Land tenure system and harvesting time’s influence on the marketing behaviour of cashew farmers in the Bono Region of Ghana

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ABSTRACT

This study investigated the land tenure system, harvesting time and marketing behaviour of cashew farmers in Ghana. Primary data was compiled from 120 cashew farmers, and the multinomial probit was used to assess the determinants of cashew marketing outlets. Types of land ownership (tenure system) for cashew production in Ghana were leasehold, stool, family, state and customary lands. The sales of cashew nuts to buying companies and/or exporters is positively influenced by the land tenure system, good road network, weekly harvest, contract agreements and grading of cashew nuts. Conversely, the experience of farmers coupled with less than one week of harvesting influences the choice of brokers’ outlet. The result implies that, cashew cultivation on stool land, likewise harvesting time increases the probability of selling to buying companies and exporters who offered higher margins compared with brokers. Consequently, generic land reform for the whole country to enhance agribusinesses may be important but unnecessary. It is also suggested that the customary land arrangement provided the opportunity to sell to a profitable marketing outlet, it is suggested that Government and NGOs should rather be interested in strengthening the current customary land regime and consultatively recommend for review where necessary in the study areas.

1. Introduction

In recent years, efforts have been made to enhance farmers’ market participation and/or commercialisation. In Ghana, various commercialisation-oriented initiatives like the Ghana Commercial Agricultural Project, the Medium-Term Agricultural Sector Investment Plan, the Food and Agricultural Sector Development Plan, Planting for Food and Jobs, among others, were implemented to increase farmers’ market participation (Teye and Torvikey, 2018). Agricultural commercialisation involves increasing the proportion of the commodity produced that is sold (MoFA, 2010). In this regard, farmers are advised to be market-centred by prioritising production for sale to drive agricultural commercialisation. Generally, it is recognised that farm commercialisation is good for poverty reduction, achieving food sufficiency and driving rural development (Etuk and Ayuk, 2021; O gutu et al., 2020; Ouedraogo, 2019; Teye and Torvikey, 2018; Huddleston and Tonts, 2007).

Though commercialisation has been known mainly for food crops in Africa, in recent times, there has been an upsurge in demand for crops such as cashew, cocoa, mango and shea on international markets. As such, many farmers are shifting from cultivating staple crops to growing high-value crops, including tree crops (Boafo et al., 2019). Currently, tree crops have become a source of livelihood in many developing countries. For instance, Asia (particularly Vietnam and India) generates a colossal cashew income. In Africa, cashew and cocoa contribute greatly to farmers’ incomes in Côte d’Ivoire and Ghana (African Cashew Initiative [ACI], 2010). Given these among other reasons, tree crops have attracted research attention in developing countries in the past few years. Studies on cash crops covered areas such as production (Heidenreich et al., 2022; Rubhara et al., 2020), marketing (Dubbert and Abdulai, 2021; Bannor et al., 2019) and commercialisation (Komarek, 2010). These studies provided insights into the cash crop production system’s dynamics, marketing strategies, commercialisation, and contribution to farmers’ livelihoods.

It should be emphasised that agricultural commercialisation is not a random phenomenon. This means there are driving forces that induce its conception. For instance, access to reliable market outlets motivates
farmers to increase output and expand subsistence farming into commercial production (Adams et al., 2020). Thus, there must exist avenues through which farmers can sell their produce. However, in reality, farmers are primarily confronted with several options in particular outlets that offer relatively higher margins and less risk of selling. Subsequently, literature uncovered that market outlet selection by individuals (including farmers) are subject to their demographic, institutional and farm-level characteristics (Amfo et al., 2022; Bannor et al., 2019, 2021; Oppong-Kyereh et al., 2019; Jitmun and Kuwornu, 2019; Bannor and Sharma, 2017). On the consumer’s side, market outlet choice determines the nature of the product and the price to be paid (Adams et al., 2020). Hence, market outlet selection is crucial for both producers and consumers.

Access to land and the land use conditions could be a challenge or propeller to the advocacy for farmers’ market participation or commercialisation (Darku and Sowah, 2021; Jayne et al., 2010). For instance, Fredriksson et al. (2017) revealed that land size influenced commercialisation in Romania, Bulgaria, Hungary and Slovenia, while Schulte et al. (2022) showed similar results in Asia, Vietnam. In Africa, Amfo et al. (2022) and Oppong-Kyremeh et al. (2019) in Ghana and Woldeyohannes et al. (2017) in Ethiopia reported similar results.

In this manuscript, the authors posited that it was not just the land size that influenced agricultural commercialisation but the tenure system. However, most literature on agricultural commercialisation tends to concentrate on land size to the tenure systems. For instance, cashew is a perennial crop and takes overland for about 60 years (Amanor 2009), therefore, it requires secure access to land for these years, which sometimes requires alienation – or eviction – of other communal users. Yet, most of the agricultural land is communally owned (commercial land is controlled by lineage or clan-based land-owning groups). Thus, increased cashew cultivation leads to greater competition for land and consolidates communal property rights into more individualised property ownership systems (Rocheleau and Edmunds, 1997; Berry, 2009). Accordingly, most countries’ ownership structure of arable lands could inhibit commercialisation (World Bank, 2013; Singh and Huang, 2011; Amanor, 2009) or otherwise (Goodwin, 2013; Berry, 2013). Given this, many previous studies assessed the implication of tenure ownership and commercial production via qualitative studies and historical narratives (Darku and Sowah, 2021; Yaro et al., 2018) and the expansion of cashew production on food security (Evans et al., 2015; Amanor, 2009).

However, empirical and quantitative research on the influence of the land tenure system on market participation/commercialisation have been rarely studied in literature. Meanwhile, the marketing outlet choice influences the margins accrued to the farmer, which is a precursor for sustainable commercialisation. Besides, land tenure system and harvesting time are critical determinants that deserve attention in the quest to commercialise cashews. The period when cash crops are harvested influences marketing outlet choice and profitability. The period when cash crops are harvested significantly influences the quality level (Gama et al., 2018; Piscopo et al., 2010) which has implications on whom farmers sell their produce to and the margins they receive. Recently, Bannor et al. (2019) revealed that the harvesting time influenced cashew quality output in Ghana. Likewise, Kongor et al. (2016) indicated that the time of harvesting cocoa beans contributed to variations in the final flavour formation. Generally, harvesting time affects the chemical composition (fatty acid and peroxide) and determines nuts’ postharvest storage quality and shelf life (Gama et al., 2018; Piscopo et al., 2010).

Aside from cocoa, cashew is Ghana’s significant non-traditional export crop that generates a colossal foreign exchange for the Ghanaian economy and improves the welfare of thousands of farmers (Hashmiu et al., 2022; Boafo et al., 2019). It is reported that Ghana exported US$340.7 million in raw cashew nuts in the year 2021 (Ghana Export Promotion Authority, 2022). Cashew trading has also emanated as a critical venture for various investors in Ghana. Every season, foreign investors and brokers trip to the country to aggregate raw cashew nuts for export (Bannor et al., 2019). Given the importance of cashew production and trade in the country, researchers have explored the dynamics in cashew value chains, marketing and profitability to help provide insights and a possible roadmap to improve the sector (Dubbert and Abdulai, 2021; Bannor et al., 2019). Though it was evident in the marketing of other commodities that the land tenure system and harvesting time influenced market participation, the same cannot be justified for the cashew sector in Ghana and Africa. Hence, this pioneering study explored the market/sales outlet selection for raw cashew nuts among cashew farmers, focusing mainly on the land tenure system and harvesting time. Specifically, this study sought to answer the following questions: which types of land tenure systems are commonly used for cashew production in Ghana? what are the cashew harvesting period and frequency in Ghana? and do land tenure system and harvesting time have influences on the marketing/sales outlet choice of cashew farmers?

The contribution of the current study is multifold. Firstly, it will help disclose the relationship between farmers’ land tenure system, harvesting time and market outlet decisions. The findings from the study will contribute to the construction of the contours of interest in land ownership and property rights begin in agricultural commercialisation policies and programmes. Also, it will provide evidence of the potential of land market reforms and market incentives to improve cashew cultivation in Ghana. Further, evidence on the link between harvesting time and channel selection will inform cashew marketing actors on how to segment farmers to get the needed purchases during cashew seasons.

2. Review of related literature

2.1. Land tenure systems in Ghana

Land tenure reforms have moved up on the priority list of African governments and donors for the past decades (Peters, 2009). Today, they continue to be recognised as a vital tool to increase agricultural productivity and promote agricultural investment. Most of Africa’s land is administered by the customary system based on well-intentioned social and cultural conventions that aim to provide equitable access to families within communities with a common interest in land. Making a living necessitates land access, without which many people’s livelihoods would be jeopardised.

The majority (around 80%) of the land in Ghana is under customary tenure, with few proportions owned privately or by the Government (Ghebru and Lambrecht, 2017; Pande and Udry, 2005). Under this customary system of land ownership, the use right is assigned to individual households, while the right to transfer is vested in the chief, family, or lineage or clan (Aanao and Guba, 2017; Bruce and Migot-Adholla, 2016). The use right can be primary or secondary. For instance, in the Nkoransa South of Ghana, Aanao (2013) and Aanao and Guba (2017) argued that the primary or the use rights to land could be via sharecropping involving permanent trees such as cocoa, cashew and oil palm. In this regime, migrants are given lands to cultivate on sharecropping protocols which could be one-third or two-thirds to the farmer and the rest to the owner. Though Aanao and Guba (2017) posited that it was fading out, it is predominantly practised in most cashew growing areas in Ghana. However, in recent times, most landowners and migrants prefer annual rent of the land or outright sales supported with the necessary documentation. Darku and Sowah (2021) highlighted three significant types of land ownership systems in Ghana: stool lands; family lands; and rent, sharecropping or lease. Firstly, stool lands are vested in the custody of chiefs for allocation to residents for farming. Secondly, the lands are allocated to families. Here, family heads are vested with the land’s control and administration, and its re-distribution happens through inheritance. This system transfers the land to males amongst tribes that practise patrilocal inheritance and vice versa (Darku and Sowah, 2021). The access and control of land guaranteed through inheritance under the matrilineal system enable some women to transfer the use and control of the land to their spouses for farming. In the third case, individuals can acquire land
through rent or a sharecropping system. In other cases, individuals have acquired and registered large tracts of land for farming on lease or outright purchase arrangements. Eventually, this land becomes the personal property of the individual, and common land ownership regulations are no longer valid (Darku and Sowah, 2021).

The latter is possible due to land reforms that began in colonial times and subsequently in Ghana by approving the National Land Policy (NLP) in 1999 (Aanafio, 2013; Aanafio and Guba, 2017). Afterwards, the Land Administration Project (LAP) was implemented in 2004 to give meaning to the NLP. The goal of LAP, like most land reforms across Africa, was for poverty reduction and social stability by improving access to land (Government of Ghana, 2003). The liberalisation intent of the LAP was supported by the Food and Agriculture Sector Development Policy 2 of Ghana – to particularly modernise agriculture in Ghana to trigger equitable growth in the agriculture sector (Schoneveld and German 2014) – as well as projects and programmes such as the Millennium Challenge Account, Ghana Commercial Agriculture Project (GCAP), among others. Despite key exertions toward formalising land ownership in Ghana, the Lands Commission can only provide land titles for properties within the Greater Accra Region (Ghebru and Lambrecht, 2017). In the remaining 15 regions, landholders cannot obtain actual land title but land transactions (lease, mortgages), and several others can be documented via the Lands Commission in deed registration (Ghebru and Lambrecht, 2017). Ghana’s land governance is currently characterised by a legal duality between statutory laws and customary laws (Ghebru and Lambrecht, 2017). The state recognises both types, yet several laws overlap or contradict (Ubink, 2008). In 1986, the Land Title Registration Law was enacted, which indicated land titling as the official system for property registration (Ghebru and Lambrecht, 2017). However, the law was scarcely applied (Jones-Casey and Knox, 2011).

2.2. Land ownership and agricultural production

A major drawback of smallholder farming in Africa is the land tenure system, affecting the potential to make the long-term financial investment and technological commitment that will help farmers to fully maximise the economic potential of the land (Kirsten et al., 2009). Sustaining expansion in the commercial agriculture sector necessitates continuity via long-term land ownership, which is difficult for many peasant farmers to achieve. In Ghana, informal customary agreements are commonly utilised to negotiate the usage of arable land by smallholders. These rules regulate who has access to land, what the land can be used for, and how long a person can have land tenure (Darku and Sowah, 2021). Smallholder land is mostly family land with competing interests; hence, arable land in Ghana is often fragmented, providing access to a wide range of community members while also ensuring the preservation of land for future usage in the communities (Asiama et al., 2017). Furthermore, the issue of access to land in Ghana is critical due to its significance in attaining sustained rural development and accelerating technological change (Nyasulu and Ampadu, 2011). It has been stated that farmers with secure tenure tend to invest in their farms, enhancing land productivity (Abdulai et al., 2011). As a result, stable land tenure provides the motivation to make land-related investments that boost production (International Fund for Agricultural Development (IFAD), 2008). Land tenure security leads to increased labour and management effort, which encourages more investment in improving land fertility (Donkor and Owusu, 2014).

Moreover, through different empirical approaches, several consequences of landownership on farming have been revealed. For instance, it was disclosed via a two-stage selectivity model that lands owned outright by farmers had a significant positive effect on investment into silvicultural farming in Ghana (Zhang and Ovwiredu, 2007). Again, a technical efficiency estimate demonstrated that rice farms under owned, rented, and sharecropping had resource use efficiencies of 68%, 62% and 45%, respectively (Donkor and Owusu, 2014). The authors expatiated that owned land and fixed rent reduced the inefficiency of rice production. This reflects the potential implication of land ownership on farm performance. In addition, it was disclosed that land tenure system significantly drove the adoption of climate-smart mitigation strategies among farmers in the Ejura-Sekyeredumase District of Ghana (Antwi-Agyei et al., 2015). Thus, farmers who cultivated rented lands only practised short-term adaptation strategies to curb production risks. Moreover, land ownership increased the likelihood of investing and the amount of investment made in land improvement and irrigation in Ghana (Ayamga et al., 2016). Likewise, Abdulai et al. (2011) found that land tenure differences significantly influenced farmers’ decision to invest in land-improving and conservation measures.

2.3. Market outlet choice among cash crop farmers

Many studies have investigated determinants of market outlet selection among food crop farmers in various jurisdictions (Adams et al., 2020; Dlamini-Mazibuko et al., 2019; Tarekegn et al., 2017). These studies highlighted that demographics, institutional and farm-level characteristics explained the selection of market outlets. Similarly, efforts have been made in tree crop marketing to explore farmers’ market channel selection decisions. It was disclosed that experience, price, contract, access to buyers, the quantity of produce, nature of road and storage facility determined kinnow farmers’ choice of pre-harvest contractors in India (Bannor and Sharma, 2017). Also, accesses to credit, market information, extension service, and education have positive and significant effect on formal traders market outlets relative to wholesale outlets while access to market has negative and significant impact on formal traders outlets relative to wholesalers’ market channel (Bezaw, 2019). In addition, farmers who were members of producer marketing groups had larger mango farm sizes and attended the training were more likely to dispose of their mango via exporters relative to brokers (Muthini, 2015).

On the other hand, farmers who owned a vehicle, were closer to the tarmac road, and had access to market information were more likely to sell to a direct market, relative to brokers (Muthini, 2015). Furthermore, findings from Anh and Bokelmann (2019) demonstrated that transaction costs (price risks, market competition, cost of transport, speed of payment and sale volume agreement) and farmers’ socioeconomic characteristics (age, ethnicity, farming experience, location and certificate ownership) significantly explained coffee farmers’ market preference in Vietnam. Similarly, transaction costs (means of transport ownership, distance to nearest market, access to market information and time taken to find buyers) and farmers’ socioeconomic factors (household size and extension access) significantly predicted rubber farmers’ choice of market outlet in Liberia (Mulbah et al., 2020). Further, Anh and Bokelmann (2019) indicated that certification ownership denoting coffee quality served as an important predictor of farmers’ market channel selection. It is worth noting that harvesting time correlates with quality of cash crops. Thus, generally, harvesting time affects the chemical composition (fatty acid and peroxide) and determines the postharvest storage quality and shelf life of nuts (Piscopo et al., 2016; Gama et al., 2018). Likewise, it was asserted that the time of harvesting cocoa beans contributed to variations in the final flavour formation (Kongor et al., 2016). Therefore, harvesting time and quality of nuts were conditions that could predict farmers’ choice of marketing outlet.

2.4. Theoretical and conceptual frameworks

Behavioural marketers have adopted several theories to explain the decisions of both consumers and manufacturers (producers). These theories are the Random Utility Theory, Expected Utility Theory, Motivation-Need Theories and Rational Choice Theory (Bannor et al., 2022). However, the Rational Choice Theory, which explains why every economic agent makes a decision based on expected costs and benefits (the anticipated costs and/or benefits associated with an option influence an individual’s choice) underpinned the study. Rational Choice Theory is
an approach social scientists use to understand human behaviour. The approach has long been the dominant model in economics, but it has become more widely used in recent decades in other disciplines such as Sociology, Political Science and Anthropology (Green, 2002). This spread of the Rational Choice approach beyond conventional economic issues is discussed by Green and Shapiro (1996), Radnitzky and Bernholz (1987), Hogarth and Reder (1987), and Becker (1976). The Rational Choice analysis assumes that an agent, or set of agents, maximises utility by picking the preferred alternative. However, this is only part of the narrative. Constraints are another critical aspect of the decision-making process. The presence of limitations necessitates the choice, and one of the benefits of Rational Choice Theory is that it makes the trade-offs between alternative choices very obvious (Green, 2002).

This study observed that cash crop farmers had access to three different marketing outlets (brokers, exporters and buying companies) that offered relatively different benefits. However, the exporter channel was recognised to offer farmers the highest margin (Bannor et al., 2019). Considering the Rational Choice Theory, rational cashew farmers in this study were expected to dispose of their nuts via the exporter channels to obtain a higher margin (satisfaction). Nonetheless, farmers are primarily confronted with several challenges which prevent them from accessing the exporter outlet. As discussed earlier, the significant constraints considered for this study were land ownership, quality requirements (grading and standards) and harvesting time. Using the Rational Choice Theory, the study sought to test the influence of these constraints on channel selection among the farmers.

About three major marketing channels are available for selling raw cashew nuts by farmers in the study area. Therefore, this study hypothesised that cashew producers would select an outlet that offered them higher benefits (profit) in the context of socioeconomic variables (education, experience, farm size, land ownership type); institutional variables (roads, workshops) and marketing variables (harvesting time, contract, grading, standardisation, storage facility availability, price surveys, regular customer etc.). Amongst these predictors, harvesting time/frequency, quality requirements and land ownership are considered key constraints to the choice of marketing outlet among cashew farmers. Figure 1 provides an overview of the conceptual framework.

3. Methodology

3.1. Study area

The study area is located within the Bono Region (formerly part of Ghana’s Bono Ahafo Region). The active economic population in the study area is mostly involved in agriculture as source of employment, with the majority involved in food and cash crops (Ghana Statistical Service, 2014). There is a seasonal rainfall pattern like in other parts of the middle belt of Ghana. The primary rainfall season is from April to October, with the rest of the years as the dry season with pockets of rain. The average minimum and maximum temperatures are 25 °C and 31 °C, respectively. The vegetation of the study area is mainly Moist semi-deciduous forest and the Guinea Savannah woodland, with the latter supporting cashew production predominantly (Ghana Statistical Service, 2014).

Tain District was selected for this study because of the upsurge in the production and marketing of cashew, which threatens the land tenure regime and food security in the District. The upsurge is because it shares borders with well-known cashew-growing areas (Ghana Statistical Service, 2014), such as Jaman North and South and Wenchi Municipal (Bannor et al., 2019, 2020). Lessons emanating from this could guide land tenure policy and practice in other cashew emerging areas in Africa and, in particular, Ghana (for instance, the Volta Region). The details of the geographical location of the study area can be found in Figure 2 below.

![Figure 1. Conceptual framework.](image-url)
3.2. Sample size and data collection

Data were collected in three major communities in the Tain District: Seikwa, Badu and Nsawkaw (Ghana Statistical Service, 2014). These communities were selected because most households are engaged in cashew cultivation. Again, they are the zonal capitals and are made of paramountcy in terms of chieftaincy, a variation in culture and inheritance (Ghana Statistical Service, 2014). Out of the 51,860 economically active population, about 42,007 were involved in agriculture and related activities (Ghana Statistical Service, 2014). About 8,792 households were in the three communities in the District, with about 80.8% (7,209) of the population being economically active in agriculture in the District (Ghana Statistical Service, 2014).

From the Yamane (1967) formula \( Q = \left( \frac{P_1 + Pe_2}{1 + e} \right) \), where \( Q \) is the sample size, \( P \) is the population, and \( e \) is the error term, the 120 farmers selected represented a power test with 9.1% margin of error, with an approximately 91% confidence level; hence, the data was helpful for the analysis.

A multistage sampling technique was employed in sampling the farmers for the study. First, the Tain District was purposively selected (refer to Study Area [3.1]), likewise the communities (refer to the first paragraph of 3.2) in the second stage. In the last stage, based on the approximated number of cashew farmers within the communities by the Ministry of Food and Agriculture Extension Officers, 40 farmers were randomly selected from each community. The primary data was obtained from the 120 cashew farmers using semi-structured face-to-face questionnaires via the Open Data Kit (ODK) data collection software. It should be emphasised that the survey instrument was pretested with ten farmers, after which the necessary corrections were made before the final data collection. The respondents’ consent was sought before the questionnaire was administered. Also, prior to the questionnaire administration if they were uncomfortable with the questions. All the 120 farmers answered the interviews.

3.3. Multinomial probit model

Multinomial probit model (MNP) was used to assess the determinants of farmers’ choice of cashew marketing outlets: brokers, buying companies and exporters. The MNP and Multinomial Logit (MNL) are appropriate for categorical/discrete response variables with over two outcomes which do not have natural ordering. The response variable for the regression was the various cashew marketing outlets: 1 = brokers, 2 = buying companies and 3 = exporters. Therefore, there were three outcomes, 1, 2 and 3, recorded in the response variable. In such circumstances, models, i.e., MNP or MNL could be used. However, the advantage of MNP (mprobit command in Stata) over MNL (mlogit command in Stata) is the independence from irrelevant alternatives (IIA), which is not assumed in the former but in the latter, though the two models are similar (Dow and Endersby, 2004; Kropko, 2008). Thus, the MNP model is used when errors are correlated, or the imposition of the IIA is not done in the MNP (Dow and Endersby, 2004; Cameron and Trivedi, 2005; StataCorp, 2015), making it more required in practical studies. Not with standing, Long and Freese (2014) argued that, mprobit also assumes IIA conditions as in mlogit. Given these diverse opinions, the authors provided the test of IIA via the Hausman test (there is no evidence that the IIA assumption has been violated) in Table 3a in the appendix. The results should be interpreted cautiously as the test might not provide useful information (Dow and Endersby, 2004; Cheng and Long, 2007; Long and Freese, 2014).

It should also be emphasised that, MNP is used when the independent variables are case specific, like in our case. Case specific here means that our independent variables, such as land ownership, age, experience, and farm size, among all the others, do vary over the individuals (farmers in our case) but do not vary over the alternatives (marketing outlet choice) (Long and Freese, 2014); therefore, the choice of multinomial probit is well good. However, if the independent variables were alternative
variant or alternative specific, the Alternative Specific Multinomial Probit (ASMP) would have sufficed (Long and Freese, 2014).

To estimate multinomial probit model, there should be only one choice/observation made by each respondent (in this case, cashew producers). According to StataCorp (2015) and Cameron and Trivedi (2005), multinomial probit model is estimated with latent-variable framework. As shown in Eq. (1), StataCorp (2015) and Cameron and Trivedi (2005) indicated that the latent variable for the $j$th option, $j = 1, \ldots, J$, was

$$
n_{ij} = z_{ij} + \epsilon_{ij}
$$

where the $1 \times q$ row vector $z_{i}$ comprised observed independent variables for the $i$th cashew producer. Also, $\epsilon_{ij}$ was the $J$ vector of regression coefficient and it was associated with $\epsilon_{i1}, \epsilon_{i2}, \ldots, \epsilon_{ij}$ were distributed independently and were identically standard normal. Following StataCorp (2015) and Cameron and Trivedi (2005), a cashew producer selected the option $k$ such that $n_{ik} \geq n_{im}$ for $m \neq k$. According to StataCorp (2015) and Cameron and Trivedi (2005), the assumption that cashew producer $i$ selected option $k$, and the difference between latent variable $n_{ik}$ and $J - 1$ is shown in Eq. (2):

$$
v_{ik} = n_{ik} - n_{ik} = z_{i}(t_{j} - a_{k}) + \epsilon_{ij} - \epsilon_{ik} = z_{ij} + \epsilon_{ij}
$$

Furthermore, marginal effects were computed in order to better interpret the choice/observation made by each respondent (in this case, cashew producer).

In Eq. (1), StataCorp (2015) and Cameron and Trivedi (2005) indicated that the latent variable for the $m$th individual $i$ was distributed independently and identically standard normal. StataCorp (2015) and Cameron and Trivedi (2005) further indicated that the probability that $k$ was selected is shown in Eqs. (3) and (4):

$$
Pr(i selects k) = Pr(v_{ik} \leq 0, \ldots, v_{ik} \leq 0)
$$

$$
= Pr(\epsilon_{i1} \leq z_{i1}, \ldots, \epsilon_{iJ} - 1 \leq -z_{iJ} - 1)
$$

In the estimation of the multinomial probit model, $1 = brokers$ was considered as the base outcome. Therefore, $1 = brokers$ was arbitrarily set to 0. The remaining coefficients ($2 = buying companies$ and $3 = exporters$) measured changes in marketing outlets relative to $1 = brokers$. Furthermore, marginal effects were computed in order to better interpret the results. The empirical model indicating the explanatory variables used in the multinomial probit estimation is shown in Eq. (5).

Cashew marketing outlet = $\beta_0 + \beta_1 Education + \beta_2 Experience + \beta_3 Farm size + \beta_4 Land type + \beta_5 Own land + \beta_6 Road + \beta_7 Contract + \beta_8 Workshop + \beta_9 Harvest frequency + \beta_{10} Grading + \beta_{11} Standardization + \beta_{12} Storage facility + \beta_{13} Price survey + \beta_{14} Regular customers + \beta_{15} Difficult buyers + \epsilon

4. Results and discussion

4.1. Background information of cashew farmers

Table 1 presents background information on cashew farmers. The majority of the cashew farmers were males. In Ghana, the production of perennial/tree crops is traditionally/culturally dominated by men (Anaafo and Guba, 2017). Also, relatively, men possess the strength to cultivate tree crops like cashew than women. On average, a cashew farmer in the study area was 53 years and had 12 years of formal education. This indicated that cashew production was undertaken by people of advanced ages and who had schooled up to the Senior High School level. Half of the cashew farmers were household heads and had an average of four members per household. Also, 70% of the cashew farmers were indigenes/natives of the study area. Therefore, a substantial proportion (30%) of the cashew farmers were migrants. This highlights the contribution of migrants to Ghana’s agricultural production. The predominant source of income for over 90% of the respondents was farming. In Ghana, the majority of rural folks are engaged in agricultural production. Also, 35% of the cashew farmers diversified their incomes through off-farm occupations. On average, a farmer had cultivated cashew for 25 years. This indicates that they have amassed ample knowledge in cashew cultivation. Table 1 further shows that the mean cashew farm size is five acres.

4.2. Land tenure systems for cashew production in Ghana

Table 2 presents the types of land tenure systems for cashew production in Ghana. The table shows six types of land ownership (land tenure system) for cashew production: stool land, family land, state land, leasehold, customary gift, and customary sale. However, 75% of the farmers produced cashew on stool lands. This finding is consistent with Ghebru and Lambrecht (2017). These are lands owned by a chief or traditional leaders based on the agreement between the two parties. Revenue that accrues from the sale of stool lands is usually used to develop communities. Also, some of the farmers cultivated cashew on family and state lands (8% each).

In most cases, family members produced on family lands, though non-family members could use family lands based on certain agreements with the family head in a few instances. Private ownership of farmland is acquired through customary purchase or customary gift of land. Such farmers have outright control of the land.

Table 2 further shows two land acquisition systems for cashew production: ‘abusa’ (2.5%) and ‘abunu’ (97.5%). Under these land acquisition systems in Ghana, a farmer cultivates cashew on a piece of land, undertakes all agronomic activities, and incurs all production costs until maturity. After about 3–5 years of maturity, the cashew farm is divided into two under the ‘abuna’ system: the farmer and the landowner take half apiece. Under the ‘abusa’ system, the cashew farm is divided into three: the farmer takes two-thirds while the landowner takes one-third. In Ghana, ‘abusa’ system is often used in the case of annual crop production while ‘abuna’ system is often used for perennial/tree crop production. Furthermore, one-third of the farmers had registered their cashew farmlands; 44% faced challenges in land acquisition for cashew production; and 16% had encountered land disputes.

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1 With ‘Abusa’, the farmer pays a substantial amount in the beginning to the landowner before beginning full operation on the farmland. The farmer is responsible for providing inputs and other resources to manage the cashew plantation, from seedling/seed planting to maturing and fruiting. The farm is divided into three (3) equal halves at the fruiting stage, which is average, four years after planting. The landowner takes 2 out of the 3 while the farmer takes 1 out of the 3.

2 In the ‘abuna’, the farmer pays an initial amount of money to the landowner. This allows the farmer to start working on the land without interference from anyone. Subsequently, the farmer provides inputs and other resources for cashew production. At maturity and fruiting of the cashew averagely of four years, the farm is split into two (2) equal halves for sharing between the farmer and the farm owner. Afterwards, each takes full responsibility for their portion of the cashew plantation.
Table 2. Types of land tenure systems for cashew production.

| Variable                                 | Description/measurement | Percentage |
|------------------------------------------|-------------------------|------------|
| Type of land ownership (land tenure system) | Stool land              | 74.17      |
|                                          | Family land             | 7.50       |
|                                          | State land              | 7.50       |
|                                          | Leasehold               | 0.83       |
|                                          | Customary gift          | 0.83       |
|                                          | Customary sale          | 9.17       |
| Land acquisition systems                 | ‘Abusa’                 | 2.50       |
|                                          | ‘Abana’                 | 97.50      |
| Whether farmer owned land for cashew production | Yes                    | 59.17      |
|                                          | No                      | 40.83      |
| Registration of land for cashew production | Yes                    | 59.17      |
|                                          | No                      | 40.83      |
| Whether farmer faced challenges in land acquisition for cashew production | Yes                    | 59.17      |
|                                          | No                      | 40.83      |
| Whether farmer had encountered land dispute | Yes                    | 59.17      |
|                                          | No                      | 40.83      |

Table 3. Cashew harvesting period and frequency.

| Variable | Description/measurement | Percentage |
|----------|-------------------------|------------|
| Harvesting frequency | Less than weekly | 30.83      |
|                                          | Weekly          | 63.33      |
|                                          | Bi-weekly       | 5.83       |
| First harvesting time | December        | 16.67      |
|                                          | January         | 15.83      |
|                                          | February        | 45.83      |
|                                          | March           | 20.83      |
|                                          | April           | 0.83       |

4.3. Cashew harvesting period and frequency in Ghana

Table 3 presents cashew harvesting period and frequency. Harvesting/picking of cashew nuts predominantly starts from December to March (Table 3). This indicates that harvesting of cashew nuts occurs in the dry season. The majority of the farmers indicated that harvesting/picking of cashew nuts begin in February (45%). However, very few (0.83%) farmers indicated that harvesting/picking of cashew nuts start in April. Table 3 shows that more than half (63%) of the farmers harvested/picked cashew nuts weekly. The frequency of harvesting/picking cashew nuts by close to one-third of the farmers was less than weekly. Such farmers harvested/picked cashew nuts more frequently (more than once in a week). However, few farmers harvested/picked cashew nuts once in two weeks. Harvesting frequency is also important in reducing losses and ensuring the quality outturn of the nuts. Likewise, Bannor et al. (2019) revealed that during the beginning of the season, when there were no rains, the quality outturn of raw cashew was high, but this reduced in the latter part of the season.

4.4. Cashew marketing outlets in Ghana

Table 4 presents cashew marketing outlets and related activities in Ghana. The cashew marketing outlets in Ghana are brokers, buying companies and exporters. The results revealed that the processing of cashew apple and nuts had not been fully developed in the country; hence, none of the farmers interviewed sold directly to processors. Meanwhile, about 4,700 jobs exist with about six cashew nut processing companies in Ghana (ComCashew, 2019). Likewise, Bannor et al. (2019) revealed that the marketing outlet for cashew did not include processors. The results suggest that more should be done to encourage the domestic processing of cashew, a crucial marketing outlet in the cashew value chain. In detail, ComCashew (2019) revealed that less than 10% of the global cashew processing was done in Africa and, even worse, in Ghana. The report further stated that cashew processing alone triggered a value addition of about US$ 2.8 billion every year pari passu 1000s of employment opportunities. Meanwhile, the continent accounts for more than 59% of the global cashew output. Obviously, Ghana and the African continent have not fully developed the cashew value chain.

From the table, most farmers (62%) sold cashew nuts to exporters, while about one-fifth sold to buying companies. However, only 17% sold cashew nuts to brokers. Exporters are companies and individuals who buy and export cashew nuts directly. Most farmers preferred to sell cashew nuts to exporters because they usually offered slightly higher

Table 4. Cashew marketing outlets and related activities in Ghana.

| Variable                              | Description/measurement | Percentage |
|---------------------------------------|-------------------------|------------|
| Marketing channels                    | Brokers                 | 16.67      |
| Quantity sold (kilogram)              | Mean                    | 1282       |
|                                      | Standard deviation      | 1216       |
|                                      | Minimum                 | 80         |
|                                      | Maximum                 | 6400       |
| Unit price (dollars per kilogram)*    | Mean                    | 0.57       |
|                                      | Standard deviation      | 0.12       |
|                                      | Minimum                 | 0.28       |
|                                      | Maximum                 | 1.10       |
| Attending of workshop on agricultural product marketing | Yes                    | 61.67      |
|                                      | No                      | 38.33      |
| Difficulty of getting buyers          | Very easy               | 47.50      |
|                                      | Easy                    | 42.50      |
|                                      | Averagely difficult/ fair | 2.50     |
|                                      | Difficult               | 2.50       |
|                                      | Very difficult          | 5.00       |
| Grading before sale                   | Yes                     | 77.50      |
|                                      | No                      | 22.50      |
| Problems with meeting grading standards | Yes                    | 45.00      |
|                                      | No                      | 55.00      |
| Rating of personal expertise on grading and standardisation | Very good               | 7.50       |
|                                      | Good                    | 60.83      |
|                                      | Average                 | 25.83      |
|                                      | Poor                    | 5.00       |
|                                      | Very poor               | 0.83       |
| Whether farmer has contractual agreement for guaranteed/ready market | Yes                    | 89.17      |
|                                      | No                      | 10.83      |
| Whether farmer has regular buyers     | Yes                     | 88.33      |
|                                      | No                      | 11.67      |
| Type of road farmer uses to market    | Gravel                  | 56.67      |
|                                      | Tarred                  | 10.83      |
|                                      | Both                    | 32.50      |
| Farmer’s rating of road linking farm and market | Good                   | 81.67      |
|                                      | Bad                     | 18.33      |
| Whether farmer has storage facility   | Yes                     | 70.00      |
|                                      | No                      | 30.00      |
| Whether farmer receives market information | Yes                    | 72.50      |
|                                      | No                      | 27.50      |
| Whether farmer performs price survey before selling | Yes                    | 67.50      |
|                                      | No                      | 32.50      |

* Ghana cedis (GH¢) is the currency of Ghana. Exchange rate: US$1 = GH¢ 7.25.
prices than other buying agents/companies. In most cases, buying companies buy cashew nuts and re-sell them to exporters. Brokers are buying agents who are more or fewer aggregators of cashew nuts. Buying companies and exporters sometimes give brokers money in the form of loans to buy cashew nuts and re-sell to them. In the cashew trade, since about 90% of the raw cashew nuts are exported, getting to sell raw nuts to exporters who are the major end-users (Bannor et al., 2019) in the cashew trade increases the farmers' share in the end-user price compared to other intermediaries – hence, the choice of farmers.

The average quantity of cashew nuts sold was 1282 kg, with an average price of US$0.57 per kilogram (Table 4). This suggests that, on average, farmers obtained US$730 from the sale of cashew nuts. The price of cashew nuts largely varies depending on the sale period, quality and buying company/agent. The price per kilogram of cashew nuts ranged from US$0.28 to US$1.10. Table 4 further shows that 62% of cashew farmers had attended workshops on agricultural product marketing. These workshops educated farmers on alternative buying companies/agents, appropriate standards/quality of cashew nuts required by buying companies/agents, and good harvesting, drying and storage practices. Most of the farmers (90%) indicated that it was easy to get buyers for cashew nuts, though about 8% indicated otherwise. This largely suggests a ready market for cashew nuts in Ghana. Close to 80% of the farmers indicated that they did quality grading of cashew nuts after harvesting before sale. Such farmers sorted/categorised cashew nuts into different grades based on size, shape, colour, breakages, and general quality. Cashew nuts attract different buyer prices based on grades.

Less than half (45%) of the farmers had problems with meeting grading standards required by cashew buying companies/agents (Table 4). This highlights the relevance of training programmes for farmers on cashew nut quality. Nearly 70% of the farmers had problems with meeting quality standards/quality of cashew nuts as good. This suggests that most farmers had higher personal expertise in grading and standardising cashew nuts. The results contrasted with the findings of Bannor et al. (2019). The differences could be attributed to several pieces of training by the Ministry of Food and Agriculture and GIZ [The Deutsche Gesellschaft für Internationale Zusammenarbeit] ComCashew, and other agencies in training farmers and other stakeholders on the quality assessment of cashew in Ghana. For instance, since 2009, more than 47,000 farmers have been trained in various aspects of cashew, from seedling production to quality assessment, postharvest loss management and marketing (ComCashew, 2019).

Table 4 further shows that 90% of the farmers had a contractual agreement with cashew nut buying companies/agents for guaranteed/ready market. In this case, some buying companies/agents provided loans to farmers, which ensured that such farmers sold their cashew nuts to the buying companies/agents that provided the loan. Close to 90% of the farmers had regular buyers for their cashew nuts. The results are suggestive that market availability is not a challenge in the cashew trade in the country though prices might differ. The dominance of contractual agreements is positive news for processors in Ghana since eight of the fourteen known processing companies had folded up due to an inadequate sustainable supply of cashew nuts (ComCashew, 2019).

Moreover, 57% of the cashew farmers used gravel-constructed roads to markets, while only 11% used tarred roads (Table 4). However, 82% of the cashew farmers rated roads linking their farms and markets as good. This suggests that the road network is not a major problem for cashew farmers. In contrast, Bannor et al. (2019) revealed that one of the notable challenges in the cashew trade was the poor road network from production sites (farms) to major cities and the ports where raw cashew nuts were eventually transported to India and Vietnam. The differences could be attributed to study areas because Bannor et al. (2019) covered most cashew-growing areas, excluding the current study area; thus, the responses relative to road networks differ. Also, the study by Bannor et al. (2019) was done in 2017, and between this year and 2021, several rural roads in Ghana have received facelifts under the Cocoa Roads Project by the Government of Ghana.

Further, 70% of the farmers had storage facilities for cashew nuts. Such farmers could store cashew nuts for higher prices. About 73% of the farmers received information on the marketing of cashew nuts. This gave farmers knowledge of quality standards, prices and alternative buying agents of cashew nuts. Moreover, 68% of farmers performed price surveys on cashew nuts before the sale. The results generally show a great improvement in cashew marketing in the country due to several projects and programmes geared towards improving cashew trade by NGOs (such as GIZ ComCashew), Cashew Companies such as OLAM-Ghana, and the Government of Ghana.

### 4.5. Determinants of cashew marketing outlets in Ghana

Table 5 shows multinomial probit estimates for the determinants of cashew marketing outlets. Multicollinearity among continuous explanatory variables used in the multinomial probit estimation was tested using variance inflation factor (VIF) as shown in appendix 1a. The result revealed the absence of multicollinearity since the mean VIF (1.13) was less than 10. Moreover, Breusch-Pagan/Cook-Weisberg test for heteroskedasticity showed a homoscedastic variance of error terms since the probability chi-squared (0.125) was not significant. The Wald chi-squared showed that the model fits the data well. Thus, the explanatory variables accounted for variations in the choice of cashew marketing outlets. Other measures of fit of the model can be found in Table 2a at the appendix. The base outcome for the estimation was brokers. Education was significant and positive for buying companies and exporters.

The marginal effects indicated that, as a farmer's years in formal education increased by one year, the probability of selling cashew nuts to buying companies increased by 3.2%, to exporters increased by 7.6%, and to brokers reduced by 4.4%, other factors held constant. This implies that education increases the probability of selling cashew nuts to buying companies and exporters compared with brokers. Thus, most educated farmers sell cashew nuts to buying companies and exporters, while most uneducated or less educated farmers sell to brokers. Buying companies and exporters purchase cashew nuts in bulk, pay ready cash, offer higher prices, and require higher quality standards than brokers (Bannor et al., 2019). Given these benefits and the cognitive power gained through formal education (Bezaw, 2019), educated farmers are likely to sell cashew nuts to buying companies and exporters.

Experience was significant and negative for buying companies and exporters. The marginal effects showed that, as experience in cashew production increased by one year, the probability of selling cashew nuts to buying companies increased by 3.2%, to exporters increased by 7.6%, and to brokers reduced by 4.4%, other factors held constant. This implies that education increases the probability of selling cashew nuts to buying companies and exporters compared with brokers. Thus, most educated farmers sell cashew nuts to buying companies and exporters, while most uneducated or less educated farmers sell to brokers. Buying companies and exporters purchase cashew nuts in bulk, pay ready cash, offer higher prices, and require higher quality standards than brokers (Bannor et al., 2019). Given these benefits and the cognitive power gained through formal education (Bezaw, 2019), educated farmers are likely to sell cashew nuts to buying companies and exporters.

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brokers reduced by 11%. Therefore, there was a higher possibility that farmers with larger cashew farms would sell cashew nuts to buying companies and exporters, while those with smaller farms would sell to brokers. This indicates that large-scale cashew farmers mostly trade with buying companies and exporters, while smallholder cashew farmers mostly trade with brokers. Buying companies and exporters usually purchase cashew nuts in bulk. This favours large-scale farmers who sell cashew nuts in larger quantities.

Land ownership type was significant and positive for buying companies and exporters. In the model estimation, land ownership type was measured as 1 for stool land and 0 for otherwise (family land, state land, leasehold, customary gift and sale). Therefore, the result implies that cashew cultivation on stool land increases the probability of selling to buying companies and exporters compared with brokers. According to Bannor et al. (2019), the marketing outlet that offered better margins to all actors in cashew supply chains (in particular, farmers) and supply chain surplus was the exporting outlet. Thus, the benefits accrued to the farmers are reasonable compared to other outlets (such as brokers and other intermediaries). On this account, the results seem to disagree with World Bank (2013) and Singh and Huang (2011) who described communally held lands as incapable of responding to the market economy, particularly in enhancing and achieving agribusiness potentials in Africa. However, it agrees with Goodwin (2013) and Berry (2013) who revealed a positive relationship between customary land ownership and communities' development. The result is suggestive that customary land ownership in the study area triggers positive economic benefits; as such, the imposition of other land tenure systems on these areas – as done in other parts of the country via land reforms – might not augur well for land tenure security and the desired economic benefits (Aanafo, 2013). Accordingly, as Aanafo (2013) suggested, the discussion on land use should move from which land tenure system was superior to being guided by differences in tenurial system in various areas and the benefits they espoused. Consequently, generic land reform for the whole country to enhance agribusinesses may be important but not necessary. The results may be counterproductive regarding food security and other relevant socioeconomic necessities maintained by customary land arrangements.

In terms of theory, the Rational Choice Theory is re-echoed, given that the choice of exporters as a marketing outlet maximizes the cashew trade's benefits. Bannor et al. (2019) observed that cashew farmers had access to three different marketing outlets (brokers, exporters and buying companies) that offered relatively different benefits. However, the exporter channel was recognised to offer farmers the highest margin. Therefore, considering the Rational Choice Theory, rational cashew farmers dispose of their nuts via the exporter channels to obtain a higher margin (satisfaction).

Furthermore, Table 5 reveals that type of road linking farm and market significantly and positively influenced cashew nuts’ sales to buying companies and exporters. The marginal effects indicated that having a good road linking farm and market reduced the probability of selling cashew nuts to brokers by 21%, other factors held constant. Thus, good road network promotes the sale of cashew nuts to buying companies and exporters. Brokers aggregate cashew nuts by travelling to various production villages. In most cases, brokers re-sell to buying companies and exporters in bulk. Thus, it is more likely that brokers would travel to typical villages/hinterlands of Ghana, where road network is usually bad to aggregate cashew nuts for buying companies and exporters.

The coefficient for a contract was significant and positive for exporters. This suggests that cashew farmers often enter a contractual agreement for a guaranteed/ready market with exporters relative to buying companies and brokers. Such exporters often offer cash and/or input credits for cashew farmers which guarantees that such farmers sell their cashew nuts to them.

Harvest frequency was significant and negative for exporters. From the marginal effects, harvesting/picking cashew nuts as frequently as less than weekly increased the probability of selling cashew nuts to brokers by 21%, other factors held constant. However, it increased the probability of selling to brokers by 13.4%, other factors held constant. Therefore, considering the Rational Choice Theory, rational cashew farmers dispose of their nuts via the exporter channels to obtain a higher margin (satisfaction).

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likely to sell to brokers while those who harvest weekly or more are more likely to sell to exporters. Brokers often travel to farming villages to purchase cashew nuts in smaller quantities from individual producers and aggregate for buying companies and exporters. This enables farmers who harvest cashew nuts frequently and sell in smaller quantities to trade with brokers than exporters. It is known that the quality outcome decreases if the nuts are not picked frequently. Consequently, cashew exporting companies should democratise their purchase within villages to get superior quality to bulky purchases.

Table 5 further shows that the coefficient for grading was significant and positive for buying companies and exporters though the latter was not significant. The marginal effects indicated that farmers’ grading of cashew nuts before sale increased the likelihood of selling to buying companies by 16.7% but insignificant for exporters. Nevertheless, grading of cashew nuts before sale reduced the likelihood of selling to brokers by 31.9%, other factors held constant. Sorting cashew nuts into various quality grades was usually a condition to meet larger buyers’ quality standards, such as buying companies and exporters. After aggregation, most brokers might grade before selling to buying companies and exporters. Also, farmers who had problems meeting grading standards had a lower probability of selling to exporters than buying companies and brokers (Table 5). This could be because exporters have higher quality requirements and standards for cashew nuts than other buying agents/companies.

5. Conclusions and recommendations

The types of land ownership (land tenure system) for cashew production in Ghana are leasehold, stool, family, state and customary lands, of which stool land recorded the highest proportion. ‘Abunu’ is Ghana’s main land acquisition system for cashew production. Registration of cashew farmlands is low in Ghana. Harvesting/picking of cashew nuts predominantly starts from December to March, indicating that harvesting of cashew nuts occurs in the dry season. The frequency of harvesting/picking cashew nuts is less than weekly, weekly or bi-weekly. Thus, the harvesting period and frequency of harvesting cashew nuts differ among farmers in Ghana. Cashew marketing outlets in Ghana are brokers, buying companies and exporters, of which exporters recorded the majority. Some farmers had problems with meeting grading standards required by cashew nut buying companies/agents. Further, the sales of cashew nuts to buying companies and/or exporters is positively influenced by the land tenure system, good road network, weekly harvest, contract agreements and grading of cashew nuts. In contrast, the experience of farmers coupled with less than one week of harvesting influences the choice of brokers’ outlet.

Regarding policy recommendations, given that the customary land arrangement provides the opportunity to sell to a reasonable marketing margins outlet, it is suggested that, Government and NGOs should rather be interested in strengthening the current land regime in the study areas. This should be done by providing suggestions for improvement where necessary, not by superimposing capitalist land reforms over the customary land arrangements in emerging cashew-growing areas. In addition, the non-existence of cashew processing as a marketing outlet implies that farmers and the country may lose from such an essential outlet in the cashew supply chains. Accordingly, through the Tree Crop Development Authority, the incentives of 10 years of tax exemption for cashew processors in industrial-free zones, and customs duty exemption on imports of processing equipment and spare parts should be trumpeted at the country’s Chamber of Commerce as well as the India Chamber of Commerce – a very important stakeholder in cashew trade in Ghana – to motivate the private sector to participate in the processing.

For practice, it is suggested that stakeholders with vested power over lands should be concerned with the expansion of cashew agribusinesses; however, it should be done in the context of the customary land arrangement rather than the capitalist land regimes since the former gives practical benefits to farmers. Also, cashew buying companies, particularly the exporting companies, should not sacrifice bulky purchases for quality; therefore, the exporting companies need to democratise their purchases in the villages to benefit from the quality that comes from the frequency of harvesting. Also, since some cashew farmers do not have enough knowledge of standards and grading, continuous capacity building on quality cashew nut production and quality assessment is necessary. For farmers, they should endeavour to join farmer associations or create associations that can liaise with the Tree Crop Development Authority and other development partners in erecting storage rooms and warehouses for storage to aggregate cashew nuts in bulk so as to sell to exporters who offer better prices.

Relative to theory, the study reafirms the Rational Choice Theory in choosing a marketing outlet among farmers, with the customary land ownership variable as a propeller. However, the theory did not suffice relative to the harvesting time.

The study coverage and the number of farmers interviewed could be enhanced by including other major growing cashew areas in Ghana. Similar studies could be done by comparing the various land regimes in Ghana’s predominant cashew growing areas – Bono, Bono East and Volta regions and Kwahu North (an emerging cashew spot in the country). The results that experience farmers were less likely to sell to high earn end-user outlets may need a more qualitative study to unravel the reasons behind this, as it was expected that experience farmers should be selling to the higher earn end-user outlet.

Declarations

Author contribution statement

Richard Kwasi Bannor, PhD Agribusiness; Bismark Amfo; Helena Oppong-Kyeremeh; Lesley Hope; Samuel Kwabena Chaa Kyiire; Reginald Djimatey: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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The authors declare no conflict of interest.

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Appendix

Appendix 1a. Test for multicollinearity among continuous explanatory variables used in the multinomial probit estimation

| Variable                  | Variance inflation factor (VIF) | 1/VIF |
|---------------------------|---------------------------------|-------|
| Farm size (acres)         | 1.20                             | 0.836 |
| Experience (years)        | 1.19                             | 0.888 |
| Education (years)         | 1.01                             | 0.994 |
| Mean VIF                  | 1.13                             |       |

Table 2a. Measures of fit of multinomial probit regression.

|                         | Log-Lik full Model | D (88): | 40.683 |
|-------------------------|--------------------|---------|-------|
| Wald X2 (30):           | 20.510             | Prob > X2 | 0.903 |
| Count R²                 | 0.917              | Adj Count R² | 0.783 |
| AIC                     | 0.872              | AIC‘n’   | 104.683 |
| BIC                     | -380.616           | BIC’     | 123.11 |
| BIC used by Stata       | 193.883            | AIC used by Stata | 104.683 |

Table 3a. Hausman test of IIA.

| Variable                                    | (b) | (B) allcats | (b-B) Difference | Sqrt (diag (V_b-V_B)) Std. error. |
|---------------------------------------------|-----|-------------|------------------|----------------------------------|
| Education                                  | -2.301 | 0.527     | -2.828            | 0.818 |
| Experience                                 | -0.012 | -0.212     | 0.120             | -    |
| Farm size                                  | 0.015 | 0.293      | -0.278            | -    |
| Land ownership type                        | -1.356 | 3.208     | -4.564            | 1.224 |
| Own land                                   | -0.905 | -0.952     | 0.047             | 1.346 |
| Road                                       | -0.158 | 5.183      | -5.341            | -    |
| Contract with buyers                       | -2.928 | 5.129     | -8.057            | 3.172 |
| Attend workshops                           | -4.095 | -1.824     | -2.271            | 2.110 |
| Harvest frequency                          | 3.470 | -2.136     | 5.605             | 1.477 |
| Grading                                    | -1.710 | 7.654      | -9.363            | 1.503 |
| Problem with standardization               | 8.882 | 0.743      | 8.139             | 3.240 |
| Storage facility                           | -1.243 | 3.205     | -4.448            | 1.921 |
| Price survey                               | 0.772 | -1.531     | 2.303             | 2.254 |
| Regular customers                          | -4.179 | -8.838     | 4.658             | -    |
| Difficult looking for buyers               | 0.272 | 0.152      | 0.120             | 1.257 |
| Constant                                   | 24.984 | -6.312     | 31.296            | 12.312 |

b = consistent under Ho and Ha; obtained from mprobit
B = inconsistent under Ha, efficient under Ho; obtained from mprobit
Test of Ho: Difference in coefficients not systematic.
Chi^2(16) = (b-B)'[V_b-V_B]^-1(b-B) = 3.32.
Prob > chi^2 = 0.9997.
(V_b-V_B is not positive definite).

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