Research article

The Effect of GlobalGAP Certification on Horticulture Production in Kenya

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Abstract Promoting sustainable production systems is one of the pillars of sustainable development. Rural development strategies, therefore, should enhance production systems that are sustainable for the future. In Kenya, horticulture exports are a state-induced development strategy meant to raise incomes, improve productivity, and eradicate poverty in rural areas. However, with the ongoing proliferation of regulatory standards and stiff competition, horticulture is becoming increasingly challenging for producers in developing countries. Phytosanitary standards have become a de facto requirement for participating in the lucrative market, intended to bridge the information asymmetry between buyers and producers and serve as an assurance of food safety and environmentally conscious production systems, thereby ensuring that more areas of production are certified. Consequently, buyers prefer producers certified by at least one of the internationally recognized schemes. Producers strive for certification, often certifying only a portion of their producing area to meet the standards, which can hinder the promotion of sustainable agricultural practices. This study aimed to assess the recent priorities for Kenyan horticulture in terms of more certified producers or more certified areas of production, what the trends are, and how these trends affect production. Using panel data obtained from GlobalGAP and FAOStat (2008 to 2020), the study found that the number of certified producers and the certified production area (ha) have both increased. The Pseudo–Poisson Maximum Likelihood (PPML) estimator shows that increasing the number of certified producers has a significant effect on exported volumes and total value, while the area under certified production for both covered and uncovered crops has no significant effect. This could imply that farmers are keen on maintaining the market requirements as opposed to increasing the certified area.

Keywords GlobalGAP, certification, horticulture, regulatory standards, Kenya

INTRODUCTION

Facilitating global market access for developing countries has been a significant achievement during the past two decades (Balié, 2020). This is because of the income opportunities it draws from a rural development perspective (McCalla and Nash, 2019). However, researchers have yet to reach a consensus on the benefits of certifications for the long-term growth of agricultural systems, specifically for resource-poor farmers (Pingali, 2017). Some researchers have argued that the expensive nature of these standards may exclude farmers with limited resources if they do not comply (Krauss and Krishnan, 2022; Ouma, 2010; Shepherd, 2015) others have referred to the certification standards as a "protectionism" strategy employed by developed countries to limit competition from developing countries, in response to the removal of tariffs and subsidies in World Trade Organization

(WTO) Doha 2002 agreement (Boza Martinez, 2015; Fiankor et al., 2020; Weinberger and Lumpkin, 2007).

Utilizing certification standards can serve as a strategic advantage to meet the rising demand for fresh produce and enhance competitiveness in global markets (Asfaw et al., 2010; Boza Martinez, 2015; Jaffee and Masakure, 2005). Moreover, certification standards build trust between producers and consumers by addressing disparities in information, thereby facilitating trade. However, even though certification standards are not mandatory, they have effectively become the prevailing practice as producers strive to maintain relationships with buyers who have a preference for certified producers. Even so, it is still debatable whether producers from developing countries gain any advantages from certifications such as market access, which would potentially increase sales revenue or increase production and improve production practices. Highlighting the issue of arguments surrounding the expansion of certification requirements (Balié, 2020; Bennett, 2017; Fiankor et al., 2017; Dolan and Humphrey, 2000; Kariuki, 2014; Krauss and Krishnan, 2022). Other works of literature have highlighted the impending high sunk cost of adopting certification for smallholder farmers (Fiankor et al., 2020; Mithöfer et al., 2009; Tallontire et al., 2014) except for Henson et al. (2011) who found that despite increasing costs burden, certified middle and large-scale farmers earn higher incomes. Other strands of literature explore the determinants of the decision to certify (Henson et al., 2011; Kariuki, 2014). Some of the literature speculates on the potential benefits of certifications, possibly because of data limitations. Regardless, a gap still exists between theoretical knowledge and empirical evidence on the effect of certification on production. To our knowledge, very little research has provided empirical evidence on this important aspect, with exceptions (Fiankor et al., 2020; Henson et al., 2011), who utilized cross-sectional data to assess the effect of certification on export value.

Hence, using panel data, this paper goes beyond asking the most important question from a development perspective: more certified producers or more certified land areas; what is more important? In that case, how does it affect production?

METHODOLOGY

The data used in the study were obtained from the GlobalGAP database (2008-2020), encompassing information on the number of certified producers, the area of certified land (in hectares), and the type of crops, such as fruits, vegetables, or cut flowers. Additionally, it detailed whether the crops were grown in a shaded greenhouse or similar structure, or an open field. We also utilize data from FAOstat and the Horticultural Crops Directorate in Kenya to obtain data on product volume and market volume. This study adopts the econometric models used by Fiankor et al. (2020). The Poison Pseudo-Maximum Likelihood (PPML) estimator is used as certification data is likely issues of heteroscedasticity as data is disaggregated trade data and to account for zeros in the trade data. Each product was run differently to account for possible heterogeneity within products (Shepherd and Wilson, 2013). The model is specified as Eq. (1)

$$X_{it} = exp_{it} + \lambda_i + t + \beta_0 + \beta_1 ln\, GAPit_{it} + \beta_2 ln\, Y_{it} + \beta_3 ln\, vol_{it} + \beta_4 \text{no. prdcts}_{it} + \beta_5 no.mrkts_{it} + \beta_6 covered\ crop_{it} + \beta_7 openfield\ crops_{it} + e_{it} \quad (1)$$

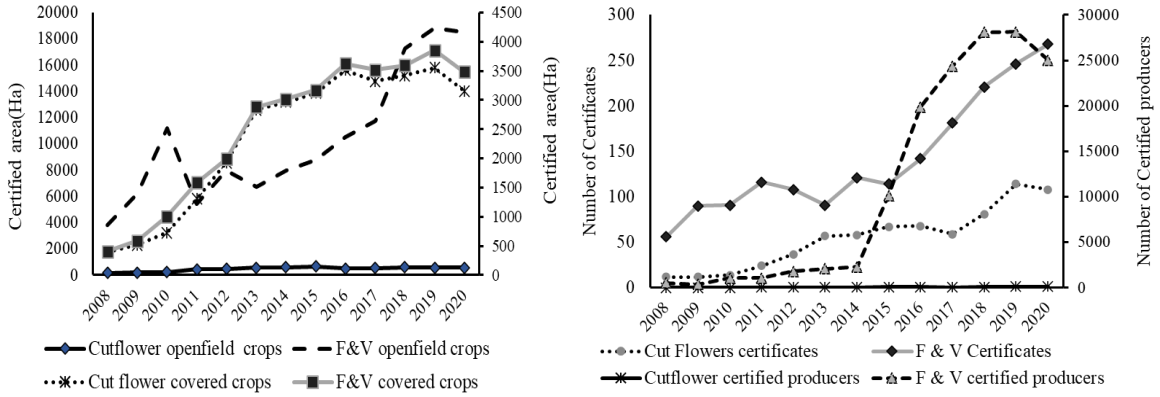
The dependent variable X_{it} represents the level of certification of product i at time t, indicated by the count of certified producers and certified area in hectares. The independent variables include product demand, indicated by export volumes, which, in major markets, drive higher certification allocation. Product characteristics (e.g., number of products exported), market access (e.g., number of markets), and production specifics, distinguishing between open-field crops and covered ones, like greenhouse or shaded cultivation. This is because certification is likely to affect the demand for produce grown in open fields and covered crops and the farmers' decisions on how to allocate land. Nonetheless, field management is different in terms of pest and disease control; open field crops are likely to use more chemicals to control pests and diseases, which attracts more keenness on measures of health and safety and making sure producers do not exceed maximum pesticide limits. On the other hand, buyers and retailers are sometimes willing to pay a premium on certified crops produced

under a controlled environment, and farmers might be moved to allocate more certified areas into covered growing structures. t is time and e_{it} is the error term.

RESULTS AND DISCUSSION

Trends of GlobalGAP Certification in Kenyan Horticulture

The number of certified producers and certified areas has increased from 2008 to 2020, as shown in Fig. 1(a). There was a spike in the certified area in 2009-2010 because of the banning of Kenyan horticulture in EU markets due to exceeding maximum residue limits. Many certified fruits and vegetables are produced in open fields which take up space of land compared to cut flowers and covered crops, which take significantly less area. Vegetables and fruits consist of majority producers consisting of small-scale farmers compared to cut flowers owned by multinational companies operating on covered crops mostly greenhouses.



a) Certified land area b) Certified producers

Source: own calculations using GlobalGAP data F& V is fruits and vegetables

Fig. 1 The trend of GlobalGAP certified producers and land area by product

Figure 1 (b) shows the trend of certified producers and the number of certificates in 2008 -2020, which has been increasing. The number of certified producers for fruits and vegetables is higher than the number of certificates issued; this is because some farmers get certified as individuals and others as groups, as also found by Tallontire et al. (2014).

The Effects of GlobalGAP Certification on Horticulture

The key variables examined in this study include the volumes of exported horticulture, market count, and production characteristics, such as the area of covered and open field crops, the number of products, and the impact of certified producers on these variables over time. The certification metrics will be discussed individually while making a comparison between the products. The impact is more significant for certified producers than for certified land areas. Specifically, a percentage rise in the number of certified producers has a greater beneficial influence on horticulture production compared to a one percent increase in certified land areas. The computed elasticity coefficients exhibit a positive and statistically significant relationship with the variables of exported volumes, number of markets, number of products, and method of production, i.e., covered and open field crops. More precisely, a rise in the number of certified producers leads to a 0.93% increase in open-field crops, a 2.9% increase in market access, and a 5.4% increase in the number of products exported. Nevertheless, the coefficient estimates for the total certified land area are negative, indicating that a 1% increase in certified producers results in a 1.4% decrease in the certified area. This indicates that the number of certified producers has been growing at a faster pace than the expansion of certified areas. This could be because the farmers' decision to obtain certification and expand their certified

area is influenced by the utility they expect to gain from the certification. However, if the decision to certify is driven by market regulations and the need to maintain buyer relationships rather than the actual benefits, the utility remains unchanged (Gichuki et al., 2020).

Open-field crop fields show a more significant influence in comparison to covered crop areas. This is because around 80% of vegetable producers in Kenya are small-scale farmers who predominantly cultivate their crops in open fields. With the tightening of Phytosanitary regulations, small-scale farmers are expected to face increased scrutiny due to the imposition of limits on pesticide residue. This is particularly relevant for open-field crops, which are more susceptible to pests, diseases, and other environmental challenges compared to crops grown in controlled environments. Another explanation is that contracting companies are eager to comply with market standards to sustain their presence in the market (Tallontire et al., 2014).

Table 1 Results of the effect of the certification PPML model (benchmark model)

	Pooled data		Fruits and vegetable		Cut flowers	
	Certified land area	Certified producers	Certified land area	Certified producers	Certified land area	Certified producers
LnGAP ^{hectares}		-1.409** (0.543)		-1.549** (0.595)		-6.309 ** (2.001
LnGAP ^{producer}	-0.028* (0.017)		-0.002 (0.029)			
LnOpenfield crops	0.928*** (0.119)	0.928** (0.422)	0.423** (0.173)	1.187* (0.677)	0.137*** (0.027)	6.294** (1.879)
LnCovered crops	0.132** (0.053)	1.470*** (0.501)	0.810*** (0.202)	1.132 (0.895)	0.832*** 0.016	0.863** (0.328)
LnVol (MT)	0.002 (0.056)	2.909*** (0.690)	0.220*** (0.035)	3.638*** (1.192)	-0.005 (0.003)	-0.129*** (0.042)
LnNo. Markets	0.231 (0.377)	5.410*** (1.533)	0.401 (0.460)	6.740** (3.099)	0.041 (0.031)	-1.152*** (0.188)
LnNo. Products	-0.513** (0.205)	3.873** (1.555)	-1.39** (0.546)	3.003 (4.174)	-0.058 (0.041)	-2.453*** (0.612)
Cons	1.484 (1.911)	-73.15*** (17.065)	-1.164 (2.206)	-80.82*** (22.078)	0.669*** (0.138)	12.787*** (1.935)
R^2	.952	.9196	.930	.882	.947	.932
Observations	26	26	13	13	13	13

*Notes: Robust product clustered standard errors in parentheses. ***, **, * denote significance at 1%, 5% and 10% respectively. LnOpenfield is whether the crop is produced in an open field while LnCovered is if produced in a production structure. LnVol is the volume exported product, and year-fixed effects are included in all regressions.*

The impact on the certified land area is significantly less in all variables when compared to the impact of certified producers. The lack of significance in the exported volumes of crops and some markets may be attributed to GlobalGAP's emphasis on environmental and social responsibility, which may not directly influence yields and hence does not have a substantial impact on the volumes exported. The number of markets accessed is not significantly influenced by the certified area, as farmers may not be aware of the advantages of certification. Additionally, expanding the area of certification may not have a significant impact on market access if farmers continue to sell to the same buyers. Like certified producers, the impact of certified open fields is greater, with significantly lower volumes, namely 0.78% accordingly.

On an individual basis, the volumes of exported fruits and vegetables grew by 0.22% due to a rise in certified producers. Similarly, the number of markets accessed for fruits & vegetables increased to 6.7% for a % increase in unit land area. In this case, the number of certified producers increased by 2.9%. The resulting coefficient of elasticity for certified producers led to a 5.4% rise in the number of markets accessed and a 3.8% increase in the number of products produced.

Controlling for Fixed Effects of Global Gap Certification

The study followed Fiankor et al. (2020) and introduced fixed effects as described in Table 2 to confirm the robustness of our model to possible endogeneity. This confirms that there is no big change; however, the effect of power changes in certified land where both volumes and markets are significant. The coefficient estimate for uncovered crops reduces to 0.78% but is still higher than that of covered crops, The model results confirm that our estimate is valid. Further time and product fixed effects allow the difference in yield between varieties, and yield may vary across years and seasons; specifically, the volumes of fruits and vegetables increase by 2.9% with a % percent increase in a unit area of certified land.

Table 2 Results of fixed effects on certification for the PPML model

	Pooled data		Fruits and vegetables		Cut flowers	
	Certified land area	Certified producers	Certified land area	Certified producers	Certified land area	Certified producers
LnGAP ^{Hectares}		-1.41***		-1.549***		-6.309*
		(.021)		(.021)		(3.783)
LnGAP ^{producer}	-.003		-.002		-.018**	
	(.003)		(.005)		(.009)	
LnOpenfield crops	.786***	1.462***	.423***	1.132***	.156***	.863
	(.014)	(.022)	(.017)	(.024)	(.052)	(.65)
LnCovered	.211***	.932***	.22***	1.187***	.838***	6.294**
	(.006)	(.013)	(.008)	(.015)	(.03)	3.147
LnVol (MT)	.027***	2.921***	.81***	3.638***	-.005	-.129*
	(.008)	(.027)	(.023)	(.031)	(.009)	(.07)
LnNo. Markets	.449***	5.435***	.401***	6.74***	-.014	-1.152***
	(.035)	(.07)	(.051)	(.081)	(.057)	(.342)
LnNo. Products	-1.626***	3.797***	-1.39**	3.003***	-.095	-2.453*
	(.055)	(.112)	(.069)	(.113)	(.179)	(1.387)
Mean dependent var	5933.79	5597.38	8700.1	11143.92	2852.08	54.69
Observations	26	26	13	13	13	13
SD dependent var	4549.41	5597.30	4516.90	11902.82	1380.9	34.121

*Notes: Robust product clustered standard errors in parentheses. ***, **, * denote significance at 1%, 5% and respectively., LnOpenfield crops are whether the crop is produced in the open field while LnCovered is produced in a production structure. LnVol is the volume exported product, and year-fixed effects are included in all regressions.*

CONCLUSION

Food safety regulation is likely to increase as demand for fresh produce increases and the world further opens in international trade. Increasing more certified producers has been more economically significant compared to the certified land area. Farmers' certification from 2008 to 2020 has been a priority perhaps for market access. Further, the volumes of exported have increased confirming that certification can be an important catalyst of trade growth. Production characteristics and types of crops are important in determining the benefits of certification. Nonetheless, both measures of certification, i.e., certified land and certified producers, are important as one caters to the economic needs in terms of enhancing continued business while certified land area can potentially lead to increased production, ensuring environmentally conscious production systems. While the data used in this study offers valuable insights into trends and certification practices in Kenyan horticulture, it also presents a limitation due to the aggregated nature of the data, which might obscure regional or local variations in certification and horticulture production.

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