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Article

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DEVELOPMENT ECONOMICS | RESEARCH ARTICLE

Meeting European exporting certification standards as a sustainable marketing choice among mango farmers in Ghana

Richard Kwasi Bannor^{1*}, George Osei¹ and Samuel Kwabena Chaa Kyire¹

Abstract: Amidst the prevalence of certification and pursuit of global markets, there is a dearth of studies on compliance with EU certification standards and market outlet preference among mango farmers in Ghana. Therefore, this study sought to determine factors influencing mango farmers to produce to meet European standards and certification, and the marketing outlet choice of mango farmers in the Bono and Bono East regions of Ghana. A multistage sampling technique was employed to select 300 mango farmers. Data gathered were analysed using multinomial and binary probit regressions. Empirical results show that gender, age, farming experience, and access to the ready market are significant predictors of a farmer's choice of the local market. On the other hand, farming experience, ready market, the quantity of harvest, fruit quality, market assurance, and good agronomic practices (GAP) significantly predict farmers' preference for retail. The level of education, farm size, GAP, annual farm income, ready market, training, and access to credit are essential determinants of a farmer's decision to practise EU standards and certification. Given the findings, it is recommended that farmers who sell and are likely to sell to processors should be targeted for pieces of training on EU market export as they are more likely to be convinced and already involved in relevant practices for such exports

Subjects: Development Studies; Regional Development; Sustainable Development; Rural Development; Business, Management and Accounting

Keywords: certification; marketing; European standards; mango; good agricultural practices

1. Introduction

For a long time, Ghana has depended on exporting traditional crops—specifically, cocoa, coffee, and timber. However, in the late '90s, the Ghana Export Promotion Authority (GEPA) introduced the export of non-traditional crops and animals, including horticultural crops such as oranges, pineapple, pepper, and mangoes. The Ghanaian horticultural industry has developed steadily over the years due to its contribution to poverty alleviation, food security, and GDP (Akrong, Mbogoh, Irungu

ABOUT THE AUTHORS

Richard Kwasi Bannor did the questionnaire design, data analysis, and the general manuscript write-up, review of responses to reviewer comments and proofreading.

George Osei conceptualised the topic, collected the data, and contributed to the initial write-up.

Samuel Kwabena Chaa Kyire was involved in the initial conceptualisation, descriptive analysis of the data and responses to reviewer comments.

et al., 2020; Joosten et al., 2015; Kuwornu & Mustapha, 2013). According to GEPA (Hlippe & Grote, 2017), Ghana's horticulture export earned 82 million US dollars in 2016, with a 5.2% growth.

The expanded horticultural industry could be attributed to the rising incomes, and public awareness about healthier diets and good nutrition which have increased the demand for fresh food products, including fruits and vegetables (Joosten et al., 2015). Given the prospect of the horticultural industry, the Government of Ghana (GoG) signed an Economic Partnership Agreement (EPA) with the European Union (EU) to grant the latter easy access to the EU market. Moreover, the GoG recently introduced the Planting for Export and Rural Development (PERD), focusing on selected tree crops, including coconut, cocoa, cashew, oil palm, rubber, shea and mango, with much emphasis on mango as the second export earner after cocoa (Graphic online, 2019).

Previously, fruits and vegetables were primarily cultivated for domestic consumption; however, these commodities have recently gained interest in export markets (Agyei-Sasu et al., 2013). One of the most promising fruit crops is mango (*Mangifera indica*). Mangoes have long been a staple of Ghanaian agriculture, although commercial mango farming is relatively recent and uses different cultivars than those found in Ghanaian homesteads and forested areas (Komayire, Komayire, 2015). Mango is Ghana's third most-consumed fruit, just behind pineapple and oranges (Broek et al., 2016). It is estimated that the total world production of mangoes as at 2021 stood a little over 57 million (FAOSTATS, 2023a). However, only a smaller proportion of the fruits are traded on the international market. For instance, approximately 25 million tons of mango were traded on the international market with India, the global lead producer exporting only 170,212.37 tonnes (FAOSTATS, 2023b). Likewise, Ghana produced approximately 99,351.74 tons of mangoes in 2021 but exported approximately a little over 8000 tonnes representing only 8.05%. This estimate indicates that Ghana has literally not utilised the opportunities associated with mango export. Meanwhile, Ghana has a comparative advantage in exportable mango production with its two seasons of production (Akrong, Mbogoh, Irungu et al., 2020; Edusei et al., 2022) and the proximity to the European markets compared to other major exporters from Asia.

However, the emergence of stringent public and private sector standards has made pursuing the latter an unrealistic goal (Akrong et al., 2022; Anang & Zakariah, 2022; Lee & Gereffi, 2015). Thus, access to the export market by Ghanaian farmers has been constrained by strict requirements (Akrong et al., 2022; Annor et al., 2016). Consequently, mango farmers need to adhere to requirements such as traceability, certification, and other safety standards before their products are allowed entry into EU countries, which is not a requirement at the local markets. Owing to these hurdles, a substantial proportion, around 80% of mangoes produced are still marketed domestically (Grumiller et al., 2018; Akrong, Mbogoh, Irungu et al., 2020). Unfortunately, the inability of mango farmers to access export markets implies a missed opportunity to increase income and improve their livelihoods through better prices from the international market (Laosutsan et al., 2019). For instance, reports indicate that mango farmers can receive three times the prices they receive for their mangoes at the domestic market if they pursue the international market (Baidoo-Williams, 2015). However, this target seems to be unfeasible due to the barriers involved in the export of mangoes.

Given the foregoing narrative, researchers have explored certifications and fruit marketing. The studies span from investigating the motivation to adopt certifications, the effect of certification on the choice of market outlet, certification and pursuit of the export market and the impact of certification on fruit producers' welfare. Nonetheless, the majority of the studies are skewed towards other fruit crops (see, Adjapong, 2018; Annor et al., 2016; Kleemann et al., 2014). In the Ghanaian context, research on certification and choice of market outlet among mango producers are just a handful. Thus, the motivation for Ghanaian mango producers to adopt European Union certification standards and pursue the export market is very silent in the literature. Akrong et al. (2022) explored the effects of GlobalGAP certification on mango producers' livelihoods. Also, recently, (Akrong, Mbogoh, Irungu et al., 2020) investigated the determinants of farmers' choice

of export and local market; however, the authors did not untangle farmers' motivations to adhere to certification requirements. Again, Oppong and Bannor (2022) revealed that applying generic compliance strategies based on a particular commodity value chain study may not get the needed impact because of the multiplicity of factors that influence different commodity value chain certifications and standards. Therefore, given the lack of clarity, what encourages or discourages Ghanaian mango farmers from adhering to export standards is unclear. Therefore, to ensure clarity with empirical evidence, the current study sought to investigate certification and marketing behaviour among mango producers by focusing on their market outlet choice and what drives their readiness to adhere to EU standards. The objectives of this study are (1) determine mango farmers' choice of market outlet (2) assess farmers' motivation and willingness to comply with EU standards and (3) examine the drivers of adopting EU standards among mango farmers.

This is a pioneer study investigating factors influencing mango farmers to produce to meet EU certification standards in Ghana. The study findings would provide evidence to certification bodies and promoters of certification and standards to make informed decisions on the constraints and how to assist farmers to adhere to these standards while selling to high-value markets. Further, it will inform marketers and traders of the marketing avenues utilised by farmers and the drivers of farmers' choices to inform prudent mango marketing strategies. Moreover, understanding the underlying motivations of mango farmers to meet European standards and certifications would help develop institutional arrangements, markets, and infrastructure that would benefit farmers and key stakeholders in their quest to promote high-value export markets for mangoes. Regarding literary contributions, this study will add to the paucity of existing literature on certification participation among farmers from emerging economies, particularly mango farmers.

2. Review of related literature

2.1. Overview of standards, certification and adoption among farmers

Recent incidences of food contamination, outbreaks of food-borne illnesses, and pest infestations have forced the international food sector to adapt. To ensure food quality and safety throughout the food supply chain, incidents like this compelled the development of public and private food safety standards like Codex Alimentarius, Hazard Analysis Critical Control Points (HACCP), Global Working Group for Good Agricultural Practice (GlobalGAP), Safe Quality Food (SQF) Certification, and International Organization for Standardization (ISO 22,000).

Geographically and in terms of tackling new issues, standards are spreading (Maertens et al., 2012). Particularly vulnerable to their tightening regulations is the agri-food industry. The governance of international agricultural value chains, from farm to fork, places a premium on food safety regulations. Private standards are optional, in contrast to de facto mandatory public standards. However, voluntary compliance is actually required to penetrate and maintain access to high-value markets due to the spread of private standards and the growing market dominance of multi-national retail chains and agribusiness companies (Henson & Humphrey, 2010).

Although not mandated by law, standards and certification are now becoming mandatory for fresh horticultural crops to enter the European market (Bain, 2010). The certification encourages farmers to produce safe and quality fruits for consumers (Pongvinyoo & Yamao, 2014). Thus, for farmers to be assured of a market for their products with a good marketing margin, they must get their farms certified by a recognised certification body. Certification hastens to enhance participation in high-value markets such as the European market. This is because buyers in high-value markets prefer to purchase certified products (Akrong, Mbogoh, Irungu et al., 2020). Also, consumers are willing to patronise a product certified by a well-known body, as they think consuming such products will not have any negative implications for their health. It is generally believed that certified growers employ good agronomic practices (GAP) to affect the quality and quantity of produce, assuring consumers of good products (Akrong, Mbogoh, Irungu et al., 2020; Ngenoh et al., 2019).

In Ghana, the majority of farmers adopt the Global GAP certification, which is a collection of good agricultural practice standards for food safety, the protection of plants and animals, and the health and safety of workers. It was founded in 2007 as a system of self-appraisal certification among horticulture growers by a coalition of European food merchants. GlobalGAP imposes a performance standard with guidelines to follow to make production processes safe to alter growers' attitudes toward food production (Bain, 2010). Despite being a voluntary standard, the adoption of GlobalGAP has become essential to gain access to the EU and other global markets. Certified farms are periodically inspected by USAID and GIZ. Extension officers sometimes pay regular visits to these certified farms, which forms part of the certification requirements (Yidu, 2015). The agencies which perform these judicial functions of Government are AfriCert, Ghana Standards Authority, and Plant Protection and Regulatory Service Division. They ensure that mangoes produced in Ghana are safe for local and international markets.

Given the existence of certifications and standards, the literature has uncovered a couple of factors that predict farmers' decisions to adopt the same. Akrong et al. (2022) identified age, household income, off-farm income, farm size, farmer group membership and access to credit as significant drivers of certification adoption among mango farmers in Ghana. The authors explained that an increase in age and off-farm income decreases the likelihood of certification adoption. Contrarily, access to credit, household income, farm size and farmer group membership increases the likelihood of adopting certification among mango farmers.

Further, Iddrisu et al. (2020) uncovered that age, household size and off-farm income are significant predictors of participation in certification schemes by cocoa farmers in Ghana. The study expatiated that whiles household size and off-farm income decrease farmers' likelihood to participate in certification schemes, an increase in their level of education increases their tendency to participate in certificate programmes. Moreover, farm size, membership of farmer organisations and awareness of certification schemes were important predictors of the decision to adopt certification (Aidoo and Fromm, 2015). Specifically, awareness of certification schemes and membership in farmer organisations increases farmers' willingness to adopt certification, while an increase in farm size decreases the adoption of certification.

Further, the perceived benefit of certification, source of income and annual production increases certification adoption (Kirumba & Pinard, 2010). Bain (2010) emphasised that farmers' knowledge about the process they will go through to ensure proper certification of their farms by recognised and standard bodies influence farmers to produce to meet standards and certification. Again, it was uncovered that compliance costs negatively affect the decision to adopt certification (Kersting & Wollni, 2012). Silva et al. (2014) revealed that farmers' age, participation in certification training and crop yield are significant variables that explain farmers' decision to take up certification.

2.2. Determinants of market outlet selection by farmers

Market participation and outlet choice are essential in fruit marketing, especially mango since the choice of the market outlet has implications on postharvest losses incurred and also determines the margins accrued by farmers. The perishability of mangoes warrants an effective market system so that farmers can make their decisions before harvesting. Ermias (2021) stated that local collectors (mostly women found on the roadside and in small market centres), retailers, wholesalers, and direct sales to consumers are some of the marketing channels used mainly by mango farmers in most African countries, including Ghana.

However, the choice of market outlet is a random decision that is influenced by several factors. The extant literature has uncovered varying factors to predict farmers' choice of market outlet for selling their agricultural products. Ermias (2021) investigated the market outlet selection by mango farmers in Southern Ethiopia via a multivariate probit model and found that distance to the nearest district market and quantity of fruits produced had a significant and positively drive farmer's selection of local collectors. In contrast, market price negatively influenced farmer choice

of the local collector outlet. The study further revealed that yield, ownership of transport, and access to market information positively determine farmers' choice of wholesale market outlet. Also, off-farm income, access to credit, and the quantity of fruits produced negatively influenced the choice of the retail outlet (Ermias, 2021).

Akrong et al. (Akrong, Mbogoh, Irungu et al., 2020) also found that education, household income, farming experience, ownership of motorized transport (tricycle), ownership of radio, trust, distance to the nearest tarmac road, certification, and access to credit are some of the factors that influence mango farmers' participation in the export market. Moreover, Mwembe et al. (Despotović et al., 2019) also unravelled that level of education, price, access to credit, and age negatively predict producers' choice of farm gate outlet. Conversely, the study highlighted that gender positively determines farmers' selection of farm gate outlets (Despotović et al., 2019). The study further added that negotiation cost and yield positively influenced mango farmers' choice of intermediaries, while price and transportation costs negatively influenced the same. Also regarding the choice of town market outlet, the authors uncovered that distance to the market, educational level, and age positively influenced this decision, while both off-farm income and negotiation cost negatively influenced the decision to sell to the town market.

An assessment of mango farmers' choice of marketing channel in Kenya using a multinomial logit regression model by Muthini (2015) also disclosed that distance to the nearest tarmac road, household income, number of mango trees the farmer has, access to market information, extension contact, and access to training are important predictors of mango producers' market outlet preference. Again, Tarekegn et al. (2017) underlined that distance to market, extension access and market information significantly explain farmers' selection of retail markets, whereas experience, the volume of harvest, extension access, distance to market, and cooperative memberships informs farmers' preference for cooperative markets. Moreover, Melese et al. (2018) revealed that ownership of transport system has a significant influence on the selection of both local and retail markets, as the farmer can easily transport his products to these outlets for a better price.

2.3. Conceptual framework

Figure 1 highlights the conceptual framework guiding the underlying study. The authors hypothesised that benefits associated with compliance—such as guaranteeing a ready market, augmenting access to credit, improving fruit quality, and assurance of more profit—motivate farmers to

Figure 1. Conceptual framework.

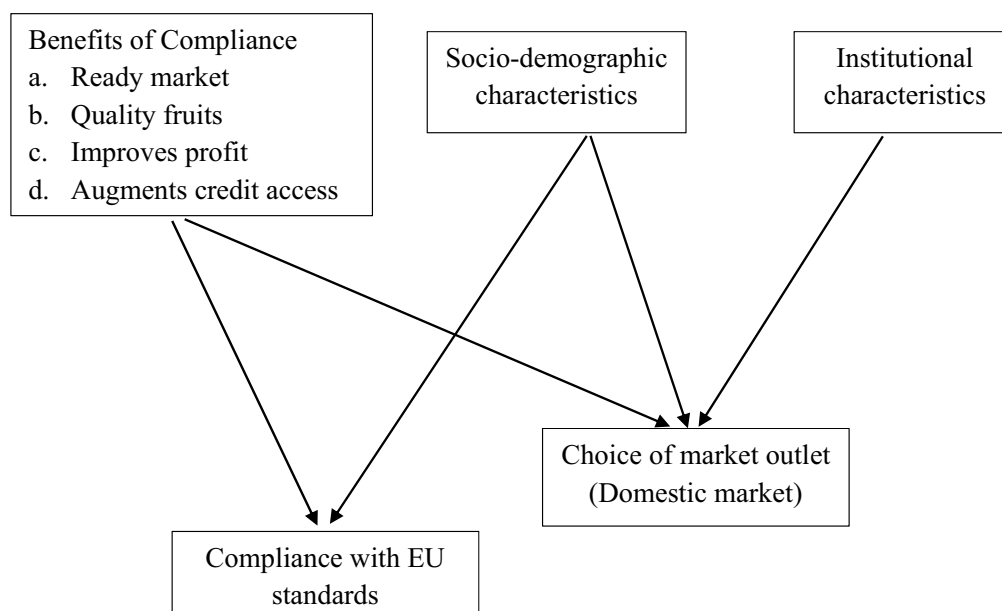
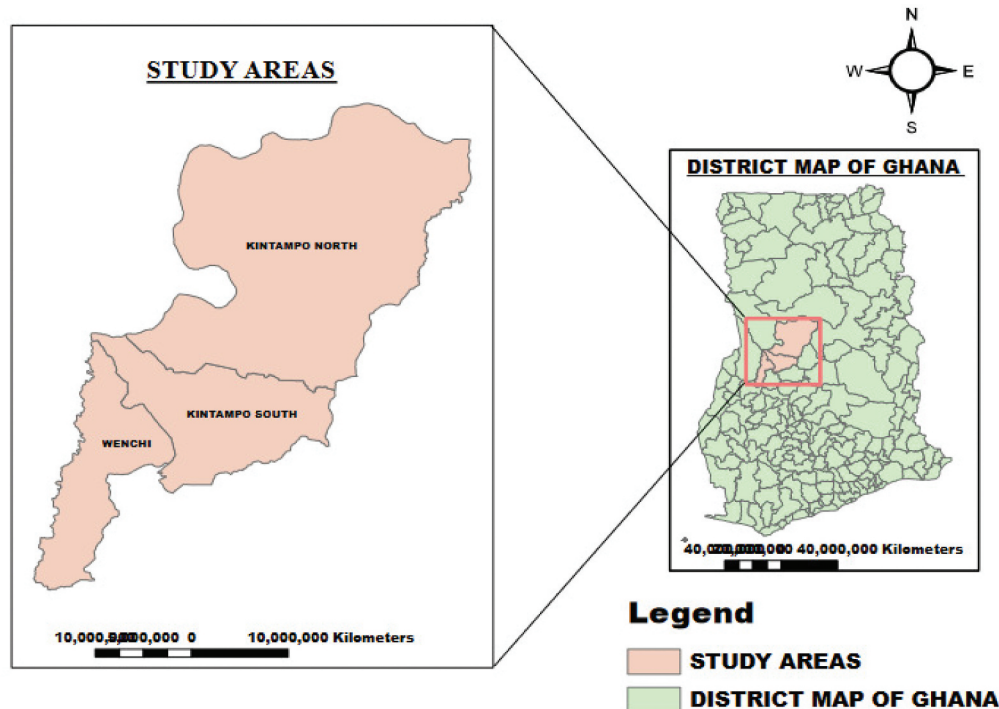


Figure 2. Map of the study area.

Source: Authors' own, 2022



comply with European Union standards. Also, farmers' socio-demographic characteristics and institutional variables explains their decision towards selecting a market outlet.

3. Materials and methods

3.1. Study area and sampling procedure

A multistage sampling approach was utilised in this study. Firstly, the Kintampo North and South Districts and the Wenchi Municipal in the Bono East and Bono region (erstwhile Brong Ahafo), respectively, were purposively selected for the study. The Wenchi Municipal is located in the eastern part of the Bono Region. The population of the Wenchi Municipal is 89,739 (Ghana Statistical Service [GSS], 2012a). The annual rainfall is between 1,140 mm—1,270 mm, which is optimal for growing mangoes. Also, Kintampo North and South are located in the Bono East Region of Ghana. The Kintampo North has a total population of 95,480 households, while the Kintampo South has a population of 81,000 (Service, 2012b, 2012c). The two districts are in the transitional zone of Ghana, sharing almost the same climatic conditions considered favourable for mango production. The Brong Ahafo regions were selected because the region and Eastern region are Ghana's two most dominant producers of mango (Komayire, 2015). In addition, commercial mango production in Ghana is concentrated in the Brong Ahafo and Eastern regions, in particular, Wenchi, Kintampo and Sunyani in the erstwhile Brong Ahafo regions. Hence, this informs the choice of the region and districts as the study area. The geographical details of the study areas have been presented in Figure 2.

In consultation with the Sunyani Green Field Mango Producers and Marketers Co-operative Society Limited, it was disclosed that the Kintampo North district has 20 registered mango farmers cultivating 83 acres of land, while Kintampo South has 66 registered mango producers cultivating 1159 acres. Likewise, the Wenchi municipal has 50 registered mango farmers with 1200 acres of plantations. However, the association disclosed that the number of registered farmers is not exhaustive of the number of mango farmers in the Brong Ahafo region. This suggests that non-registered farmers cultivate mangoes in the study area. Having noticed this, the study did not

focus on only the registered members of the association. Hence, using a simple random sampling approach, 203 mango farmers were sampled from the Wenchi municipal, while 97 were sampled from the Kintampo North and South districts. In total, 300 mango producers were sampled for the study.

The sample size is deemed sufficient given that the three districts have a population of 265,218 residents; hence, the total number of mango farmers is expected to be lower than the total population. Therefore, using Yamane's (1967) approach for sample size determination, $(n = \frac{N}{1 + Ne^2})$, the derived margin of error for the sample size is 6.0%. This means there is 94% confidence that the findings from this study represent the entire mango farmers in the study area. Further, Green (1991) as followed by Bannor et al. (2022), suggested that a sample size of $n \geq 50 + 8p$ is sufficient for regression analysis (where $p = 12$, represents the maximum number of explanatory variables used in the regression analysis). The study's minimum sample size (n) should be 146. This suggests that the 300 sample size is adequate for the inferential analysis. Data was gathered from the selected respondents with the help of a structured questionnaire. Pre-testing involving eight mango farmers was conducted to adjust the questionnaire. The necessary corrections were done after the pretesting, making the survey instrument vigorous for the data collection. The data collection exercise took place from August to November 2020.

3.2. Method of data analysis

3.2.1. Determinants of EU standards and certification practice among mango producers

The decision to follow EU or certification standards is binary, that is to practice or otherwise. Grounded on the expected utility theory (Von Neuman & Morgenstern, 1953), farmers will be willing to adopt standard practices considering that their anticipated benefits are worthwhile. However, the farmer's choice from these binary options is not random. Thus, a couple of factors contribute to the decision-making. In econometrics, this kind of decision-making (binary choices) had broadly been analysed with the binary probit or logit models. The only difference is that the probit has a normal cumulative distribution function while the logit model assumes a logistic distribution of the dependent variable (Gujarati, 2004). Given this, the model's choice depends on the researcher's preference (Nigussie et al., 2021). However, the ability of the binary probit model to resolve heteroskedasticity makes it more preferred for this study than the binary logit model (Asante et al., 2011). Therefore, following Martey et al. (2014), the binary probit model can be specified as:

$$\text{Prob}\left(P = 1 \text{ or } \frac{0}{Z}\right) = f(Za) = a_0 + \sum_{j=1}^{i-j} a_{0j}Z_{ji} + \mu_i \quad (1)$$

where Z denotes vectors of explanatory variables, f denotes a standard normal cumulative distribution function, a represents a vector of unknown parameters, j denotes j^{th} factors influencing mango farmers to produce to meet European standard certification, μ represents the error term, and i denotes the i^{th} farmer.

$$y^* = \beta_0 + \sum_{j=1}^k \beta_j x_{ji} + \varepsilon_i \quad (2)$$

In this equation, the unobserved variable—termed a latent variable—is represented by X^* . Thus, the decision of farmers to produce to meet European standard certification is measured by the latent variable. Hence, the dichotomous variable which is observed can be specified as:

$$y = \sum_0^1 \frac{\text{if } y^* > 0}{\text{if } y^* \leq 0} \quad (3)$$

Given that y^* is unobserved, it is understood to correlate with the observed characteristics of the farmer; as such, this provides the empirical mode given by the relationship. The model is specified as:

$$Y^* = \beta_0 + \beta_1 \text{Age} + \beta_2 \text{Gender} + \beta_3 \text{Edu} + \beta_4 \text{HHsize} + \beta_5 \text{Fsize} + \beta_6 \text{GAP} + \beta_7 \text{Exprnx} \\ + \beta_8 \text{Income} + \beta_9 \text{Quality} + \beta_{10} \text{RdyMarket} + \beta_{11} \text{Training} + \beta_{12} \text{CrdAccess} \quad (4)$$

Therefore, the limits of Y are specified as $0 \leq Y \leq 1$. It is 1 if there is a maximum agreement and 0 if there is minimum agreement among respondents (Martey et al., 2014).

3.2.2. Drivers of market outlet preference among mango farmers

From the field, mango farmers choose sales outlets from three alternatives (processors, local, and retail) where they primarily sell mango fruits, indicating one possible outcome of 1, 2, and 3 responses. Given this situation, either Multinomial Probit or Logit is used. However, if the operationalisation of the sales outlet choice on the field were more than one binary sales outlet (i.e. Yes/No for processors, Yes/No for local and Yes/No for retail), the Multivariate Probit regression would have sufficed. The advantage of MNP (mprobit command in Stata) over MNL (mlogit command in Stata) is the independence from irrelevant alternatives (IIA), which is assumed in the latter but not in the former (Dow & Endersby, 2004; Kropko, 2008). That is to say the MNP model is most preferred in practical situations like this when the errors are likely to be correlated (Bannor et al., 2022; Cameron & Trivedi, 2005; Dow & Endersby, 2004; StataCorp, 2015), hence, its usage. Long and Freese (2014), on the other hand, revealed that mprobit also assumes IIA conditions as in mlogit; hence, the results are not different and do not believe the assumption of IIA is useful. Therefore, given the more preferred use of the MNP model, it was selected over the MNL. Following up on Bannor et al. (2020) and Bannor et al. (2022), the multinomial probit model is specified as follows:

Let $Y_{ij} = 1$, if the individual i chooses alternative j ($j = 1, 2, 3$)

Also, let

$$\pi_{ij} = \Pr(Y_{ij} = 1) \quad (5)$$

where \Pr = Probability

Hence, the probability that an individual i chooses alternatives 1, 2, and 3 are represented by $\pi_{i1}, \pi_{i2}, \pi_{i3}$, where alternative 1 = local market, 2 = retailers, and 3 = processing factories. It is worth stating that the data gathered reveal that none of the sampled farmers disposed of their mangoes via the export market. This makes it statistically impossible to include the export market in the market outlet choice modelling. Therefore, if the farmer faces only these three alternatives, then

$$\pi_{i1} + \pi_{i2} + \pi_{i3} = 1 \quad (6)$$

Thus, the sum of the probabilities of mutually exclusive and exhaustive occurrences must equal 1. As a result, the three odds cannot be estimated separately. The MPM can be re-defined by generalising the bivariate logit model. This is specified as:

$$\pi_{ij} = \frac{e^{\alpha_j + \beta_j X_i}}{\sum_{j=1}^3 e^{\alpha_j + \beta_j X_i}} \quad (7)$$

where a subscript j denotes the values of the intercept and slope coefficients. The values of these coefficients will vary from choice to choice. In total, eleven (10) regressors were fitted in the model

(age, gender, education, experience, farm size, ready market, quantity of harvest, fruit quality, GAP, credit access), where X represents a vector of variables and β represents a vector of coefficients. Six slope coefficients will be estimated, which can vary from one choice to another since it was previously stated that the three probabilities cannot be estimated independently. As a result, the coefficient values for the base, reference, and contrast categories are set to zero. Assuming the first option (local market) is chosen and set $\alpha_1 = 0$ and $\beta_1 = 0$ the following estimates of the probabilities are then obtained for the three choices which are:

$$\pi_{i1} = \frac{1}{1 + e^{\alpha_2 + \beta_2 X_i} + e^{\alpha_3 + \beta_3 X_i}} \quad (8)$$

$$\pi_{i2} = \frac{e^{\alpha_2 + \beta_2 X_i}}{1 + e^{\alpha_2 + \beta_2 X_i} + e^{\alpha_3 + \beta_3 X_i}} \quad (9)$$

$$\pi_{i3} = \frac{e^{\alpha_3 + \beta_3 X_i}}{1 + e^{\alpha_2 + \beta_2 X_i} + e^{\alpha_3 + \beta_3 X_i}} \quad (10)$$

Even though the same regressors appear in each (response) probability expression, their coefficients are not always the same. Since we have three mutually exclusive choices in the study, when we add the three (3) probabilities in equations (8), (9), and (10), it should result in a value of 1. In estimating the multinomial probit model, the processor outlet was arbitrarily selected and set to zero. Thus, the STATA software randomly selects the frequently utilised market channel as a reference category.

The empirical model used in the multinomial probit estimation is shown below.

$$\begin{aligned} \text{Marketing outlet}_{ij} = & \beta_0 + \beta_1 \text{Age}_{ij} + \beta_2 \text{Gender}_{ij} + \beta_3 \text{Education}_{ij} + \beta_4 \text{Experience}_{ij} + \beta_5 \text{Farm size}_{ij} \\ & + \beta_6 \text{Ready market}_{ij} + \beta_7 \text{Quantity}_{ij} + \beta_8 \text{Quality}_{ij} + \beta_9 \text{Credit access}_{ij} \\ & + \beta_{10} \text{GAP}_{ij} + \varepsilon_{ij} \end{aligned}$$

Table 1 represents the variables for the multinomial probit regression model and probit regressions.

Factors influencing the choice of marketing outlet and practising EU standards are modelled in 1 and 2, respectively. The dependent variables were farmers' three marketing channels to market their mangoes: local, retail, and processing factories. Thirteen independent variables were fitted in the models with the expected signs, indicating either an increase or a decrease in the variable and its effect on the dependent variable. The means and standard deviations for all the variables were calculated.

4. Results and discussions

The demographic characteristics of the respondents in the Wenchi and Kintampo municipalities are presented in Table 2.

In Wenchi municipality, the study recorded 54.2% males and 45.8% females while 55.7% males and 44.3% females were recorded in the Kintampo municipality. This shows that mango farming is a male-dominated occupation. This is supported by Okorley (Okorley et al., 2014) who stated that men dominate plantations such as mango, cashew and cocoa production in Ghana. This could result from requirements such as a large span of farmland, high initial capital, and labour that Ghanaian women generally lack. Male dominance in plantations could also be attributed to

Table 1. Description of variables used for regression analysis

Variable	Description	Type	Measurement	Model I	Model II	Mean	Std. Dev.	Supporting literature
Dependent variable								
(1) Choice of market outlet	Outlet via which farmers dispose of mangoes	Categorical	1 = Local market 2 = Retail market 3 = Processors			0.47 0.30 0.71	0.50 0.46 0.46	
(1) Practice EU standard	Farmers comply with EU standards and certification	Binary	1 = Yes 0 = No			0.94	0.23	
Independent variables								
Socio-economic characteristics								
Age	Age of farmer	Continuous	Number		+	46.42	14.86	(Despotović et al., 2019)*; (Ajewole, 2010)**
Gender	Gender of farmer	Binary	1 = Male 2 = Female	+	+	0.45	0.50	(Despotović et al., 2019)*
Education	Farmer's level of education	Continuous	Years	+	+	3.02	0.978	(Akron, Mbogoh, Irungu et al., 2020)*; (Ajewole, 2010)**
Household size	Number of people in the household	Continuous	Number		+	5.55	2.52	(Kleemann et al., 2014)**
Experience	Years of mango farming	Continuous	Years	+	+	7.42	4.66	(Akron, Mbogoh, Irungu et al., 2020)*; (Ajewole, 2010)**
Farm-level and institutional characteristics								
Farm size	Acres of mango plantation	Continuous	Number (acres)	+		7.42	5.30	(Maertens & Swinnen, 2009)
Ready market	Access to a ready market	Binary	1 = Yes 0 = No	+	+	0.06	0.24	(Muthini, 2015)*; (Laosutsan et al., 2019)**

(Continued)

Table 1. (Continued)

Variable	Description	Type	Measurement	Model I	Model II	Mean	Std. Dev.	Supporting literature
Farm-level and institutional characteristics								
Quantity	Quantity of harvest	Continuous	Number (tonnes)	+		38.61	25.84	(Ermias, 2021)*
Quality	Fresh fruit external feature quality after harvest	Interval scale	1 = Very low 2 = Low 3 = Neutral 4 = High 5 = Very high	+	+	4.54	0.68	(Laosutsan et al., 2019)
Credit access	Access to credit facilities	Binary	1 = Yes 0 = No	+	+	0.33	0.47	(Muthini, 2015)*; (Kersting & Wollni, 2012) **
GAP	Proper use of agrochemicals and farm sanitation	Binary	1 = Yes 0 = No	+	+	0.64	0.47	(Opoku et al., 2020) *
Farm income	Annual farm income	Continuous	Number (GH¢)		+	2955.86	5266.09	(Akron, Mbogoh, Irungu et al., 2020) **
Training	Received training on GAP	Binary	1 = Yes 0 = No		+	0.75	0.43	(Meemken et al., 2016) **

The dependent variable for Model I* reference is practice EU standards, and Model II* reference (Base market outlet = Processors) is the choice of marketing outlet. NB: 1US{{footpara}}amp;#x00A0;= GH ¢5.73

variations in law, ethnicity, religious, and moral beliefs, which most often exclude females from certain farm ventures.

From Table 2, more than 82.3% of the sampled farmers are above 25 years. This infers that mango cultivation is practised chiefly by the aged. Regarding the UN classification of youth (between the ages of 15–24), it can be concluded that there is low participation of youths in mango production in Ghana. Similarly, (Akrong, Mbogoh, Irungu et al., 2020) reported low involvement of youth in agriculture, particularly mango production in Ghana. Interestingly, all farmers sampled for this research had a formal education; 26.5% of the respondents had primary education, 61.3% had secondary and technical education, and 12.2% had tertiary education. This is quite unusual; however, it is awe-inspiring and a good sign because education aid farmers in understanding and adapting new farming technologies (R.K. Bannor et al., 2019). The results also highlight that the majority (48%) of the sampled farmers sell their mangoes to the processors, while 31.67% utilised the local markets. In a related study, (Akrong, Mbogoh, Irungu et al., 2020) underlined that most mango farmers utilised the local market to dispose of their produce. The least proportion (20.33%) of the farmers sell their mangoes to retailers. Further, 88% of the farmers have farming as their major occupation. The majority of the farmers representing 70.7%, are married. Marriage is a common practice in most farming households in Ghana. Being married provides an extra hand in undertaking farm activities. The majority, thus 56% of the sampled farmers, cultivate on 3 acres or less.

Table 3 presents farmers' motivation to adhere to European Union standards.

A 5-point Likert scale was used to evaluate farmers' motivation to comply with the EU standards. Hence, a cut-off point of 3 relative to the mean values was used. A mean value greater than 3 indicates that farmers are motivated to comply with EU standards and vice versa. It can be inferred from the table that most farmers (50%) strongly agreed that they are motivated to comply with EU standards because doing so offers more profit than the conventional production system. None of the respondents strongly disagreed that compliance offers more profit. This indicates that farmers are aware of the benefits of profit associated with compliance with the EU standards. The mean value for this statement was 4.40. Therefore, when compared to the cut-off point of 3 (neutral), it can be concluded that farmers are motivated to comply with EU standards because of the associated profits. It is not surprising because previous studies have noted that certified mango farmers or those who comply with export requirements receive prices that are three times that offered on local markets (Akrong, Mbogoh, Irungu et al., 2020; Baidoo-Williams, 2015). Also, a substantial proportion of the farmers (59.7%) strongly agreed that compliance ensures the production of quality mango fruits for the market. Only 1.3% of the farmers strongly disagreed that compliance ensures quality mango fruits. This demonstrates that farmers are motivated to adhere to standards supposing the practices ensure quality fruits. Generally, farmers are motivated to comply with EU standards because it ensures quality fruits as indicated by the mean value of 4.54. Perhaps, quality mango fruits are bought at good prices which motivates farmers to comply with the standards. Further, only a small proportion (3.7%) of the farmers strongly agreed that compliance assures a ready market while the majority (49.7%) strongly disagreed that compliance provides a ready market for their produce. The mean value for this statement was 1.71, which is less than 3. This means farmers' perception is skewed because compliance does not guarantee ready markets for their products. This is likely to demotivate them to adhere to EU standards. Contrarily, the adoption of certification standards has been disclosed to offer marketing opportunities in international and domestic markets (Carrillo-Labela et al., 2020; Massoud et al., 2015). Lastly, the largest proportion (28.7%) of the farmers are neutral that compliance with EU standards facilitates access to credit. Also, 21% of the farmers strongly disagreed with the statement that compliance stimulates credit access while 16.3% also strongly agreed that compliance facilitates credit access. This statement has a mean value of 2.90, indicating that farmers believe compliance with EU standards does not augment credit access.

Table 2. Demographic characteristics of respondents

Variable	Wenchi Municipal (N = 203)		Kintampo Municipal (N = 97)		Pooled (N = 300)	
	No.	%	No.	%	No.	%
Gender						
Male	110	54.2	54	55.7	164	54.7
Female	93	45.8	43	44.3	136	45.3
Age						
20–30	45	22.1	8	8.2	53	17.7
31–40	54	26.6	14	14.4	68	22.7
41–50	33	16.3	19	19.6	52	17.2
51–60	381	18.7	28	28.9	66	22
>60	33	16.3	28	28.9	61	20.3
Educational level						
Basic	24	11.8	2	2.1	48	26.5
Technical	66	32.5	50	51.5	15	8.3
Secondary	58	28.6	8	8.2	96	53
Tertiary	55	27.1	37	38.1	22	12.2
Marital status						
Single	54	70	17	17.5	71	23.7
Married	142	26.6	70	72.2	212	70.7
Divorced	7	3.4	10	10.3	17	5.6
Household size						
1–3	119	58.6	49	50.5	168	56
4–6	78	38.4	46	47.4	124	41.3
>6	6	3	2	2.1	8	2.7
Main occupation						
Farming	186	91.6	78	80.4	264	88
Otherwise	17	8.4	19	19.6	36	12
Farm size						
1–3	115	56.7	43	44.3	158	52.7
4–6	66	32.5	34	35.1	100	33.3
Above 6	22	10.8	20	20.6	42	14
Experience						
1–5	98	48.3		32	129	43
6–10	88	43.3	33	34	121	40.3
11–15	14	6.9	18	18.6	32	10.7
>15	3	1.5	15	15.5	18	6
Off-farm job						
Yes	125	61.6	56	57.7	166	55.3
No	78	38.4	41	42.3	134	44.7
Marketing channel choices						
Local	79	38.92	16	16.49	95	31.67
Retail	49	24.14	12	12.37	61	20.33
Processing	75	36.95	69	71.13	144	48.00

Table 3. Motivation towards compliance with European Union standards

Variable	Strongly agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly disagree (1)	Mean	SD
Compliance ensures more profit	150(50.0)	125(41.7)	21(7.0)	4(1.3)	0(0)	4.40	0.68
Compliance ensures quality fruit	179(59.7)	112(37.3)	4(1.3)	1(0.3)	4(1.3)	4.54	0.68
Compliance guarantees a ready market	11(3.7)	7(2.3)	16(5.3)	117(39.0)	149(49.7)	1.71	0.95
Compliance augments credit access	49(16.3)	50(16.7)	86(28.7)	52(17.3)	63(21.0)	2.90	1.35

NB: Numbers in parentheses are percentages.

Table 4. Farmers' willingness to comply with European Union practices

Variable	Very ready (5)	Ready (4)	Neutral (3)	Not ready (2)	Very not ready (1)	Mean	SD
Ready to ensure no chemical residues in the fruits	20(6.7)	21(7.0)	62(20.7)	102 (34.0)	95(31.7)	2.23	1.16
Ready to ensure worker's health and safety	11(3.7)	57(19.0)	94(31.3)	105 (35.0)	33(11.0)	2.69	1.02
Willingness to ensure proper soil management	39(13.0)	113 (37.7)	109 (36.3)	33(11.0)	6(2.0)	3.49	0.92
Ready to optimise the use of chemical fertilizer	4(1.3)	22(7.3)	91(30.3)	123 (41.0)	60(20.0)	2.29	0.91
Willing to practice integrated pest management	1(0.3)	8(2.7)	54(18.0)	120 (40.0)	116 (38.7)	1.86	0.83
Ready to utilise EU-approved chemicals	5(1.7)	5(1.7)	24(8.0)	127 (42.3)	139 (46.3)	1.70	0.82
Willing to fund the cost of certification	47(15.7)	47(15.7)	49(16.3)	61(20.3)	96(32.0)	2.60	1.45
Willing to adopt proper farm record keeping	2(0.7)	2(0.7)	38(12.7)	72(24.0)	186 (62.0)	1.54	0.79
Willing to practice farm sanitation at all times	2(0.7)	0(0)	9(3.0)	135 (45.0)	154 (51.3)	1.53	0.62
Willing for farm to be certified by PPRSD	10(3.3)	26(8.7)	19(6.3)	166 (55.3)	79(26.3)	2.07	0.99

NB: Numbers in parentheses are percentages, PPD = Plant Protection and Regulatory Services Directorate, and EU = European Union.

Table 4 highlights farmers' readiness to comply with some European Union standard practices.

A 5-point Likert scale was used to evaluate farmers' willingness to comply with the EU standards. Hence, a cut-off point of 3 compared to the estimated mean values was used. A mean value greater than 3 infers that farmers are willing to comply with EU practices and vice versa. The table highlights that the majority of the mango farmers are "not ready" (34%) or are "very not ready" (31.7%) to ensure appropriate chemical residues in the mango fruits. This explains that farmers are not ready to reduce the use of synthetic chemicals which contributes to many chemical residues in mango fruits. Only a few of these farmers are "very ready" (6.7%) to ensure that their mango fruits have appropriate chemical residues. The mean value for this statement is 2.23, indicating that mango farmers are generally unwilling to ensure appropriate chemical residues in their mangoes. Also, most of the farmers are "not ready" (35%) to ensure the health and safety of their workers. Only 11 of the farmers were ready to ensure their workers' safety and health. This statement has a mean value of 2.69, indicating that the farmers are unwilling to ensure their workers' health and safety. In Ghana, farm workers' health and safety remain a major issue, as acknowledged by Amfo et al. (2021). Most farmers are not ready to cater for their workers' health and ensure their safety. It is, therefore, not surprising that this study found similar evidence. Further, the results demonstrate that most of the farmers (20%) are not ready to optimise chemical fertiliser use, while only a small proportion (3.7%) are willing to do the same. The mean value of 2.29 for this statement concludes that farmers are not ready to use synthetic fertilisers judiciously. Synthetic chemicals have become a norm with most Ghanaian farmers due to depleted soils and rampant pests and diseases (see, Anang & Zakariah, 2022; Darkwah et al., 2019; Mensah et al., 2018). Though the significance of synthetic fertilizers is inconclusive and area-specific, policymakers and other developmental organisations alike have continuously advocated that farmers utilise the same (Darkwah

et al., 2019). Moreover, only 0.3% and 2.7% of farmers were very ready and ready, respectively, to practice integrated pest management (IPM). Thus, the majority (40%) of the farmers were not ready to practice IPM. Therefore, with a mean value of 1.86, it can be concluded that the mango farmers were not willing to practice IPM. Generally, IPM practices are regarded as laborious and time-consuming. As such most farmers abhor practising the same. Likewise, the adoption of IPM practices is well-acknowledged as a challenge among farmers (see, Bueno et al., 2021; Despotović et al., 2019; Diaz et al., 2020). Further, the majority (46.3%) of the farmers are very unwilling to utilise European Union approved chemicals in their mango farms while just 1.7% of them are very willing to adopt the use of EU-approved chemicals. Therefore, with a mean value of 1.70, it can be concluded that the mango farmers were not willing to utilise EU-approved chemicals. Perhaps, it could be that access to these chemicals is very challenging and costly (Agbongiarhuoy & Fawole, 2020), and could contribute to their intentions not to utilise the same. The results also demonstrate that most (32%) of the farmers were very unwilling to fund the cost associated with certification standards. Thus, these farmers are not ready to bear the cost of certification. Only a few (15.7%) of the farmers are very ready to fund the cost of certification. Regarding the mean value (2.60), it can be concluded that farmers are not ready to fund the cost involved in obtaining the EU certification. Probably, certification is very costly and farmers cannot afford it. It is recognised that agricultural certification is a costly endeavour (Lernoud et al., 2017), meaning that most farmers in the developing part of the world cannot afford to get certified. Surprisingly, only 0.7% of the sampled farmers are both very willing and willing to practise proper farm records, while the majority (62%) are very unwilling to practice the same. The mean value (1.54) indicates that generally, farmers are not ready to practice proper record keeping that will augment their certification process. Similarly, Oppong and Bannor (2022) indicated that time-consuming record-keeping processes are a significant barrier for farmers in Africa and Asia towards meeting certification standards. From the results, more than half (51.3%) of the farmers are not ready to practice farm sanitation. Based on the mean value of 1.53, it can be concluded that farmers are generally not ready to observe farm sanitation on their farms. Interestingly, the majority (55.3%) of the farmers are ready for their farms to be certified by PPRSD, while only a few (3.3%) of them are ready for their farms to be certified by the organisation. Conclusively, the mean value for this statement (2.07) demonstrates that farmers are collectively not ready for their farms to be certified by PPRSD. The results generally revealed that most sampled farmers were not ready to implement EU certification requirements. Bannor and Oppong (Bannor et al., 2022) revealed that insufficient knowledge and skills to meet such standards vis-a-vis is crucial for farmers' inability and, in this case, could contribute to farmers' unwillingness to meet such standards.

The determinants of mango producers' compliance with European standards and certification are presented in Table 5.

Six of the 12 independent variables significantly predict farmers' practice of EU standards and certification. Thus, three socio-demographic and institutional variables each were revealed as significant determinants of adherence to the standards. Farmers' education level, mango farm size, the practice of GAP, household income, access to the ready market, and participation in certification and standards training are significant predictors of the decision to adopt the EU standards. The results revealed that education positively influences farmers' decisions to practice European standards and certification. This implies that a year increase in farmers' education will correspondingly increase the probability of producing to meet European standards and certification by 42.3%. This result agrees with the work of Lemeilleur et al. (2020), who revealed that education positively influences mango farmers to adopt GlobalGAP certification. A good reason behind this finding is that educated farmers are well-oriented, more open to innovative ideas, and likely to adopt new practices (R.K. Bannor et al., 2019).

Further, mango plantation size is positively related to the practice of EU standards and certification. This indicates that a unit increase in farm size will increase the probability that a mango farmer will adopt European standards and certification by 79.7%. This finding is laudable, in that

farmers cultivating on large farm sizes are mostly commercially oriented. These farmers are market and profit-oriented and, hence, would be willing to adopt EU standards to be able to penetrate the international markets for better prices. This result corroborates with the study of Laosutsan et al. (2019), which unearthed that farm size positively drives farmers to participate in the certification scheme.

Furthermore, GAP positively correlates with farmers' adherence to EU requirements. This means that the likelihood of a farmer adopting EU standards increases by 3.5% when the farmer is already practising good agronomic practices. Obtaining EU certification and penetrating the export market requires the producer to follow laid-down practices, primarily good agronomic practices. Hence, a farmer already practising good agronomic practices will be comfortable producing to fulfil certification requirements. In addition, annual farm income is negatively associated with the decision to follow EU standards. Thus, an increase in producers' annual farm income decreases their probability of complying with EU standards by 4%. However, this contradicts the findings of Akrong et al. (Akrong et al., 2022) that profit positively influenced mango farmers to participate in a high-value market. Probably, because the local market can absorb the mangoes produced and farmers can make quite a considerable income from their farm endeavours, they do not see the need to engage themselves in the challenges involved in meeting EU standards. Interestingly, access to a ready market and the practice of EU standards are positively correlated. This indicates that farmers' probability of producing to meet EU standards is contingent on the assurance of a ready market on the international market. Thus, once there is a ready buyer overseas with better market conditions, there is a high probability that farmers will be willing to comply with EU standards and certification to produce for this buyer.

Table 5. Determinants of compliance with EU standards and certification practice among Mango producers

Variables	Coefficient	Robust Std. errs.	P-value	Marginal effects
<i>Socio-economic characteristics</i>				
Age	0.007	0.009	0.428	0.001
Gender	−0.198	0.191	0.300	−0.039
Education	0.217	0.100	**0.031	0.423
Household size	−0.048	0.051	0.342	−0.009
Farm size	0.049	0.020	**0.015	0.797
GAP	0.182	0.093	**0.050	0.035
Experience	−0.213	0.202	0.292	−0.041
<i>Institutional characteristics</i>				
Farm income	−0.213	0.097	**0.027	−0.041
Quality fruits	−0.095	0.119	0.427	−0.018
Ready market	0.340	0.132	***0.010	0.066
Standard training	−0.371	0.113	***0.001	−0.072
Credit access	0.095	0.082	0.242	0.019
Constant	0.989	0.799	0.216	
Prob >Chi ²	0.002			
Wald Chi ² (12)	30.07			
Pseudo R ²	0.790			
Log pseudo-likelihood	106.262			

Note: ***, **, and * represent significance levels at 1%, 5%, and 10%, respectively. NB: 1US{{footpara}}amp;#x00A0; = GH¢5.73

Contrary to expectations, the results reveal that training negatively affects farmers' practice of EU standards and certification. Thus, mango farmers participating in European Union requirement training programs are very unlikely to comply with European standards and certification by 7.2%. This is possible because training on certification standards makes farmers aware of the cumbersome procedures involved in getting certified. Knowing the stringent procedures and their associated hurdles inhibits a significant number of farmers' intentions to get certified though a fraction might be interested. Contrarily, Adetomiwa et al. (2022) underlined that compliance with EU standards could be improved with increased training. A comparison of the results of a current review by Oppong and Bannor (2022) revealed that an application of generic compliance strategies based on a particular commodity value chain, may not get the needed impact because, although geographically, Africa and Asia bear similar characteristics in the reasons for willingness to comply with certification standards.

Table 6 presents the multinomial probit estimates on mango farmers' market outlet choice determinants. The base market outlet category used for the analysis is processors.

The results from Table 6 demonstrate that four out of the 11 explanatory variables significantly predict a farmer's choice of local markets, while seven out of the 11 predictors significantly influence the farmer's choice of the retail market. Thus, farmers' age, gender, farming experience, and ready market access are statistically significant determinants of farmers' choice of local markets. In contrast, farming experience, access to a ready market, the quantity of harvest, quality of fruit after harvest, following good agronomic practices, access to credit, and market assurance explain a farmer's choice of the retail market.

Age had a significant negative influence on the choice of local marketing outlet. The result shows that, as a farmer's age increases by a year, the farmer's probability of choosing a local market outlet compared to a processor to sell his/her fresh mangoes falls by 2.4% at a 5% significance level. Similarly, Mwembe et al. (Despotović et al., 2019) revealed that age negatively affected mango farmers choosing the local marketing outlet for marketing their agro-forestry-based mangoes in Kenya. In contrast, Madhuri (2019) showed that age significantly and positively influences the farmer's choice of local collectors for marketing their mangoes. Further, the results show that male mango farmers are 5.9% likely to utilise the local market to dispose of their mangoes relative to the processor outlet. This result tallies with Harrison et al. whose work revealed that males have more networks and a better ability to engage in negotiations than females. Therefore, they are more likely to partake in the local market where much negotiation and marketing skills are needed to dispose of mangoes.

As expected, farming experience significantly influenced the farmers' choice of both local and retail marketing outlets. An increase in the experience of a mango farmer by a year will increase the farmer's probability of selling at the local and retail market by 1.4% and 0.5%, respectively, compared to processors. This result contradicts the results obtained by Akrong et al. (2021), who found that experience negatively influenced farmers' choice of the local market for marketing mangoes in Southern Ghana. The estimated coefficient for the ready market is positively significant for both local and retail outlets at a 1% significance level. An increase in ready-market availability will increase a farmer's probability of selling at local and retail markets by 1.2% and 2%, respectively, relative to the processor outlet. Meeting export requirements is acknowledged to be very challenging for farmers; ergo, when there are buyers available on the local market (local and retail outlets), it saves farmers the hustle to meet export requirements.

The results show that yield had a significant positive impact on the farmers' retail outlet choice. This result explained that a significant rise in yield increases the chance of a farmer selecting the retail outlet by 19%, compared to the processor outlet. This means farmers with more yields are more likely to select retail outlets over processing outlets. These findings concur with the works done by Mesay (2017), Mwembe et al. (2021), and Ermias (2021). Perhaps, the farmers cannot

Table 6. Drivers of Mango producers' Mango outlet preference

Variables	Local market				Retail market			
	Co-eff.	Robust Std. Err	P-Values	Marginal Effect	Co-eff.	Robust Std. Err	P-Values	Marginal Effects
Socio-demographic characteristics								
Age	-1.171	0.566	**0.039	-0.024	-0.797	0.527	0.130	-0.002
Gender	0.597	0.366	*0.103	0.059	0.296	0.348	0.395	0.039
Education	-0.238	0.206	0.247	-0.294		0.189	0.654	-0.168
Experience	0.123	0.048	***0.010	0.014	0.158	0.047	*0.001	0.005
Farm-level and institutional characteristics								
Farm size	0.037	0.035	0.295	0.020	0.024	0.031	0.445	0.003
Ready market	1.673	0.413	***0.000	0.012	1.277	0.400	***0.001	0.020
Quantity	0.180	0.426	0.673	0.258	0.984	0.567	*0.083	0.191
Quality	0.243	0.160	0.129	0.078	-0.240	0.146	*0.101	0.042
GAP	-0.199	0.175	0.257	-0.059	-0.331	0.143	**0.021	-0.058
Credit access	0.100	0.136	0.461	0.0681	0.337	0.105	***0.001	0.523
Constant	1.808	1.506	0.230		2.007	1.710	0.241	
Base category Processors								
Wald chi2 (22)		38.04						
Prob>chi2		0.000***						
PseudoR ²		0.061						
Log pseudo Likelihood		-293.123						

Note: ***, **, and * represent significance levels at 1%, 5%, and 10%, respectively.

produce to meet the quality requirements of processing firms which prevents them from utilising the same even with higher yields.

Quality had a significant effect on the choice of retailer outlet. A unit increase in the fruit's quality decreases the probability of selling at the retailer outlet by 41.7% compared to the processing outlet. This means that farmers are less likely to sell at the retail outlet as the fruit quality rises. In contrast, Arinloye et al. (2015) and Gindi et al. (2016) revealed that quality positively influences the selection of retail outlets. Good agricultural practices (GAP) had a significant but inverse influence on the choice of retail marketing outlet. Increased agricultural practices on farms decrease the farmer's probability of choosing a retailer outlet by 5.7%. Performing good agricultural practices will increase the cost per kilogram of mango produce and may, hence, require sales to a market that is not regular (e.g., processing) and will pay higher prices for the same.

Credit opportunity significantly influenced the choice of retail marketing outlet with a positive coefficient. In most of the channels for marketing mangoes, most farmers prefer to choose outlets that will offer immediate assistance to a need for money, which are easily provided by retailers (Mesay, 2017). This result disagrees with Mwembe et al. (2021) whose work revealed that access to credit had a negative influence on farmers' choice of retail marketing outlet for selling their mangoes.

5. Conclusion and recommendations

Given the relevance of certification in fruit marketing, researchers have conducted studies on the same in other jurisdictions and on different fruits. However, in Ghana and concerning mango, studies are silent on the motivations of the choice of marketing outlets among mango farmers and reasons why a mango farmer would be willing to adhere to European Union exporting requirements. This study investigated farmers' motivation towards the adoption of EU standards, willingness to adopt the standards, drivers that explain farmers' compliance with EU standards and marketing outlet preference. A multistage sampling approach was used to draw 300 mango farmers from the Kintampo and Wenchi districts. Data gathered were analysed using multinomial and binary probit regressions. The study uncovered that farmers' motivation towards adopting EU practices is geared towards guaranteeing more profit and quality mango fruits. Generally, the study found that farmers are not willing to adopt EU-recommended practices. The results disclosed that compliance with EU certification and standards practices is influenced mainly by education farm size, farm income, GAP, ready market, and training. Also, the majority of farmers sold their mangoes to the processors. Further, farm and institutional factors such as market availability, the quantity of harvest and credit access are the significant variables that explain farmers' market outlet preference. Farmers' socio-demographic characteristics mainly influenced the choice of local marketing outlets. The quality of fruits was the primary variable that explains farmers' choice of processors as a marketing outlet.

Given the study's findings, stakeholders such as the Ghana Export Promotion Authority (GEPA) and private investors spearheading the exportation of mangoes into EU markets should consider trade credit as a strategy to establish their customer base. Thus, the provision of credit has the potential to induce farmers to sell to an outlet. Apart from that, farmers who sell and are likely to sell to processors should be targeted for initial exporting to EU markets as they are more likely to be convinced and already involved in relevant practices for such exports. Moreover, training provided by the Ministry of Food and Agriculture (MOFA) and the Tree Crop Development Authority (TCDA) through its extension agents should be tailored to suit farmers' needs to ensure that pieces of training are not dysfunctional. In this regard, the relevant institutions (MOFA, TCDA, and Research institutions) should follow a bottom-up approach when designing training programmes to ensure that farmers' desires are inculcated in the training modules. Also, extension services should intensify teachings on good agronomic practices and certifications since such can facilitate farmers' readiness to adopt EU standards and certification. A limitation of this study was the sampling of mango farmers in the erstwhile Brong Ahafo region, despite the evidence that the Eastern region is also a key hub of mango production in Ghana. Apart from that, given the

proximity of the Eastern region to the international ports of Ghana, there could be differences in the marketing outlet choices and other motivations this study unravelled. Therefore, future studies could explore sampling from the two regions to validate the findings or reveal emerging patterns.

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Data will be made available upon request from the corresponding author.

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Author contribution

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