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POVERTY IN THE FACE OF GLOBAL-GAP STANDARDS: THE CASE OF SMALLHOLDER FRENCH BEANS FARMERS IN KIRINYAGA COUNTY, KENYA

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Abstract

The majority of smallholder French bean farmers in Kenya produce for the export market intending to alleviate household poverty. Export markets are seen as lucrative and therefore able to improve household income and consequently reduce household poverty. However, export markets require compliance with Global-GAP standards. Compliance and certification processes of these standards are costly and thus raise a concern about their effectiveness in addressing household poverty. Currently, studies to determine the link between compliance with Global-GAP standards and French bean farmers' poverty status are limited. Using data from 492 randomly selected Global-GAP-certified and non-certified French bean farmers and Foster-Greer-Thorbecke's (2010) measures of poverty, the study determined the impact of Global-GAP certification on French bean farmers' poverty status. Results show that the majority of the certified French bean farmers (42.7 percent) were poor relative to non-certified (29.9 percent). Poverty depth and severity were also high among certified farmers at 29 percent and 25.2 percent respectively. The results suggest that income earned from Global-GAP certification was not sufficient to move French bean farmers out of poverty. It also suggests that, since compliance and certification processes are costly, there is a high likelihood that the processes contributed to the losses incurred by the Global-GAP-certified farmers. Government therefore should come up with policies that are geared towards lowering costs related to Global-GAP compliance and certification processes. This will in turn increase household income and thus household poverty reduction.

Keywords: *French beans farmers, Global-GAP Standards; Household poverty*

INTRODUCTION

French bean is an example of an exotic vegetable (AFA, 2020). The major areas grown in Kenya include Kirinyaga, Murang'a, Nakuru, Kajiado, Thika, Machakos, Uasin Gishu, Western Kenya, Kisumu, Nyeri, and Naivasha (The Standard, 2021 and Greenlife, 2023). According to the National Bureau of Statistics (2021), most of the vegetables produced in Kenya are locally consumed while some are exported to various countries such as Uganda, Egypt, Pakistan, the United Arab Emirates, the Netherlands, the United Kingdom, and United States of America among other countries. Research Solutions Africa Ltd (2015) reported that fresh

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vegetables produced in Kenya are mainly exported to the European Union. In 2017, approximately two-thirds of the green beans (45,000 tons) exported were rejected in the export market (European Commission, 2018). From 2011 to 2018, the value and volume of exported beans have been declining as a result of restrictions imposed on the beans by importing countries (KNBS, 2019 Fulano, et al., 2021). This indicates a possibility of the smallholder farmers incurring losses.

It is estimated that at least 70% to 80% of Kenyan fresh fruit and vegetable producers are smallholder farmers with land sizes of approximately 0.47 hectares (Kangai and Gwademba, 2017 Matui et al., 2017). According to Kirago (2015), Global GAP was introduced to provide optimal farm productivity by using resources available. Most of the smallholder vegetable farmers in Kenya embrace Global standards in the production of French beans. The objective of smallholder farmers adopting the Global-GAP standards was to access lucrative export markets, especially in Europe, earn more income, and thus alleviate household poverty.

Poverty worldwide has been increasing. For instance, according to Suckling, *et al.* (2021), over one-fifth and over two-fifths of the world population live below $3.20 and $5.50 a day respectively. They further noted that in the year 2021, approximately 9% of the world population was living on less than $1.90 a day. In Kenya, the national poverty rate is still high at 51.4 percent while the rural poverty level stands at 39.9 percent (Oxford Poverty and Human Development Initiative, 2017). Shepherd *et al.* (2014) predicted that over 10.57 million Kenyans would remain poor by the year 2030. According to the Kenya Institute of Public Policy Research and Analysis (2020), the high poverty level in rural areas is caused by over-reliance on agriculture, low productivity, and large household sizes.

In the Central Region of Kenya, where Kirinyaga County is located, observed poverty per adult equivalent is high at 30.4 percent (Kenya National Bureau of Statistics, 2007). Current projections indicate that vulnerability to the expected poverty rate in rural areas of Kirinyaga County stands at 31.9 percent (Oxford Poverty and Human Development Initiative, 2017). According to the International Fund for Agricultural Development (2013), agriculture in Kenya can reduce poverty two times more than the reduction by other sectors of the economy. According to Kuyiah *et al.* (2006) and Kibet *et al.* (2011), horticultural crops are high-yielding, more profitable relative to cereal crops, and hence the ability to reduce poverty even under situations of high risks. Studies by Koppmair *et al.* (2017) and Ecker (2018) confirm that enhancing smallholder farm production diversity increases households' food and nutrition security. Diao *et al.* (2007) argued that African farmers need to adopt new agricultural technologies to produce more, earn more income, and hence alleviate their current poverty and vulnerability to expected poverty. Kirimi, *et al.* (2013).

Nonetheless, agricultural technologies such as Global-GAP are costly concerning compliance and certification processes. In addition, the production of horticultural crops, such as French beans, is characterized by huge risks that include rejection in the export market due to lack of proper compliance (European Commission, 2018), price volatility, pests, and diseases (Humphrey, 2008; Asfaw, *et al*, 2010; Muriithi, *et al.*, 2011; Economic Survey, 2017). Thus the costs and risks dynamics facing the farmers are likely to squeeze out profits from the French beans, and hence the likelihood of farmers not able to earn sufficient income to move them out of poverty. This therefore calls for the need to continuously research the relationship between Global-GAP certification and poverty among smallholder farmers to advise on better policies to support the sub-sector.

Poverty is one of the key development problems that need proper understanding to deal with it effectively. To understand poverty clearly, there is a need to measure it accurately and in doing so, efficient and effective policies aimed at eradicating it will be developed. In Kenya, many studies have been conducted to assess the relationship between the Global-GAP standards and the welfare of French bean farmers. However, most of them have determined the effect of Global-GAP certification on welfare indicators such as household income, expenditure, and asset base but not on poverty. For instance, McCulloch and Ota (2002) and Muriithi and Matz (2014) determined the effect of French bean exports on farmer's incomes in Kenya. They found a significant and positive relationship. These studies however did not estimate poverty.

Studies that have estimated poverty in the face of Global-GAP certification in French bean production include; Achieng (2014) who used the Difference-in-Differences method. The study found a positive relationship between Global-GAP certification and poverty reduction among French bean farmers in Buuri and Kirinyaga County. Rao and Qaim (2010) used endogenous switching regression to determine the impact of marketing vegetables using supermarket outlets on farmer's income and poverty in rural areas of Kenya. The study found a significant and positive relationship between marketing vegetables using supermarket outlets and farmer's incomes and poverty reduction.

Chege *et al.* (2015) used a propensity score matching approach to determine the impact of horticultural exports on household food security in Kenya. The study found a significant and positive relationship between horticultural farming and household food security status. Mwende (2016) found that a farmer who engages in horticultural farming is less likely to be poor than a non-horticultural farmer. Weinberger and Lumpkin (2007) however reported contrary findings. They noted that diversification towards horticulture production in developing countries may not alleviate poverty due to high land sub-division that leads to low yields and thus low income.

To contribute to more understanding of the relationship between global gap certification and poverty reduction, the study used a different approach. The reason is that different studies reported different conclusions on the relationship between Global certification and poverty reduction. Using different approaches is vital in validating the conclusions. In this regard, the study used Foster, Greer, and Thorbecke's (2010) measures of poverty to determine the relationship between Global-GAP certification and poverty among smallholder French bean farmers in Kenya. Very few studies, if any, have used this approach in the analysis of the relationship between Global-GAP certification and poverty among French bean farmers in Kenya.

MATERIALS AND METHODS

Study area

The study was conducted in Kirinyaga County because of the growing importance of the production of Global-GAP-certified French beans among farmers in the County. The County is located 120 km North West of Nairobi and has a total population of 153, 095 (Economic Survey, 2009). The County has five Sub-Counties where French beans are produced. They are namely: Kirinyaga

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Central, Kirinyaga East, Kirinyaga West, Mwea East and Mwea West. A part from French beans, rice, maize, and horticulture are majorly produced in the County. French beans are mainly produced under irrigation and rain-fed.

Sample size determination

A sampling frame of 1,943 certified and non-certified farmers was generated first. Then the formula by Krejcie and Morgan (1970) was used to determine the sample size. Mathematically, the formula is given as:

$$S = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2 P(1-P)} \qquad (1)$$

such that S is the required sample size, X^2= the table value of chi-square for 1 degree of freedom at the desired confidence level (1.96 × 1.96 = 3.84), N = Population size P = Population proportion (assumed to be 0.50), d = degree of accuracy expressed as a proportion (0.05). Using the formula, the sample size corresponding to N=1,943 is 322. However due to the anticipation of some questionnaires being rejected and the need to increase accuracy in estimation, the number of questionnaires was increased proportionately to the sample size of each category of French bean farmers to 492.

Sampling procedure

A systematic random sampling procedure was used to draw the sample size of 492 respondents (certified and non-certified) from the sampling frame. The sample size was drawn in such a way that all the Sub-Counties (Kirinyaga Central, Kirinyaga West, Kirinyaga East, Mwea East, and Mwea West) were represented proportionately.

Data and data collection

A single cross-sectional data was used to estimate poverty among certified and non-certified French bean farmers in the face of Global-GAP certification. Data collected include French bean farmers' socioeconomic and institutional factors, French bean income, and annual total household income. Both structured and unstructured questionnaires were used to solicit the data.

Analytical Framework

Several approaches are acceptable in the estimation of household poverty. These approaches include but are not limited to the biological approach, relative deprivation, expenditure, income inequality, and asset approaches. Previous studies have shown that the major limitation of the biological approach is difficulty in accurately defining the nutrients required and how much is needed for one to be considered optimally productive (Machio, 2015). In the relative deprivation approach, an individual is poor if he or she owns less of what is considered desirable attributes. Desirable attributes in this case may include access to employment, power, and adequate income among other attributes considered to be desirable. The limitation of this approach is that it is difficult to map and identify the group(s) for benchmarks and attributes considered to be desirable for one to be well-off or not (Machio, 2015).

In the expenditure approach, the amount an individual spends (per adult equivalent expenditure) within a given period is used to determine if the individual is poor or not given an expenditure poverty. Any person with expenditure below the predetermined poverty line is considered poor but if his/her expenditure is equal to or above the predetermined poverty, then the individual is considered not poor. This approach however has been criticized based on its assumption that consumption levels of both the poor and non-poor are determined through the same process. It is also criticized based on its assumption that increasing expenditure reduces poverty, which is not true in reality because excess expenditures eventually render an individual poor (Okwi, 1999 Geda *et al.*, 2001).

The asset approach is also used in welfare assessment. The total value of assets per adult equivalent at a given time is used to gauge if one is likely to be poor or not. Accumulation of assets acts as security for future use or helps during the occurrence of risks in life. Some assets do yield regular incomes hence helping households prevent or overcome poverty. Some of the studies that have applied this approach include Burke *et al.* (2007) who explored poverty movements using an asset-based measure of poverty in Kenya among other studies.

In the income approach, poverty is determined based on the income of an individual given a predetermined poverty line. The commonly used poverty line is the international rate of one dollar per day per adult equivalent expressed in local currency given the current exchange rate. If the income of an individual per day is below a dollar per day, then he or she is considered poor. But if his or her income is equal to or above the dollar per day, then he or she is considered not poor. In this study, expenditure and income approaches were used in the estimation of the observed vulnerability of French bean farmers to future poverty in the face of Global-GAP standards. In this study, the income approach was used to estimate poverty under Foster, Greer, and Thorbeke's measures of poverty (FGT, 2010).

The Foster Greer and Thorbeke (FGT) measures of poverty

FGT (2010) measures of poverty are based on the income approach. FGT utilizes the income of an individual and the income poverty line to measure three indices of poverty in a given population. These three indices are poverty rate (headcount), gravity of poverty (depth of poverty), and intensity of poverty or severity of poverty (Foster *et al.*, 2010). FGT measures of poverty are easy to interpret and it is possible to tell the extent and significance of poverty in a given population. Specification of the FGT model is given as:

$$P_\alpha = \frac{1}{n}\sum_{t=1}^{q}\left(1-\frac{y_i}{z}\right)^\alpha \qquad (2)$$

Where n is the sample size of both certified and non-certified vegetable farmers, y_i is the per capita income of the i^{th} French bean farmer, *and* z is the poverty line of KES 193.56 ($1.90 at the exchange rate of KES 101.87 per dollar). q represents the number of poor French bean farmers (those who live below the poverty line), P is the poverty index, α is the poverty aversion variable which takes 0 (head count ratio), 1 (poverty gap), and 2 (squared poverty gap) (Foster *et al.*, 1984). Results will be reported based on the risk and time preferences, type of private standard, farmers' location, and type of French beans produced. The headcount index (P_0) measures the proportion of the population that is poor. It is popular because it is easy to understand and measure. However, it does not indicate how poor the poor are.

$$P_0 = \frac{1}{n}\sum_{t=1}^{q}\left(1-\frac{y_i}{z}\right)^0 \qquad (3)$$

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This can be further simplified to give the following equation:

$$P_0 = \frac{1}{n} \quad (4)$$

The poverty gap index (P_1) measures the extent to which individuals fall below the poverty line (the poverty gaps) as a proportion of the poverty line. The sum of these poverty gaps gives the minimum cost of eliminating poverty if transfers were perfectly targeted. Nonetheless, the measure does not reflect changes in inequality among the poor.

$$P_1 = \frac{1}{n}\sum_{t=1}^{q}\left(1-\frac{y_i}{z}\right)^1 \quad (5)$$

The squared poverty gap "poverty severity" index (P_2) averages the squares of the poverty gaps relative to the poverty line. It is one of the FGT classes of poverty measures that may be written as:

$$P_2 = \frac{1}{n}\sum_{t=1}^{q}\left(1-\frac{y_i}{z}\right)^2 \quad (6)$$

Poverty line and poverty determination

The poverty line ($1.90 per day per adult equivalent) developed by Narayan *et al.* (2015) was used. The new poverty line is highly recommended for poverty estimations, especially in developing countries. The reason is that it was partly generated from data collected in African nations (Narayan *et al.*, 2015). Kenya is a developing country and given the fact that very few studies have applied this new poverty line, it was imperative to embrace this study. The total annual household income of each French bean farmer was estimated and divided by 365 days and then by household size to obtain daily per adult equivalent values. Household size was determined using World Health Organization adult equivalent conversion factors found in Muyanga *et al.* (2007). Both certified and non-certified French beans farmers were categorized as poor if their daily income per adult equivalent fell below KES 193.56 ($1.90 at the exchange rate of KES 101.87 per dollar during the data collection period) poverty line and non-poor if equal or fell above the poverty line.

RESULTS AND DISCUSSIONS

Rate of household observed poverty

Certified and non-certified French bean farmers were categorized as poor and non-poor by using the global poverty line of KES 193.56 ($1.90 per day per adult equivalent). A household was considered poor if income per day fell below KES 193.56. Results in Table 1 indicate that the majority of French bean farmers were poor (72.6 percent).

Table 1: Rate of household observed poverty

[1]Poverty status	Frequency	Percent
Poor	357	72.6
Not poor	135	27.4

[1]Poverty status generated using the international poverty line of $1.90 per day per adult equivalent or KES 193.56 per day per adult equivalent.

According to Mukaila (2022), vegetable production has a positive and significant effect on farming households' income. The results therefore suggest that income from French beans was not sufficient to move the households out of poverty brackets due to the low acreage cultivated. Poor farmers cultivated an average of 0.5 acres of French beans while non-poor ones cultivated an average of 0.5 acres as indicated in Table 2.

Respondent's socio-economic characteristics by poverty status

Both poor and non-poor French bean farmers did not statistically differ in terms of household size and acreage under French beans. However, both statistically differed based on costs incurred per acre of French beans, net income per acre of French beans, total annual household income, and total annual household expenditure per adult equivalent (Table 2).

Table 2: Farmer characteristics by observed poverty category

	[1]Poverty status				
	Poor (N = 357)		Not poor (N = 135)		
Variable	Mean	S.D	Mean	S.D	M.D
Household size (Adult equivalent)	3.6	4.5	2.6	1.0	1.1
	(0.2)		(0.1)		
French beans acreage	0.5	0.4	0.5	0.5	-0.0
	(0.0)		(0.0)		
French beans cost per acre	11045	11534	14606**	16633	-3562
	(610)		(1432)		
Net French beans income per acre	25090	29135	49223***	67980	-24133
	(1542)		(5851)		
Total annual household income per adult equivalent	76448	82700	446800***	382574	-370352
	(4377)		(32927)		
Total annual household expenditure per adult equivalent	177093	299218	256820**	364833	-79726
	(15836)		(31400)		

*, **, and *** mean significance at 10, 5, and 1 percent respectively. Stands for Mean Difference while stands for Standard Deviation. Figures in parentheses are standard errors. Means, SD, and MD values were rounded off to two (2) decimal places. 1Poverty status generated using the international poverty line of $1.90 per day per adult equivalent or KES 193.56 per day per adult equivalent.

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Relative to the poor, non-poor had the highest net annual French beans income (Mean difference = KES 24,133), French beans production costs (Mean difference = KES 3,562), total net annual household income per adult equivalent (Mean difference = KES 370,352), and total annual household expenditures per adult equivalent (Mean difference = KES 79,726). The results suggest that Global-GAP certification had a positive impact on French beans income, total annual household income, and total annual household expenditure, which in turn alleviated household poverty. The findings concur with those of Asfaw et al. (2009:2010), Rao, and Qaim (2010) who noted that vegetable production and marketing positively and significantly influence farmers' incomes which in turn alleviates their poverty levels.

Level of observed poverty between certified and non-certified farmers

Results in Table 3 indicate that, despite certified farmers having a lower poverty level, the poverty levels between certified and non-certified bean farmers did not statistically and significantly (p = 0.281). The results are in line with those of Achieng (2014) who found that Global-GAP-certified French bean farmers had lower levels of poverty but statistically insignificant relative to non-certified farmers.

Table 3: Overall poverty status by certification category

*Poverty status	Indicators	Global-GAP certification status	
		Certified	Non-certified
Poor	N	147_a	51_a
	Percent	41.2%	37.8%
Not poor	N	210_a	84_a
	Percent	58.8%	62.2%

*Poverty status generated using poverty line = KES 193.56 ($1.90 at an exchange rate of KES 101.87) and p-value = 0.281

Impact of Global-GAP certification on farmers' poverty status using FGT measures of poverty

The poverty results for the certified and non-certified French bean farmers were further disaggregated using FGT measures of poverty (Poverty headcount, depth, and severity) as shown in Table 4. The results show that the majority of certified French bean farmers were characterized by high poverty rates, depth, and severity of poverty relative to non-certified farmers. That is, the majority of the Global-GAP certified farmers were poor as indicated by the poverty headcount ratio (P_0) of certified farmers (42.7 percent) and non-certified farmers (29.8 percent). The poverty headcount rates of the two categories of farmers are close to national and rural poverty rates of about 51.4 and 39.9 percent respectively.

Table 4: Poverty headcount, depth, and severity by certification status category

	FGT poverty indicators		
Certification status	***P_0*** **(Poverty Headcount)**	***P_1*** **(Poverty Depth)**	***P_2*** **(Poverty Severity)**
Certified	42.68	0.299	0.252
Non-certified	29.88	0.190	0.156

Poverty line=$1.90 (KES 193.56) per day per adult equivalent, P_0- poverty headcount ratio, P_1- poverty gap, and P_2-severity of poverty.

Poverty depth (P_1) among certified and non-certified was 0.299 and 0.190 respectively. This implies that on average, certified and non-certified French bean farmers fell short of escaping poverty by 29.9 percent and 19 percent of the estimated poverty line respectively. That is, certified and non-certified French bean farmers would require 29.90 percent and 19 percent of KES 193.56 respectively to get out of poverty. Therefore, a certified farmer was poorer relative to a non-certified farmer. The severity of poverty (P_2) was also high among certified farmers (25.2 percent) relative to non-certified farmers (15.6 percent). This indicates that the majority of the Global-GAP-certified farmers belonged to the core poor.

The results further suggest that Global-GAP certification alone as a strategy to increase household income and alleviate poverty is not enough. That is because, despite Global-GAP certification being profitable, the income is not sufficient to move the households out of poverty due to small land sizes. The possible reasons are that the first production of Global-GAP-certified French beans is characterized by various risks that include but are not limited to price fluctuation, pests, and diseases. Secondly, Global compliance and certification processes are costly. Thus, given the risks coupled with the huge costs of production, the farmers are likely to get very low income or even losses. Low income or losses mean a high likelihood of the farmers falling into poverty.

The results concur with the conclusion by Liesbeth, *et al.* (2012) who noted that compliance with the standards marginalizes small-scale and poor farmers in developing countries because they are excluded from high-standards supply chains while the rents in the chain are extracted by large companies. Similar findings are found in Weinberger and Lumpkin (2007) who reported that diversification towards horticulture production in developing countries may not alleviate poverty due to high land sub-division that leads to low yields and thus low income. A study by Machio (2015) shows that farmers who produce and rely on cash crops are more likely to be poor than those who do not. Also, a study by Mwende (2016) found that enforcement of Global-GAP standards increases the likelihood of households being poor by 2.3%.

Contrary findings are reported by Achieng (2014) who found a positive relationship between Global-GAP certification and poverty reduction among French bean farmers in Buuri and Kirinyaga County. Asfaw *et al.* (2010) found that for the Eurep-GAP (now Global-GAP) standard to significantly and positively reduce poverty among farmers, the scale of adoption needs to be increased and this means land size also needs to be increased. Rao and Qaim (2010) noted that a significant and positive relationship exists between marketing vegetables using supermarket outlets and farmer's incomes and poverty reduction. Chege *et al.* (2015) and McCulloch and Ota (2002) concur that horticultural exports have significant and positive influences on household food security and poverty respectively.

Conclusions

The study sought to determine the impact of Global-GAP certification on French bean farmer's observed poverty. Results show that poverty headcount, depth, and severity ratios were high among the certified French bean farmers relative to non-certified. The study concludes that Global-GAP certification is profitable but the income is not sufficient enough to move French bean farmers out of poverty. There is also a high likelihood that the costly Global-GAP compliance and certification processes and other

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marketing challenges contributed to the losses incurred by the certified farmers.

Policy implications

Since Global-GAP compliance and certification is a profitable venture and the income is not sufficient to move the households out of poverty, the smallholder French beans farmers need to increase the land size under Global-GAP certified French beans. In addition, the National and County governments, and other partners need to support the French bean farmers by subsidizing key inputs necessary for Global-GAP compliance and certification. Subsidy on credit facilities, key physical inputs, and insurance is critical. This will lower Global-GAP compliance and certification costs, which in turn increases household income and consequently alleviate the growing poverty.

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