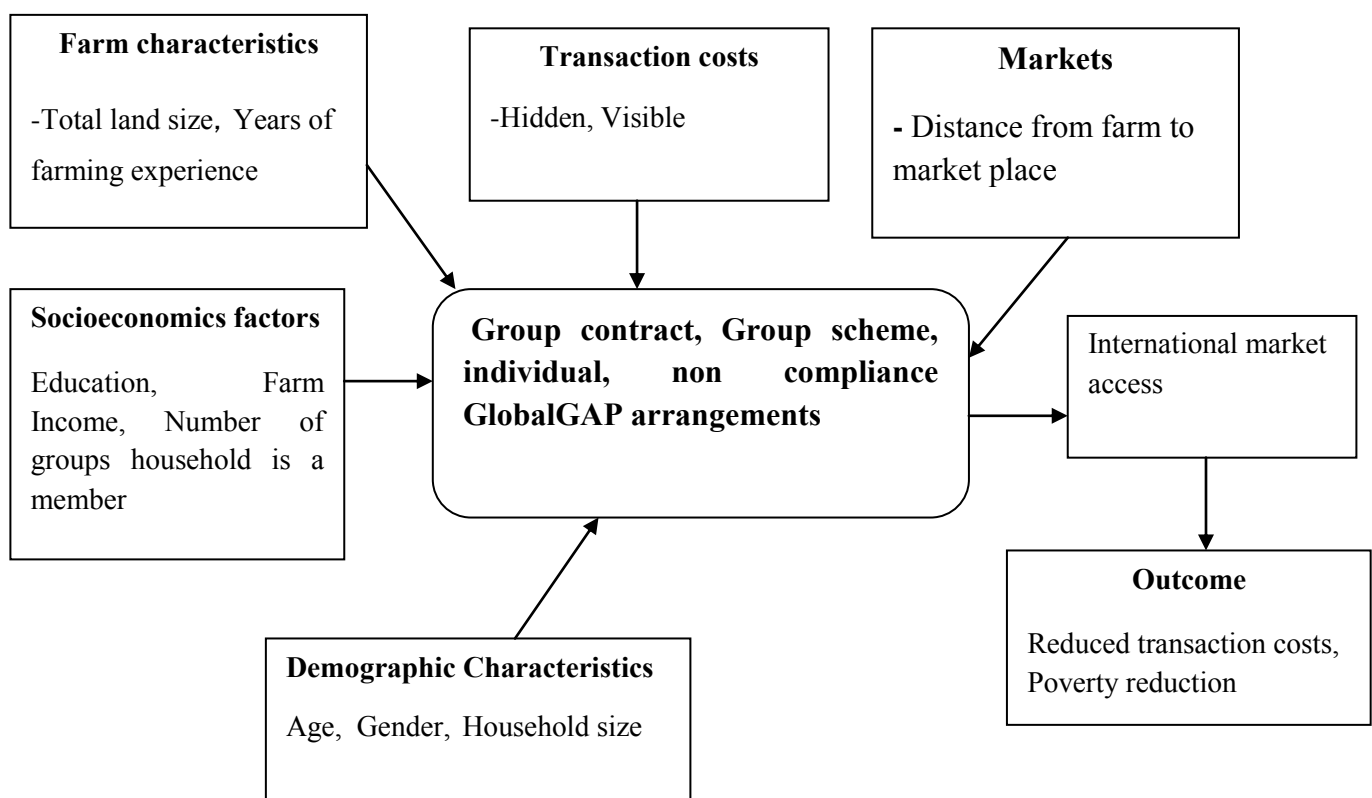
It is therefore necessary to understand the implications of smallholder farmer's choice of compliance arrangement in order to guide policy makers in formulation of policies that reduce the costs resource poor farmers face in developing countries in the event of accessing the international markets.

## **2. Conceptual Framework**

Previous studies on determinants of the choice of compliance arrangements with food safety standards have focused on farmers' endowments with physical, human and social capital and concluded that they increase degree of compliance among smallholder farmers (Okello, 2006). Compliance with GlobalGAP standards implies incurring transaction costs which can be classified as either Hidden or visible costs. The choice of whether a smallholder farmer complies

with the GlobalGAP standards is a function of farm, market, household head characteristics and transaction costs.

Compliance through group contract, group scheme or individual institutional arrangements was hypothesized to be influenced by household characteristics such as age, gender, income, transaction costs, farm size, education level, membership to community based groups and distance to the market place. These factors influence compliance which in turn determine the accessibility to international markets. International market access leads to reduced transaction costs and also sustainable livelihoods. Schematically this can be as shown below



**Figure 1: Determinants' influencing the choice of compliance arrangements with GlobalGAP standards among smallholder French bean farmers in Kirinyaga, Buuri/Laikipia and Mbooni, Kenya**

### **3. Data and estimation Procedures**

#### **3.1 Data sources**

Household survey for primary data collection was undertaken targeting smallholder horticultural producers in Buuri/Laikipia, Mbooni and Kirinyaga Districts in Riftvalley, Eastern and Central provinces respectively. The three provinces are of economic importance because they have the highest smallholder horticultural production in Kenya targeting international markets and especially the European Market. Multi-stage sampling procedure was used to select participants in the study. First at the district, then division, sub-location and village level.

Sampling procedure used was both purposive and random. Purposive sampling was used to select the three divisions in Kirinyaga district; Ndia, Mwea and Gichugu. In Mbooni district; Mbooni, Kitundu, Kyuu, Kithungo, Tulimani and Mutitu divisions were selected while in Laikipia district Timau, Daiga and Ethi divisions were sampled. Overall a sample of 650, 306 and 359 was selected from Kirinyaga, Laikipia and Mbooni respectively

#### **3.2 Theoretical Framework**

The theoretical framework behind this study is the Random Utility Model(RUM).The study is predicted on the basis of the derivable utility from complying with the GlobalGAP standards. Smallholder farmers were assumed to choose the compliance arrangement that maximized their unobserved utility. French bean smallholder farmers are assumed to maximize their utility by choosing (group contract, group scheme, non compliance or individual) compliance arrangement that best suits them. That is, a compliance arrangement that enables them to cheaply and conveniently gain access to the international market for their French bean produce at the highest returns. A utility function is therefore assumed to exist for GlobalGAP compliance arrangements.

Suppose  $X_{ij}$  is a vector of characteristics reflecting farmers socioeconomic, demographic, market and farm attributes,  $e_{ij}$  is a random error term and  $U_{ij}$  is the utility derived by farmers for choosing a compliance arrangement. Therefore, the utility from choosing a certain compliance arrangement will be given by:

$$U_{ij} = X_{ij} + e_{ij}$$

The choice set will show that the  $i^{\text{th}}$  farmer will select the combination of compliance arrangement attributes that will maximize their utility. Random Utility Theory(RUM) assumes that a farmer has a set of options to choose from, which a farmer is assumed to discriminate from and in this case it could be group contract, group scheme, individual and non compliance arrangements.



### 3.3 Econometric model

The Multinomial Logit model was adopted in this study. The model is fit to carry out this analysis because it involves multiple choices, is simple to compute than Multinomial Probit Model(MNP) and permits the analysis of decisions across more than two different categories, hence allowing the determination of choice probabilities for the different compliance arrangements. (Deressa *et al.*, 2009, Nhemachena and Hassan, 2008). It does not only focus on the primary compliance arrangement but also on the factors that influence the choice of the compliance arrangements. Four dependent variables (compliance arrangements) are involved: (i) Group contract (ii) Group Scheme (iii) Individual , and (iv) non compliance arrangements.

Empirically, to describe the multinomial logit model, let  $y$  denote a random variable taking the values  $\{1,2,3,4,...J\}$  for  $J$  number of options, a positive integer, and let  $x$  denote a set of conditioning variables. In this case,  $y$  denotes the compliance arrangements and the  $x$  contains the different socioeconomic, farm, market and demographic attributes described in the conceptual framework.

The next step is to find out how changes in the elements of  $x$  affect the dependent variable (response) probabilities  $\{P(y=j/x), j=1,2,...,J\}$ .

If we let  $x$  be a  $1 \times K$  vector with first element unity, then the MNL model response probabilities will be given by:

$$P(y=j | x) = \frac{\exp(x\beta_j)}{[1 + \sum_{h=1}^J \exp(x\beta_h)]}, j=1,...,J \quad \text{for } y=1,2,3,4 \quad \text{Eqn .....1}$$

where  $\beta_j$  is  $K \times 1$ ,  $j=1,...,J$ .

Therefore, the  $P(y=j | x)$  is the probability of complying either in group contract, group scheme, individual or non compliant.

The MNL has one limitation in that, the independence of irrelevant alternatives(IIA) assumption requires that the probability of choosing one compliance arrangement with GlobalGAP by an individual smallholder farmer needs to be independent from the probability of choosing another compliance arrangements(that is,  $P_j | P_k$  is independent of the remaining probabilities). That is, the probability of choosing individual compliance is independent of the probability of choosing either group contract or group scheme. The premise of the IIA assumption is the independent and homoscedastic disturbance terms of the basic model in Eq. (1). The parameter estimates of the MNL model provide only the the direction of the effect of the independent variables on the dependent(response) variable, but not the the actual magnitude of change or probabilities (Deressa *et al.*, 2009). Differentiating Eq.(1) with respect to the explanatory variables provides marginal effects of the explanatory variables as

$$\frac{\partial P_j}{\partial x_k} = P_j(\beta_{jk} - \sum_{j=1}^{J-1} P_j \beta_{jk}) \quad \text{Eqn .....2}$$

$\partial x_k$

The marginal effects or marginal probabilities are functions of the probability itself and measure the expected change in probability of a particular choice being made with respect to a unit change in an independent variable from the mean (Greene 2003).

### 3.4 Measurement of variables

The tables below describe the relevant variables used in the Multinomial Logit regression and provides their descriptive statistics.

**Table 1: Kiringaya**

Variable	Mean	Std Dev
Age of Household Head in Years	46.64	12.63
Gender of Household Head (1 Male, 0 Female)	0.84	0.36
Distance to the market place in Kilometres	0.77	1.61
Years of farming experience	16.92	11.01
Household size	4.18	1.65
Number of community based groups Household head is a member	2.1	1.26
Household Years of formal schooling	2.30	1.27
Total farm size in acres	2.73	2.93
Hidden transaction costs per year in Kshs	7265.59	16299.91
Visible transaction costs per year in Kshs.	20439.32	41932.09
Total household income per year in Kshs.	331513.2	432823
Primary compliance arrangements 1 Group contract, 2 Group scheme 3 Non compliant 4 Individual compliance	41.97%, 10.22%, 38.69%, 9.12%	1.07

**Table 2: Mbooni**

<b>Variable</b>	<b>Mean</b>	<b>Std Dev</b>
Age of Household Head in Years	46.46	14.20
Gender of Household Head (1 Male, 0 Female)	0.79	0.41
Distance to the market place in Kilometres	5.98	6.31
Years of farming experience	20.85	11.94
Household size	5.91	2.19
Number of community based groups Household head is a member	2.1	1.21
Household Years of formal schooling	8.61	3.28
Total farm size in acres	3.46	3.33
Hidden transaction costs per year in Kshs	3261.42	8022.29
Visible transaction costs per year in Kshs.	4369.79	8178.77
Total household income per year in Kshs.	138092.9	132919
Primary compliance arrangements 1 Group contract, 2 Group scheme 3 Non compliant 4 Individual compliance	3.33%, 20% , 61.33%, 15.33%	0.69

In Mbooni district, about 3.33 percent of households chose to comply with GlobalGAP in the group contract compliance arrangement. This percentage forms an insignificant number of five smallholder farmers in the entire sample. This compliance arrangement was therefore eliminated in the multinomial regression model for Mbooni district.

**Table 3: Laikipia**

Variable	Mean	Std Dev
Age of Household Head in Years	51.26	14.26
Gender of Household Head (1 Male, 0 Female)	0.84	0.36
Distance to the market place in Kilometres	5.44	5.36
Years of farming experience	18.65	11.39
Household size	4.89	1.78
Number of community based groups Household head is a member	1.99	0.977
Household Years of formal schooling	8.28	11.40
Total farm size in acres	5.16	1.46
Hidden transaction costs per year in Kshs	48527.93	261504.3
Visible transaction costs per year in Kshs.	45086.26	413385.2
Total household income per year in Kshs.	635965.2	306271
Primary Compliance arrangements 1 Group contract, 2 Group scheme 3 Non compliant 4 Individual compliance	21.40%, 8.29%, 60.70%, 9.61%	0.93

Respondents in this study were given a chance to make a choice of the most appropriate compliance arrangement ( group contract, group scheme, individual and non compliance arrangements).

#### 4. Multinomial Logistic Regression Results

Three models are presented below with information on the estimated coefficients and marginal effects of independent variables and dependent variables and their p values. In the three models, Household size, hidden and visible transaction costs, household income, distance to the market place, years of farming experience, years of schooling, number of community based groups and total farmsize are statistically significant.

According to the McFadden  $R^2$ , the explanatory power of variables in the three models is within the expected range. Model 2 has the highest explanatory power because it explains 47 percent of the variation of dependent variables (compliance or failure to comply) compared to model 1 and 3 whose McFadden  $R^2$  of 0.38 and 0.34 respectively. Another reason why model 2 has the highest explanatory power is because it has two choices (group scheme and individual

compliance arrangements) while model 1 and 3 has three choices (group contract, group scheme and individual compliance arrangements) with all having a common base outcome (non compliance arrangement).

The model results are as presented below;

**Table 4: Model 1; Kirinyaga**

Estimated coefficients for different compliance arrangements			
Independent variables	Group contract	Group scheme	Individual
Age	0.018 (0.429)	-0.006 (0.831)	-0.015 (0.620)
Gender	-0.292 (0.609)	-0.516 (0.483)	-0.840 (0.221)
Distance to the market (km)	0.071 (0.812)	0.276 (0.086 *)	0.068 (0.832)
Years of farming experience	0.002 (0.946)	0.026 (0.380)	0.057 (0.083*)
Household size	0.348 (0.012***)	0.705 (0.130)	-0.381 (0.038***)
No. Community groups	-0.014 (0.843)	0.010 (0.915)	0.057 (0.499)
Years of schooling	0.064 (0.710)	0.085 (0.688)	-0.057 (0.804)
Total farm size in acres	0.019 (0.796)	0.141 (0.082 *)	0.050 (0.579)
Hidden transaction costs	0.733 (0.000***)	0.898 (0.000***)	-0.205 (0.301)
Visible transaction costs	0.019 (0.000***)	0.012 (0.011***)	-0.020 (0.000***)
Total household income	-0.002 (0.032***)	-0.002 (0.172)	0.02 (0.746)
constant	-3.321(0.016***)	-4.218 (0.016***)	-2.258 (0.204)
<b>Notes:</b> Figures in parenthesis are p-values. $R^2=0.38$ , Log likelihood = -198.59, LR $\chi^2$ (33)= 244.95, Prob > $\chi^2=0.000$ * 10 percent ** 5 percent *** 1 percent significance level, Non compliance to GlobalGAP (base case outcome), Number of observations 272.			

**Table 5: Model 2; Mbooni**

Estimated coefficients for different compliance arrangements			
Independent variables	Group scheme		Individual
Age	-0.31	(0.360)	0.74 (0.882)
Gender	-0.99	(0.211)	-1.18 (0.165)
Distance to the market (km)	0.37	(0.023 <sup>***</sup> )	-0.39 (0.033 <sup>***</sup> )
Years of farming experience	0.03	(0.417)	0.08 (0.122)
Household size	0.05	(0.460)	-0.39 (0.033 <sup>***</sup> )
No. Community groups	0.34	(0.321)	-0.35 (0.037 <sup>***</sup> )
Years of schooling	0.08	(0.495)	0.14 (0.285)
Total farm size in acres	0.05	(0.761)	0.38 (0.093 <sup>*</sup> )
Hidden transaction costs	0.02	(0.009 <sup>***</sup> )	-0.03 (0.007 <sup>***</sup> )
Visible transaction costs	0.03	(0.000 <sup>***</sup> )	-0.03 (0.000 <sup>***</sup> )
Total household income	-0.10	(0.077 <sup>*</sup> )	0.13 (0.053 <sup>*</sup> )
constant	-4.00	(0.037 <sup>***</sup> )	-5.11 (0.019 <sup>***</sup> )
<b>Notes:</b> Figures in parenthesis are p-values. $R^2=0.47$ , Log likelihood = -66.61, LR $\chi^2$ (22)= 118.62, Prob > $\chi^2$ =0.000 * 10 percent ** 5 percent *** 1 percent significance level, Non compliance to GlobalGAP (base case outcome), Number of observations 139.			

**Table 6: Model 3; Laikipia**

Estimated coefficients for different compliance arrangements			
Independent variables	Group contract	Group scheme	Individual
Age	-0.025 (0.192)	-0.014 (0.410)	0.003 (0.842)
Gender	-0.721 (0.259)	-0.438 (0.624)	0.630 (0.489)
Distance to the market (km)	0.117 (0.042 <sup>***</sup> )	0.052 (0.437)	-0.050 (0.296)
Years of farming experience	0.01 (0.648)	-0.055 (0.102)	0.018 (0.547)
Household size	0.094 (0.499)	0.378 (0.037 <sup>***</sup> )	-0.286 (0.085 <sup>*</sup> )
No. Community groups	0.01 (0.993)	0.093 (0.219)	0.076 (0.281)
Years of schooling	-0.071 (0.311)	-0.041 (0.638)	0.221 (0.022 <sup>***</sup> )
Total farm size in acres	0.300 (0.063 <sup>*</sup> )	0.520 (0.007 <sup>***</sup> )	0.355 (0.137)
Hidden transaction costs	0.812 (0.000 <sup>***</sup> )	0.491 (0.001 <sup>***</sup> )	-0.457 (0.000 <sup>***</sup> )
Visible transaction costs	-0.194 (0.010 <sup>***</sup> )	-0.154 (0.079 <sup>*</sup> )	-0.076 (0.037 <sup>***</sup> )
Total household income	-0.165 (0.056 <sup>*</sup> )	0.029 (0.644)	0.099 (0.154)
constant	0.934 (0.530)	-1.670 (0.354)	-8.282 (0.000 <sup>***</sup> )
<b>Notes:</b> Figures in parenthesis are p-values. $R^2=0.34$ , Log likelihood = -166.73, LR $\chi^2$ (33)= 106.89, Prob > $\chi^2=0.000$ * 10 percent ** 5 percent *** 1 percent significance level, Non compliance to GlobalGAP (base case outcome), Number of observations 223.			

In this analysis, non compliance is used as the base category for no choice and the other choices (group contract, group scheme and individual compliance arrangements) are evaluated as the alternatives to this option.

#### 4.1 MARGINAL EFFECTS

The results of marginal effects for the three models above are presented below. In kirinyaga District, the model correctly predicted about 50.69 percent of compliance in Group contract, 18.39 percent of compliance in Group scheme and 26.67 percent of compliance in individual institutional arrangements with GlobalGAP. Overall the prediction was 95.72 percent. In Mbooni district, the model predicted 25.33 percent for group scheme and 42.52 percent individual compliance arrangement. Overall the prediction for Mbooni was 67.85 percent. On the other hand, Laikipia district 26.21 percent was predicted for group contract, 35.59 for group scheme

and 16.80 percent for individual compliance arrangements. Overall the predictive power was 78.6 percent.

**Table7: Kirinyaga**

Marginal effects Dy/Dx			
Independent variables	(Dy/Dx): Grp contract	(Dy/Dx): Grp scheme	(Dy/Dx):Individual
Age	0.006 (0.166)	-0.001 (0.521)	-0.004 (0.285)
Gender	0.078 (0.504)	-0.009 (0.864)	-0.084 (0.439)
Distance to the market (km)	0.049 (0.177)	0.059 (0.095 <sup>*</sup> )	-0.011 (0.593)
Years of farming experience	-0.011 (0.673)	0.001 (0.584)	0.007 (0.077 <sup>*</sup> )
Household size	0.008 (0.086 <sup>*</sup> )	0.005 (0.675)	-0.008 (0.023 <sup>***</sup> )
No. Community groups	0.010 (0.401)	0.001 (0.906)	0.009 (0.359)
Years of schooling	0.015 (0.622)	0.004 (0.806)	-0.017 (0.546)
Total farm size in acres	0.010 (0.411)	0.009 (0.031 <sup>***</sup> )	0.003 (0.798)
Hidden transaction costs	0.074 (0.024 <sup>***</sup> )	0.023 (0.034 <sup>***</sup> )	-0.070 (0.543)
Visible transaction costs	0.01 (0.002 <sup>***</sup> )	-0.001 (0.003 <sup>***</sup> )	-0.003 (0.004 <sup>***</sup> )
Total household income	-0.03 (0.062 <sup>*</sup> )	-0.01 (0.595)	0.03 (0.456)
<b>Notes:</b> Figures in parenthesis are p-values. Prob > $\chi^2$ =0.000      * 10 percent      ** 5 percent      *** 1 percent significance level,    Note: (*) Dy/Dx is for discrete change of dummy variable from 0 to 1, Predictive power 1=50.69%, 2=18.39, 4=26.67%			

**Table 8: Mbooni**



Marginal effects Dy/Dx		
Independent variables	(Dy/Dx): Grp scheme	(Dy/Dx):Individual
Age	-0.06 (0.228)	0.06 (0.777)
Gender	-0.15 (0.305)	- 0.08 (0.325)
Distance to the market (km)	0.06 (0.045 <sup>***</sup> )	-0.02 (0.087 <sup>*</sup> )
Years of farming experience	0.01 (0.278)	-0.01 (0.108)
Household size	-0.05 (0.029 <sup>***</sup> )	0.02 (0.087 <sup>*</sup> )
No. Community groups	0.06 (0.263)	-0.03 (0.027 <sup>***</sup> )
Years of schooling	0.01 (0.553)	0.01 (0.311)
Total farm size in acres	0.02 (0.930)	0.01 (0.076 <sup>*</sup> )
Hidden transaction costs	0.03 (0.011 <sup>***</sup> )	-0.01 (0.030 <sup>***</sup> )
Visible transaction costs	0.04 (0.004 <sup>***</sup> )	-0.01 (0.031 <sup>***</sup> )
Total household income	-0.01 (0.078 <sup>*</sup> )	0.07 (0.078 <sup>*</sup> )
<b>Notes:</b> Figures in parenthesis are p-values. <sup>*</sup> 10 percent <sup>**</sup> 5 percent <sup>***</sup> 1 percent significance level, Note: <sup>(*)</sup> Dy/Dx is for discrete change of dummy variable from 0 to 1, Predictive power 2=25.33, 4=42.52%		

**Table 9: Laikipia**

Marginal effects Dy/Dx			
Independent variables	(Dy/Dx): Grp contract	(Dy/Dx): Grp scheme	(Dy/Dx):Individual
Age	-0.001 (0.234)	-0.001 (0.447)	0.0004(0.721)
Gender	-0.053 (0.354)	-0.025 (0.678)	0.037 (0.318)
Distance to the market (km)	0.007 (0.016 <sup>***</sup> )	0.003 (0.479)	-0.004 (0.182)
Years of farming experience	0.001 (0.603)	-0.002 (0.111)	0.001 (0.505)
Household size	0.01 (0.488)	0.021 (0.022 <sup>***</sup> )	-0.019 (0.072 <sup>*</sup> )
No. Community groups	-0.001 (0.855)	0.005 (0.248)	0.004 (0.315)
Years of schooling	-0.005 (0.239)	-0.003 (0.541)	0.014 (0.011 <sup>***</sup> )
Total farm size in acres	0.014 (0.071 <sup>*</sup> )	0.025 (0.021 <sup>***</sup> )	0.019 (0.122)
Hidden transaction costs	0.044 (0.004 <sup>***</sup> )	0.021 (0.017 <sup>***</sup> )	-0.024 (0.012 <sup>***</sup> )
Visible transaction costs	-0.011 (0.009 <sup>***</sup> )	-0.008(0.037 <sup>***</sup> )	-0.006 (0.054 <sup>*</sup> )
Total household income	-0.009 (0.034 <sup>***</sup> )	-0.002 (0.442)	0.006 (0.169)
<b>Notes:</b> Figures in parenthesis are p-values. <sup>*</sup> 10 percent <sup>**</sup> 5 percent <sup>***</sup> 1 percent significance level, Note: ( <sup>*</sup> ) Dy/Dx is for discrete change of dummy variable from 0 to 1, Predictive power 1=26.21%, 2=35.59%, 4=16.80%			

### Distance to the market place.

Distance to the market place coefficient is positive and statistically significant at 10 percent for group scheme in Kirinyaga District and 1 percent for group contract in Laikipai District. In Mbooni district, its also positive and statistically significant at 1 percent for group scheme and negative and statistically significant at 1 percent for individual compliance arrangement. This is because the greater the distance from market place the higher the transport and production costs.

Marginal effects show that as distance to the market place increases by one unit, compliance in the group scheme and group contract increases by 8.6 and 1.6 percent in Kirinyaga and Laikipia districts respectively while in Mbooni district group scheme compliance increases by 4.5 percent. However, in Mbooni district individual compliance reduces as distance to the market place increases by 8.7 percent. These results imply that, the further the households are from the market place the less the individual compliance and the more the group contract and group scheme compliance arrangements in order to reduce the costs. Therefore, the probability of a farmer to

comply in group increases with increased distance to the market place due to the need to share production and transport costs. Long distance to the market place encourages group compliance and discourages individual compliance.

### **Years of farming experience**

The coefficient of years of farming experience is positive and statistically significant at 10 percent in Kirinyaga district for individual compliance arrangements. This implies that the more the number of years in farming an individual farmer has, the more likely the farmer is to comply with GlobalGAP. Experience in farming goes hand in hand with age, and the more a farmer advances in age, the more experience he has in farming and the more likely he is to comply to increase market access for higher incomes.

The marginal effects show that an increase in the number of years of farming by one unit leads to an increased individual compliance by 7.7 percent in Kirinyaga district. This is because individual farmers desire to get richer as years of farming pass by. They also exploit new opportunities and compete amongst themselves for market share for higher returns. Years of experience therefore encourages individual compliance.

### **Household Size**

The coefficient for household size is positive and statistically significant at 1 percent for group contract and group scheme in Kirinyaga and Laikipia districts respectively. Its also negative and statistically significant at 1 percent in Kirinyaga and Mbooni, and 10 percent in Laikipia districts for individual compliance arrangements. This means that the more the number of people in a household the less the probability of compliance through individual arrangements and the more the probability of compliance through group contract and group scheme arrangements.

The marginal effects of household size in Kirinyaga and Laikipia district show that, as household size increases, group contract increases by 8.6 in Kirinyaga and 2.9 percent for group scheme in Mbooni districts. However, increase in the number of people in a household leads to a decrease in individual compliance by 2.3, 8.7 and 7.2 percent in Kirinyaga, Mbooni and Laikipia districts respectively. This therefore means that large household sizes encourages group scheme and group contract compliance and discourages individual compliance arrangements.

### **Number of groups a household head is a member**

The coefficient for the number of groups a household is part of was found to be negative and statistically significant at 1 percent for individual compliance arrangements in Mbooni District. This means that an increase in the number of groups a household head joins reduces the probability of individual compliance arrangements.

The marginal effect for individual compliance arrangements in Mbooni shows that a one unit reduction in group membership leads to an increase in individual compliance by 2.7 percent and vice versa. This means when farmers join groups they are likely to increase the probability of compliance using the group contract arrangement and reduce the possibility of individual compliance because eventually in groups households realize group benefits such as reduction of transaction and production costs.

### **Years of schooling**

Years of schooling coefficient is positive and statistically significant at 1 percent in Laikipia District. This means that an increase in education level leads to an increase in individual farmer compliance with GlobalGAP.

The marginal effect for years of schooling in Laikipia District show that an increase in years of schooling increases individual compliance by 2.2 percent. This implies that high education level enlightens individual farmers on the importance of complying with GlobalGAP in order to increase international market access and incomes. Farming experience and education level work perfectly well in increasing individual group compliance.

### **Farm size**

Farm size coefficient is positive and statistically significant at 10 percent for group scheme in Kirinyaga District and at 10 percent for individual compliance in Mbooni District. Its also positive and statistically significant at 10 percent for group contract and 1 percent for group scheme in Laikipia district. This means that an increase in farm size increases compliance (individual, group contract and group scheme ) in the three districts.

Marginal effects show that an increase in farm size by one unit increases group scheme compliance by 3.1 and 2.1 percent in Kirinyaga and Laikipia Districts. It also increases group contract compliance by 7.1 percent in Laikipia district while in Mbooni district individual compliance increases by 7.6. This indicates that larger farm sizes enables farmers to enjoy economies of large scale production which in turn lead to increased compliance with GlobalGAP hence enhances export of French beans to the international markets.

### **Hidden transaction costs**

Hidden transaction costs are unobservable market costs that consist of investment and recurrent costs. Hidden investment costs are incurred before compliance and they include information search costs (meetings with exporters, government officials and friends), contract making and negotiation costs. Hidden recurrent costs are the unobservable costs of maintaining compliance such as opportunity costs of participating in compliance related activities. In this study, the sum of money value of time spent in a compliance activity, transport costs and incidental expenses

incurred while doing that activity gave the total hidden transaction costs for the particular activity (Nyota, 2011).

The coefficient for hidden transaction costs is positive and statistically significant at 1 percent for group contract and group scheme compliance arrangements for both Kirinyaga and Laikipia Districts. Its also positive and statistically significant at 1 percent for group scheme in Mbooni Districts. However, its negative and statistically significant at 1 percent in Kirinyaga, Mbooni and Laikipia District respectively for individual compliance arrangements. That is, an increase in hidden transaction costs, increases compliance with GlobalGAP through group contract and group scheme and reduces individual compliance arrangements.

The marginal effects of hidden transaction costs show that as the costs increases group scheme and group contract increases by 2.4 and 3.4 percent, 0.4 and 1.7 percent for Kirinyaga and Laikipia districts. It also leads to an increase of group scheme compliance with GlobalGAP by 1.1 percent in Mbooni. However, increase in hidden transaction costs decreases individual compliance by 3 and 1.2 percent in Mbooni and Laikipia districts respectively. This implies that increased hidden transaction costs encourages compliance both in group contract and group schemes in order to share costs and reduces individual compliance due to high costs spent on information search, contract making and bargaining.

### **Visible transaction costs**

Visible transaction costs are the observable market costs which include costs of construction of buildings and facilities, equipments, needs assessment, technical assistance/service, protective gears, masks, gloves, inputs used, record keeping, initial auditing, certification costs (Muriithi, 2008).

The coefficient for visible transaction costs is positive and statistically significant at 1 percent for group contract and group scheme compliance arrangements in Kirinyaga and Laikipia Districts. Its negative and statistically significant at 1 percent for individual compliance in Kirinyaga and Mbooni Districts and 10 percent for Laikipia Districts.

The marginal costs show that in Kirinyaga District an increase in visible transaction costs, increases compliance with GlobalGAP through group contract and group scheme by 0.2, 0.3 compliance arrangements respectively in Kirinyaga districts. Increase in visible transaction costs also increases group scheme compliance by 0.4 percent in Mbooni district. Individual compliance with GlobalGAP reduces with increase of visible transaction costs by 0.4, 3.1 and 5.4 for Kirinyaga, Mbooni and Laikipia Districts respectively. Therefore, the marginal effects show that an increase in visible transaction costs by one unit leads to an increase in group contract and group scheme compliance arrangements while a reduction of visible transaction costs by one unit encourages individual compliance. This implies that the higher the transaction costs the higher the compliance in group contract and group scheme and the lower the individual

compliance due to the high costs of putting up grading sheds, fertilizer and pesticide stores, protective clothing and also maintenance costs.

### **Income**

The coefficient for income is negative and statistically significant at 1 and 10 percent for group contract in Kirinyaga and Laikipia Districts respectively. It is also negative and statistically significant at 10 percent for group scheme in Mbooni district. It is however, positive and significant at 10 percent in Mbooni district. This indicates that low individual household income encourages joining groups in order to be able to comply through either group contract or group scheme compliance.

The marginal effects show that a decrease in income by one unit increases group contract compliance by 6.2 and 3.4 percent in Kirinyaga and Laikipia Districts respectively and also increases group scheme compliance in Mbooni District by 7.4 percent. An increase in individual farm income by one unit increases individual compliance arrangement with GlobalGAP by 7.8 percent. This means that high income among smallholder farmers increases the probability of an individual farmer to solely afford the expensive compliance requirements such as building and facilities, equipments and inputs. It is expected that the wealthier the farmer, the higher the tendency to comply individually. Lower incomes among farmers encourage group contract and group scheme compliance arrangements due to the high possibility to share costs.

## **5. Conclusions and Policy implications**

This study assessed the choice of compliance arrangements with GlobalGAP standards among smallholder French bean Farmers in Kirinyaga, Mbooni and Buuri/Laikipia Districts, Kenya. It identified both positive and negative influence of socioeconomic, demographic, market and farm characteristics on the GlobalGAP compliance arrangements. Empirical analysis revealed that years of farming experience, number of groups a household head is a member, years of schooling and farm size positively influence compliance arrangements with GlobalGAP in Kirinyaga, Mbooni and Laikipia Districts. Some of the factors had an indeterminate sign to compliance arrangements. For instance, distance to the market place had a positive influence on group contract and group scheme compliance arrangements with GlobalGAP and negative influence on individual compliance arrangements in the three Districts.

The study found out that distance to market discourages compliance with GlobalGAP standards through individual compliance and encourages group contract and group scheme compliance arrangements. In the short term, the government should work towards encouraging farmer groups in order to facilitate compliance. In the long run, infrastructural development by both roads and

communication facilities in order to reduce transaction and production costs involved in compliance arrangements.

The number of groups that a household is a part of was found to discourage individual and encourage group compliance arrangements. This means that when farmers join groups they realise benefits of sharing facilities intended to ensure GlobalGAP certification and hence reduce individual compliance for maximum benefits. The government and private sector should increase credit, input subsidies and extension services in order to ensure sustainable existence of groups for compliance purposes. .

Years of farming and schooling were also found to encourage compliance. Increased years of schooling and farming experience were found to encourage individual compliance. Education among farmers should be encouraged and especially through extension services, exporters and brokers to provide useful information.

Households with large farm size were also found to prefer both group compliance and individual compliance so as to take advantage of economies of large scale. Smallholder farmers who grow French beans on a large scale need to be encouraged to consider complying with GlobalGAP for the sake of exporting their large production to the international market to avoid wastage. The government should ensure enough extension services are available to educate farmers on the need to comply with GlobalGAP in order to export their excess production for higher incomes and especially those growing French beans on large scale.

High visible and hidden transaction costs were found to encourage group contract and group scheme and discourage individual compliance arrangements. In order to encourage farmers to overcome high transaction costs, policies need to be put in place for farmers who are members of a group such as credit and input support policies for collective reduction of compliance costs per farmer. GlobalGAP compliance standards are lumpy and expensive and households should be educated on the need to join groups to share the costs. The government should provide a conducive environment for investors involved in horticultural business such NGO's and exporters to provide support to farmers who form groups to reduce both production and transaction costs.

## **6. Recommendations for further studies**

First there is need to carry out a comparative study between group contract and group scheme compliance arrangements to find out if there is any significant difference between the two. Secondly a study on transaction costs vs income returns for each compliance arrangement need to be undertaken to find out which arrangement lead to more exitors. Finally, this study eliminates non growers from the choices, and therefore the role of non growers in the compliance with GlobalGAP standards should be determined.

## References

- Asfaw, S, Mithofer, D and Waibel, H, 2009. Food-safety Standards and Farmers Health: Evidence from Kenyan's Export Vegetable Growers. Contributed Paper prepared at the International Association of Agricultural Economists Conference, Beijing, China, August 16-22, 2009.
- Deressa, T.T., Hassan, R.M., Ringler, C., Alemu, T., and Yusuf, M., 2009. Determinants of farmer's choice of adaptation methods to climate change in the Nile Basin of Ethiopia. *Journal of Global Environmental Change*- 688; No of Pages 8.
- Dolan, C., Humphrey, J., 2000. Governance and Trade in Fresh Vegetables: The Impact of UK Supermarkets on the African Horticulture Industry. *Journal of Development Studies* 37(2), 147-176.
- Elosy, K and Mburu, J., 2012. Opportunities and challenges for youth's participation in horticultural production in the face of GlobalGAP standards in Kenya. Paper presented at the International Conference on 'Young People Farming and Food' Accra, Ghana. March 19-21, 2012.
- GlobalGAP (2011), Produce safety standard, Control Points and Compliance Criteria, GLOBALG.A.P.
- Government of Kenya (GoK), 2005. Laikipia district Vision and Strategy: 2005-2015.
- Government of Kenya (GoK), 2009. Laikipia district Long rains Food security assessment Report 20th to 24th July, 2009.
- Government of Kenya (GoK), 2004. Strategy for Revitalizing Agriculture 2002-2008. Ministry of Agriculture and Ministry of Livestock and Fisheries Development, Nairobi.
- Graffham, A, Cooper, J, Wainwright, H and MacGregor, J, 2007. Small-scale farmers who withdraw from GlobalGap. Results of a survey in Kenya. Published by International Institute for Environment and Development.
- Greene, WH, 2003. *Econometric analysis* 5th ed. Prentice Hall, Upper Saddle River, New Jersey: Prentice-Hall.



- Hassan, R & Nhemachena, C.,(2008).Determinants of African farmers' strategies for adapting to climate change: multinomial choice analysis. *African Journal of Agricultural and Resource Economics* 2 (1), 83-104.
- Kersting, S and Wollni, M 2012. New institutional arrangements and standard adoption: Evidence from small-scale fruit and vegetable farmers in Thailand. Selected Paper prepared for presentation at the International Association of Agricultural Economists(IAAE) Triennial Conference, Foz do Iguacu, Brazil, 18-24 August, 2012.
- Mbithi, I. (2008).African experience with strategic export development:The success story of Kenya's horticultural industry.World Bank workshop. University of Pretoria.October 2008.
- Monda, E.O, Munene, S and Ndegua, A, 2003. French beans production constraints in Kenya. *African Crop Science Conference Proceedings*, Vol. 6. 683-687.
- Muriithi, B, W., 2008. Compliance with EUREPGAP standards:Determinants, Costs and Implications of Profitability among smallholder French Beans Exporters in Kirinyaga District, Kenya.Masters thesis.
- Nyota, H, N, 2011. Transaction costs and other determinants of choice of compliance arrangements with GlobalGAP standards among smallholder French Bean Farmers: The case of Kirinyaga South District, Kenya.Msc Thesis Department of Agricultural Economics, University of Nairobi.
- Okati, S., (MoLD), Njau, E., (MoA), Kamwanza, M., (ALRMP), Odingo, G.,(FAO), Adiema, C.,(WFP), and GoK enumerators, 2009. Makueni District Market Profile.
- Okello, J.J, and Swinton, S. M, 2005. Compliance with International Food Safety Standards in Kenya's Green Bean Industry: A Paired Case Study of Small and Large Family Farms. Selected Paper Prepared for Presentation at the American Agricultural Economics Association Meeting, Providence, Rhode Island, July 24-27, 2005.
- Subervie, J and Vagneron, I, 2012. Can Fresh Produce Farmers Benefit from Global Gap Certification?The case of lychee producers in Madagascar. Selected Paper prepared for presentation at the International Association of Agricultural Economists(IAAE) Triennial Conference, Foz do Iguacu, Brazil, 18-24 August, 2012.
- United States Agency for International Development (USAID), 2012. Kenya Horticulture Competitiveness Project. Issue No. 24.