

## Trading modes of cashew (*Anacardium occidentale* L.) by small producers in Central Benin

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## **Trading modes of cashew (*Anacardium occidentale* L.) by small producers in Central Benin**

### **Abstract**

The cashew tree occupies an important place in the Beninese economy. In recent years, the sector has been facing several challenges, among which trading represents a significant concern. The objective of this study is to understand the determinants of the trading methods used by small cashew producers in central Benin. In this context, a semi-structured questionnaire was administered to 254 cashew farms, selected in two municipalities. The Multiple Correspondence Analysis (MCA) allowed for the characterization of sales methods using the FactoMineR and factoextra packages. The small-scale cashew producers based on various factors were categorized and the determinants of the choice of trading modes were identified using logistic regression method. The producers were grouped according to four trading modes: individual sale, group sale, warehouse sale and mixed sale. These modes were practiced respectively by 32%, 27%, 19%, and 22% of producers. Producers in the municipality of Savalou engage more in individual sales (54% compared to 46%) and sales at the store (SIPI) (53% compared to 47%). Individual sales were chosen based on the distance between the village and the nearest market, contact with extension services, the area cultivated with cashew trees, the number of cashew plantations, and the unit selling price of cashews. The choice of group sales was linked to variables such as wholesaler, sources of internal and external advice, access to credit, and education. The area cultivated with cashews, the unit selling price of cashews, and the semi-wholesaler variable were the determinants of sales to individual shops. The pursuit of a secondary activity, the need to purchase inputs, the need for construction, and the need to purchase equipment were the determinants of mixed sales. These results provided essential foundations for a better understanding of cashew trading in Central Benin, with a view to reorganizing the sector.

**Keywords:** Trading modes, cashew, rational choice theory, Central Benin.

**Classification JEL :** Q13

**Paper type:** Empirical Research

## 1. Introduction

The cashew tree (*Anacardium occidentale* L.) is primarily cultivated for its nut, which is consumed in various forms (Unctad 2021). Cashew is the third most produced edible nut worldwide, after peanuts and almonds (Kolliesuah et al. 2020). The African continent accounts for over 55% of global supply, with West Africa emerging as the leading production hub, consistently contributing at least 90% of Africa's supply (Gbaguidi 2019). Benin is one of the major cashew producers in West Africa (Adjobo and Yabi 2020). Cashew is a cash crop, driven by the growing global demand for raw nuts (Diulyale et al. 2019). As such, it has continuously attracted attention and is one of the eight priority sectors in the agricultural recovery plan and the government's action program for agriculture in Benin (Salifou et al. 2022). Benin ranks among the world's top ten producers, contributing 2% of global production (Wallis et al. 2016). Cashew cultivation is mainly practiced on smallholder farms due to the ease of management (Amanoudo et al. 2022). At the end of each marketing campaign, income from cashew enables producers to organize ceremonies (rituals, weddings, funerals, etc.), acquire goods (motorcycles, bicycles, household appliances, etc.), access vital services (healthcare, children's education, etc.), and construct housing (Yabi et al. 2013). This performance directly explains the interest of economic operators, particularly producers, in the sector (Salifou et al. 2022). The development of the cashew sector thus generates income that contributes to the national economy through exports and to the local economy through the growth of income-generating activities along the value chain (Balogoun et al. 2014).

In Benin, the coordination of cashew trading is organized around two main modes: individual and group sales (Degla and Ahodode 2021). Several studies have highlighted the importance of marketing and the various feedback loops between production, marketing, and consumption (Requier-Desjardins 2019). Better access to domestic and international markets allows rural farmers to sell their products at higher prices, motivating them to increase the quantity, quality, and diversity of the goods they produce and sell more (Bannor et al. 2022). Reliable market access also benefits regional income growth, food security, and poverty and hunger alleviation (Bannor et al. 2022). Despite these significant benefits, smallholder farmers' market access has been constrained by a wide range of factors, such as remote locations (Muto and Yamano 2009; Barbier 2023), information asymmetry (Ullah et al. 2020; Dey and Singh 2023), high transaction costs (Markelova et al. 2009; Gurmu et al. 2024), and the lack of business skills (Otekunrin et al. 2019). These issues are more common in developing and emerging countries. Literature shows that producers use multiple modes of selling their harvest. Many studies have investigated determinants of market outlet selection among food crop farmers in various jurisdictions (Tarekegn et al. 2017; Dlamini-Mazibuko et al. 2019; Adams et al. 2020). 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 accesses 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. In Benin, few studies have addressed this in the cashew sector (Yolou 2019). Adegbola and Zinsou (2010), in an analysis of cashew nut markets, identified the coexistence of individual and group sales. Baranon et al. (2014) argued that volumes marketed collectively remain low. Tandjiekpon (2010) estimated that less than 4% of national cashew production was marketed collectively in 2011. Thus, producers' choice of trading mode is influenced by several factors. The explicit problem statement of this study focuses on identifying and characterizing the factors influencing the choice of trading methods among small-scale cashew producers in the municipalities of Bantè and Savalou, particularly in light of the challenges they face regarding market access, transaction costs, and the coexistence of individual and group sales.

## **2. Literature Review**

### **2.1. Theoretical Framework**

The producer is an economic agent primarily concerned with minimizing production costs and maximizing profit (Jael, 2015). In normal circumstances, humans make their choices based on their understanding, vision, and especially on the results they expect in the future. Thus, the present research is based on the theory of rationality. One of the main authors associated with this theory is Neumann and Morgenstern, (1964), who developed mathematical models to formalize decision-making. Their work, *Theory of Games and Economic Behavior*, established the foundations of game theory, a closely related field. According to Boudon (2004), the theory of rationality is a model for explaining human behavior that starts from the principle that the producer will naturally tend, in order to achieve ends that coincide with his immediate interests, to employ the most suitable means. He therefore makes rational choices among those that are accessible to him. The theory is based on several key hypotheses:

1. Rationality: Individuals make logical decisions based on their preferences.
2. Complete Preferences: Individuals can rank all available options according to their utility.
3. Transitivity: If an individual prefers A to B and B to C, then he prefers A to C.
4. Independence of Irrelevant Alternatives: The choice between two options should not be influenced by a third irrelevant option.

Rationality is therefore not identical for all economic actors, as it depends on each actor's preferences, income, and the notion of time. Becker (1996) argues that an action is rational as long as it gives the individual who commits it the feeling of producing effects that he appreciates and even appreciates more than those that any alternative action could have produced. El Gemayel (2013) identified three main determinants of an individual's decision-making process. These are perception (the individual collects information about his own situation and the context), decision (the individual finds feasible actions, evaluates them, and selects the one that seems most desirable in his current situation given his objectives), and action (he executes the selected action, provided it is indeed feasible). Simon, (1957) introduced the concept of bounded rationality, suggesting that individuals cannot always act perfectly rationally due to cognitive and informational constraints. Recent studies such as Durand et al., (2008, 2013a, 2013b, 2019); Lin (2011), Lin and Lu (2015); Patterson and Daigler (2014) have focused on the effects of investor's personality traits on the investment decision-making process and exhibition of cognitive biases. They found a significant influence of investor's personality traits and risk-taking attitude on cognitive biases and investment decision process. Gambetti and Giusberti (2012), Lin (2011); Statman et al., (2006), Stone et al., (2001) provide that investors with neuroticism trait lack confidence in their decision-making ability because they are emotionally unstable and nervous (Costa and McCrae, 1992). Investors characterized by the

neuroticism trait are nervous and anxious, and want to realize early profit while holding losing stocks for a longer period of time (Lin, 2011; Wolfe and Grosch, 1990). They hence exhibit a disposition effect. Because of low levels of self-confidence, such investors also follow the advice and instructions of advisors and friends to make investment decisions, leading to herding behavior (Durand et al., 2013a). Hence, it seems that the neuroticism trait in investors is negatively associated with overconfidence bias and positively linked with disposition effect and herding behavior. The extraversion trait is characterized by zeal, energy, optimism, sociability, talkativeness and assertiveness (Costa and McCrae, 1992). Extraverts are optimistic about the expected performance of losing investment choices and retain them for a longer period (Van de Venter and Michayluk, 2008). Because of the sociability effect, they want to realize the short-term profits to reflect that they have earned a positive return and have used profitable strategies, leading to the disposition effect.

### **3. Materials and Methods**

#### **3.1. Study Area**

The study area covers the municipalities of Bantè and Savalou in the Collines Department. Bantè is in the far northwestern part of the department (Anato et al. 2024), between 8°00' and 8°40' North latitude and 1°30' to 2°17' East longitude. It covers an area of 2,695 km<sup>2</sup>. It is bordered by the commune of Savalou to the south, Bassila to the north, Glazoué to the east, and the Republic of Togo to the west. Savalou is situated in the central-southern part of the country, between 7°35' and 8°13' North latitude and between 1°30' and 2°06' East longitude (Yabi et al. 2013). These two municipalities were selected not only because they are highly favorable for cashew production on a national scale (Issaka 2019), but also because they host a cashew processing plant in Savalou (Gogohounga et al. 2019) and storage facilities of the Société d'Investissements et de Promotion de l'Industrie (SIPI-Bénin S.A.).

#### **3.2. Data Collection**

The observation units consisted of agricultural producers engaged in cashew nut cultivation. Villages were selected based on the significance of cashew production within each municipality. Subsequently, a sampling frame was developed with the assistance of resource persons' familiar with the selected villages. A total of 254 producers were randomly sampled, including 125 in Bantè and 129 in Savalou. The distribution of respondents by commune and by village is presented in Table 1.

Primary data were collected through direct interviews with farmers using a semi-structured digital questionnaire, designed on the KoboToolbox server and administered to household heads during September and October 2023. These primary data relate to the sociodemographic and economic characteristics of the surveyed farmers.

This data collection followed the obtaining of various authorizations from the structures involved. Thus, the Applied Statistics and Computer Science Unit (USIA) attached to the Forestry Study and Research Laboratory (LERF) of the University of Parakou authorized the collection following the validation of the questionnaire and the analysis methods to be used. Finally, Municipal Cooperatives of Cashew Producers of Bantè and Savalou have given their authorization and informed consent for the collection of data from their members (cashew producers).

**Table 1: Distribution of respondents by village**

Municipalities	villages	Number of respondents	Total of municipalities
Bantè	Adjigo	19	125
	Bobè	22	
	Gbégamey	07	
	Idi-ogou	12	
	Illélakoun	12	
	Illaré	28	
	N'tchoché	06	
	N'tchon	19	
Savalou	Tchetti -Igbéri	16	129
	Kitikpli	19	
	Koffodoua	05	
	Kpataba	17	
	Obicro	05	
	Odoagbon	39	
	Okouffo	01	
	Ottélé	15	
	Tchetti	10	
	Zoundji	02	
Total	18	254	

Source : Authors

### 3.3. Data Analysis

The data collected were directly transferred from the platform created on the Kobotoolbox server to Microsoft Excel 2016. Descriptive statistical methods were used to highlight the characteristics of the surveyed producers by determining the proportions of the modalities of each variable used. Multiple Correspondence Analysis (MCA) and Hierarchical Ascending Classification (HAC) were employed to develop a typology of small-scale cashew producers. The statistical software R, version 4.4.1, was used to identify the determinants of cashew trading modes among smallholders. The model is based on the binary logistic regression. Binary logistic regression is a technique used to analyze the relationship between a qualitative dependent variable  $y$ , nominal with two modalities (coded, for instance, as  $y = 0$  and  $y = 1$ ), and one or more explanatory variables  $X_i$  ( $i = 1, \dots, k$ ), which may be quantitative or qualitative (ordinal or nominal), and are assumed to be perfectly known (Akossou 2014; Akueson et al. 2021; Alidou et al. 2024). In this case, the goal is to model the probability  $\pi$  of a cashew producer adopting a specific trading mode based on various factors. To achieve this, a transformation of the success probabilities is performed using link functions, denoted as  $g$ . Several link functions exist, but the most used is the logit function. Furthermore, the distribution calculations of the Logit model appear more advantageous (Gujarati 2004). It is defined as (Eq. 1):

$$g = \text{logit}(\pi) = \ln [\pi/(1 - \pi)] = \mathbf{x}'_i \boldsymbol{\beta} \quad (i = 1, \dots, n), \quad (1)$$

Where  $\mathbf{x}'_i = (1, x_{i1}, \dots, x_{ik})$  is a  $1 \times (k + 1)$  vector corresponding to  $k$  covariates associated with producer  $i$ , and  $\boldsymbol{\beta} = (\beta_0, \beta_1, \dots, \beta_k)'$  is the  $(k + 1) \times 1$  vector of coefficients.  $\boldsymbol{\beta}$  contains the parameters to be estimated, usually by the Maximum Likelihood Estimation (MLE) method.

The inverse transformation is used to compute the estimated probabilities based on  $\mathbf{x}$  (Eq. 2):

$$\pi = \exp(g) / [1 + \exp(g)] \quad (2)$$

For a given producer  $i$ , with characteristics  $\mathbf{x}_i$ , the ratio between the probability  $\pi$  of adopting a specific trading mode and the probability  $(1 - \pi)$  of not adopting it represents the odds ratio. The general formulation of the link function is (Eq. 3):

$$g_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i} + \dots + \beta_k x_{ki} + \varepsilon_i \quad (3)$$

Where:

$g_i$  = characteristics of the cashew farm, its environment, and the producer's choice;

$\beta_i$  = coefficients of explanatory variables;

$x_{ki}$  = explanatory variables.

Estimation was performed using the Maximum Likelihood method. A separate model was established for each trading mode, as the explanatory variables differ from one mode to another. Thus, if a producer adopts a trading mode, the dependent variable  $y$  takes the value 1, and  $y = 0$  otherwise. For each trading mode, the link function is defined as follows:

For individual selling (**Eq. 4**):

$$g_i = \beta_0 + \beta_1 DISTM_i + \beta_2 SEXE_i + \beta_3 TAME_i + \beta_4 ACC_i + \beta_5 NACA_i + \beta_6 SERVU_i + \beta_7 SUPACAJOU_i + \beta_8 APP_i + \beta_9 NbrePla_i + \beta_{10} Prixunitairekvgv_i + \beta_{11} CSavalou_i + \varepsilon_i \quad (4)$$

For group selling (**Eq. 5**):

$$g_i = \beta_0 + \beta_1 Prixunitairekvgv_i + \beta_2 Grossiste_i + \beta_3 Sourcesex4_i + \beta_4 Sourcesin1_i + \beta_5 Sourcein3_i + \beta_6 AMOF_i + \beta_7 ACC_i + \beta_8 ALPHA_i + \beta_9 SUPACAJOU_i + \beta_{10} C er emonie_i + \varepsilon_i \quad (5)$$

For SIPI warehouse selling (**Eq. 6**):

$$g_i = \beta_0 + \beta_1 QUAN_i + \beta_2 QUALI_i + \beta_3 SUPACAJOU_i + \beta_4 TAME_i + \beta_5 Prixunitairekvgv_i + \beta_6 SENS12_i + \beta_7 SENS13_i + \beta_8 SOUC11_i + \beta_9 SOUC12_i + \beta_{10} Semi - grossiste_i + \varepsilon_i \quad (6)$$

For mixed selling (**Eq. 7**):

$$g_i = \beta_0 + \beta_1 TAME_i + \beta_2 NACA_i + \beta_3 ACTSE_i + \beta_4 CSavalou_i + \beta_5 ACHA_i + \beta_6 Construction_i + \beta_7 ACHAE_i + \varepsilon_i \quad (7)$$

The choice of a mixed selling mode for cashew nuts by a producer is based on a strategic criterion. This mode allows for the diversification of distribution channels, combining both individual sales and group sales, such as sales to SIPI stores.

A backward selection of variables starting from the full model was also carried out in order to identify the explanatory factors of adoption having a significant effect on the adoption of each trading mode. The choice of this method is justified insofar as, in the presence of a large number of explanatory variables whose impact on the variable to be explained is not known in advance, a selection of variables seems essential in order to obtain a final model of reasonable complexity (Akossou and Palm 2005), even if this selection can lead in certain cases to the introduction of bias, in particular omission bias and selection bias (Akossou and Palm 2005). The selection of variables was made according to the Akaike Information Criterion or AIC (Akaike 1998). The goodness of fit of each model was assessed by residual deviance and AIC. We also used pseudo-coefficients of determination such as  $R^2$  of Cox and Snell (Cox and Snell, 1989) and  $R^2$  of Nagelkerke (Nagelkerke, 1991), even if these coefficients have relatively low values (theoretical value less than 1, even for a "perfect" model), especially in the presence of categorical variables in the model. The coefficient  $R^2$  of Cox and Snell is equal to 1 minus the ratio of the likelihood of the adjusted model to the likelihood of the independent model raised to the power  $2/Sw$ , where  $Sw$  is the sum of weights. The coefficient  $R^2$  of Nagelkerke is equal to ratio of the  $R^2$  of Cox and Snell, divided by 1 minus the likelihood of the independent model raised to the power  $2/Sw$ . the percentage of well-classified observations was also added. In case of overdispersion, the quasibinomial distribution was replaced by the binomial distribution for

parameter estimation. The explanatory variables considered, their level of measurement and the expected signs are recorded in Table 2.

**Table 2: Explanatory variables of the model, their measurement levels, expected signs and reference modality in the logistics model**

Codes and meaning of variables	Individual Sale	Group Sale	Sale at SIPI Store	Mixed Sale	Reference modality in the logistics model
DISTM: Distance between the village and the nearest market where the producer sells their product (in Km)	+	0	0	0	
SEX (0: Female; 1: Male)	+	0	0	0	Female
TAME: Household size (Continuous)	+	0	+	+	
ACC: Access to credit (0: No; 1: Yes)	+	+	0	0	No
NACA: Number of years of experience in cashew production	+	0	0	+	
SERVU: Contact with extension services (0: No; 1: Yes)	+	0	0	0	No
SUPACAJOU (in hectares)	+	+	+	0	
Prixunitairekgvi (F CFA)	+	+	+	0	
APP: Membership in a cashew producers' association (0: Not a member; 1: Member)	+	0	0	0	Not Member
NbrePla: Number of cashew plantations	-	0	0	0	
CSavalou (0: Not located in Savalou; 1: Located in Savalou)	+	0	0	+	Not located in Savalou
Wholesalers (0: No; 1: Yes)	0	+	0	0	No
Sourcesex: Sources of external information (Colleague; Grouping; Buyers; Suppliers; Agents; Journal; From myself)	0	+	0	0	Buyers
Sourcesin: Sources of internal advice (Family; Other; From myself)	0	-	0	0	Other
AMOF (0: No use of salaried labor; 1: Uses salaried labor)	0	+	0	0	No use of salaried labor
ALPHA: Literacy (0: No; 1: Yes)	0	-	0	0	No
Ceremony (0: No; 1: Yes)	0	+	0	0	No
QUAN (0: Does not have a large quantity; 1: Has a large quantity)	0	0	+	0	Has a large quantity
QUALI (0: Products do not meet quality standards; 1: Products meet quality standards)	0	0	+	0	Products do not meet quality standards
SENSI: Sensitivity to risk-taking (None; moderate, high)	0	0	+	0	high
SOUCI: concern for safeguarding the farm (None; Slight; Strong)	0	0	+	0	Strong
Semi-wholesalers (0: No; 1: Yes)	0	0	+	0	No
ACTSE (0: No secondary activity; 1: Has a secondary activity)	0	0	0	+	Has a secondary activity
ACHA: Purchase of inputs (0: No; 1: Yes)	0	0	0	+	No
Construction (0: No; 1: Yes)	0	0	0	+	No
ACHAE: Purchase of equipment (0: No; 1: Yes)	0	0	0	+	No

*Source : Authors*

## 4. Results

### 4.1. Socio-economic Characteristics of Small-Scale Cashew Producers

The socio-economic characteristics of the surveyed producers (Table 3) revealed that most respondents were men (74%), while women represented only 26% of the study sample. Most of the respondents were married (79%), have not attended formal schooling (54%), engaged exclusively in agricultural activities (66.53%), and belonged to the N'tcha, Idatchaa, and Ifè ethnic groups. On average, the producers were 47 years old and had 19 years of experience in cashew production. Their farms typically cover an average area of 4 hectares dedicated to cashew cultivation, with an average household size of 8 members.

**Table 3: Characteristics of small-scale cashew producers**

Qualitative Variables	Modalities	Count	Frequency (%)
Municipality	Bantè	125	49
	Savalou	129	51
Sex	Male	186	74
	Female	68	26
Marital Status	Married	203	79
	Divorced	12	4
	Widowed	37	14
	Single	1	1.5
Education Level	Separated	1	1.5
	None	139	54
	Primary	64	25
	Lower Secondary	32	12
Secondary Activity	Upper Secondary	15	5
	University	4	1
	Agricultural activities	169	66.53
Ethnic Group	Non-agricultural activities	85	33.47
	Most represented (N'tcha, Idatcha, Ifè)	231	91
	Less represented (Fon, Ditammari)	23	9
Quantitative Variables	Mean	Standard Deviation	
Age	47	10	
Cashew farming experience (years)	19	8	
Cashew cultivation area (hectares)	4	1	
Household size	8	3	

*Source : Authors*

#### 4.2. Categorization of Small-Scale Cashew Producers

The results of the Multiple Correspondence Analysis (MCA) and the Ascending Hierarchical Classification (AHC), illustrated in Figure 1, indicated that the first two axes explained 66.15% of the information contained in the initial variables. Each factorial axis was determined by examining the relative contribution of the variable modalities to the explained inertia. The projection of individuals on the factorial axes and the AHC (Fig. 2) identified four groups of small-scale producers. These producers were grouped according to their mode of cashew commercialization. Accordingly, four trading modes were identified: individual sale, group sale, sale through the SIPI store, and mixed sale. This structure allowed for a clear and precise understanding, while highlighting the balanced contribution of the two main dimensions and the diversity of observed trading modes. The characteristics of each observed group (Table 4) revealed varied relationships between the discriminant variables and the cashew commercialization groups, all significant at the 1% level ( $p < 0.01$ ).

Producers in the individual sale group were mainly those with health issues within their households (72.5%) and who felt they obtained the best-selling price, while also facing urgent financial needs for construction projects (55%). These farms, often under financial pressure, sell their products individually, without being members of an association, without complying with quality standards, and without contracts with the SIPI store. On average, they market 1,269 kg of cashew nuts in this manner. This distribution highlights the economic and social constraints that drive these producers to opt for this sales method, despite the absence of support structures or contractual guarantees.

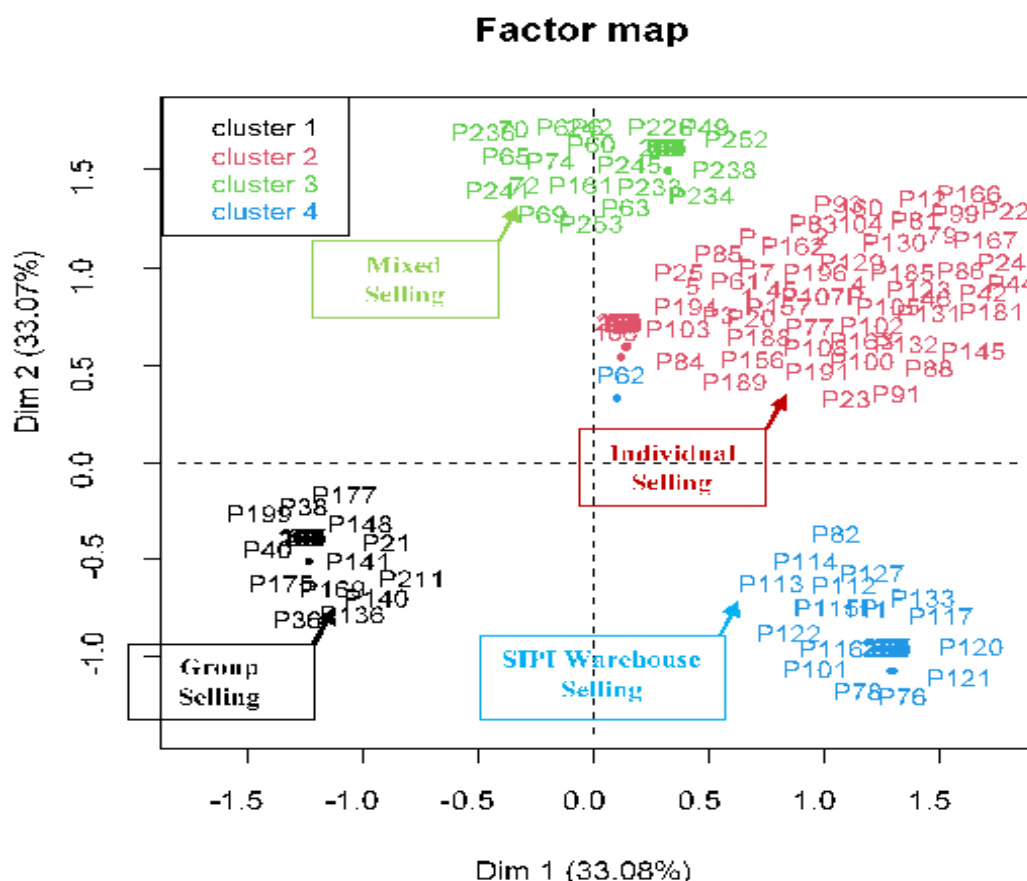
Farms engaged in group sales were all association members (100%) and used this commercialization mode to finance construction projects (80.9%), purchase equipment (91.2%), and agricultural inputs (75%). They generally do not face immediate financial needs nor urgent demands related to ceremonies or health problems. On average, they sold 3,705 kg

of cashew nuts through this channel. Group selling is thus adopted by organized farms that choose this trading approach to benefit from collective input and equipment purchasing services.

Farms selling through the SIPI store typically had large quantities of cashew nuts (83.7%) that comply with quality standards (98%) and were bound by contracts with the SIPI store (79.6%), requiring them to sell their products there (79.6%). These farms had no urgent financial needs and were not members of any association. On average, they sold 3,720 kg of cashew nuts through the SIPI store. This commercialization mode was therefore primarily adopted by farms contractually linked to the SIPI store, obligated to adhere to these agreements without alternative sales options.

Farms practicing mixed sales face several urgent demands, such as lack of funds (73.7%), organizing ceremonies (78.9%), addressing health issues (87.7%), and needs related to construction (75.4%), equipment (71.9%), and inputs (91.2%). Most of these farms are association members (94.7%), possess large product quantities (82.5%), comply with quality standards (93%), and have contracts with the SIPI store (73.7%). They choose this trading mode mainly when the market offers a better price (98.2%) and when no other option is available but to combine the different previously mentioned sales modes. On average, they market 3,146 kg of cashew nuts using the mixed sale strategy. This mode thus reflects the need to manage various urgent needs while maximizing available selling opportunities.

**Figure. 1. Projection of surveyed cashew producers on factorial axes 1 and 2**



*Source: Authors*

**Table 4: Characteristics of the Four Groups (Trading Modes) of Small-Scale Cashew Producers**

Variables	Modalities	Individual Selling	Group Selling	SIPI Warehouse Selling	Mixed Selling	Significance
Lack of funds	Yes	47.5%	0%	0%	73.7%	p = 0.000
	No	52.5%	100%	100%	26.3%	
Ceremonial expenses	Yes	42.5%	0%	0%	78.9%	p = 0.000
	No	57.5%	100%	100%	21.1%	
Health problems	Yes	72.5%	0%	0%	87.7%	p = 0.000
	No	27.5%	100%	100%	12.3%	
Best price	Yes	92.5%	0%	0%	98.2%	p = 0.000
	No	7.5%	100%	100%	1.8%	
Construction needs	Yes	55%	80.9%	0%	75.4%	p = 0.000
	No	45%	19.1%	100%	24.6%	
Quantity sold	Mean (Standard Deviation)	1.269 (1.137)	3.705 (2.508)	3.720 (1.434)	3.146 (1.724)	p = 0.000
Association membership	Yes	0%	100%	0%	94.7%	p = 0.006
	No	100%	0%	100%	5.3%	
Purchase of equipment	Yes	0%	91.2%	0%	71.9%	p = 0.000
	No	100%	8.8%	100%	28.1%	
Purchase of inputs	Yes	0%	75%	0%	91.2%	p = 0.000
	No	100%	25%	100%	8.8%	
Availability of large quantities	Yes	0%	0%	83.7%	82.5%	p = 0.000
	No	100%	100%	16.3%	17.5%	
Products comply with quality standards	Yes	0%	0%	98%	93%	p = 0.000
	No	100%	100%	2%	7%	
Contract with warehouse	Yes	0%	0%	79.6%	73.7%	p = 0.000
	No	100%	100%	20.4%	26.3%	
Only option available	Yes	0%	0%	79.6%	84.2%	p = 0.000
	No	100%	100%	20.4%	15.8%	

Source : Authors

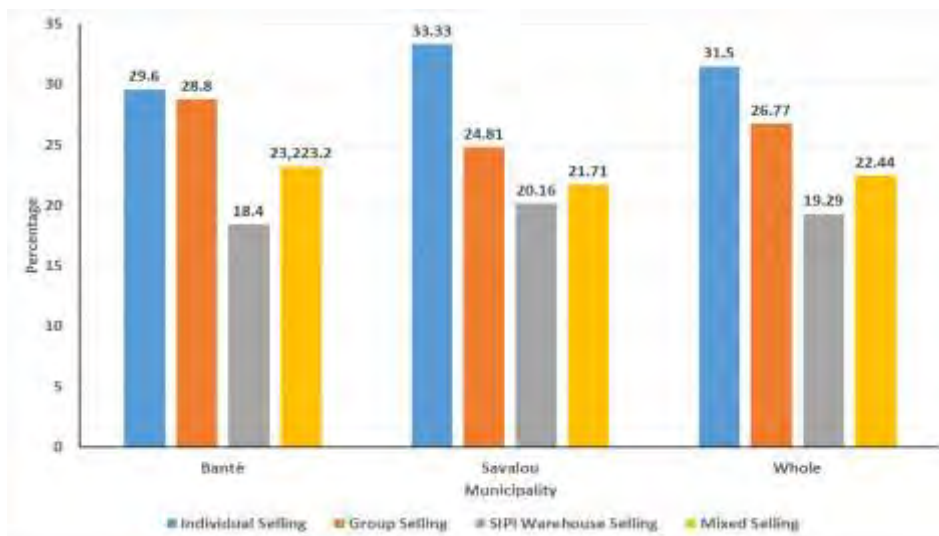
### 4.3. Effect of municipality on the trading mode

The distribution of respondents by trading mode across municipalities revealed that in the municipality of Savalou, individual sales and group sales were the most common, practiced by 29.6% and 28.8% of respondents respectively. A similar trend was observed in the municipality of Bantè, where individual sales predominate with 33.33% of producers, followed by group sales (24.81% of producers).

Across both municipalities, individual sales remained the most widespread trading mode (31.5%), followed by group sales (26.8%), mixed sales (22.4%), and sales through the SIPI store (19.3%).

This distribution highlights significant variations in trading preferences depending on the regions studied.

**Figure 2. Distribution of producers according to trading mode by municipality**



Source : Authors

#### **4.4. Determinants of cashew trading modes among small-scale producers**

##### **4.4.1. Individual Sale Mode of Cashew Nuts**

Regression results (Tables 5 and 6) showed that the distance between the village and the nearest market, contact with extension services, cashew cultivation area, number of cashew plantations and unit sale price of cashew nuts are the determining factors of individual sales. The distance to the nearest market has a positive influence on the likelihood of adopting individual sales at the 5% significance level ( $p < 0.05$ ). The odds ratio of 1.2 implies that, all else being equal, an increase of one unit in distance increased the likelihood of a producer adopting individual sales by 1.2 times. In other words, there is a 20% greater chance of adopting individual sales compared to other modes as the distance increases.

Producer contact with extension services had a positive influence on individual sales at the 1% level ( $p < 0.01$ ). Thus, producers who were in contact with extension services were more likely to adopt individual sales than those who were not. When a producer had such contact, their likelihood of selling individually was 11.32 times higher than that of a producer without contact. Cashew cultivation area had a positive effect on individual sales. This result indicated that as the cashew cultivation area increased, producers were more inclined to sell individually. An increase of one unit in the area corresponded to a 1.51 times higher likelihood of adopting individual sales.

The number of cashew plantations was negatively correlated with individual sales at the 5% level ( $p < 0.05$ ). As the number of plantations increased, the likelihood of adopting individual sales decreased. Specifically, each additional plantation nearly halves the probability of adopting individual sales compared to not adopting it.

The unit sale price of cashew had a positive effect on individual sales at the 5% significance level ( $p < 0.05$ ). This suggests that a one-unit increase in price raises the probability of individual sales by a factor of 1.01. However, since this odds ratio is very close to 1, the change in probability is marginal.

##### **4.4.2. Group Sale Mode of Cashew Nuts**

The logistic regression model revealed that group sales were influenced by unit sale price, wholesaler status, internal and external advice sources, access to credit, and ceremonial obligations. Unit price positively influenced group sales at the 1% level ( $p < 0.01$ ). An increase in sale price by one unit resulted in an equal probability of adopting or not adopting group sales

(odds ratio = 1), all else being equal. Wholesaler status had a negative effect on group sales at the 5% level ( $p < 0.05$ ). Wholesalers were less likely to adopt group sales than non-wholesalers (odds = 0.35).

Internal advice from fellow producers significantly increased the likelihood of adopting group sales compared to advice from other sources by a factor of 7.7. In contrast, external advice from producer groups was far less influential than that from buyers, with an odds ratio of just 0.009. Access to credit negatively influenced group sales at the 1% level ( $p < 0.01$ ). Producers with access to credit were 83% less likely to adopt group sales compared to those without such access (odds ratio = 0.26).

Ceremonial obligations positively affected the adoption of group sales at the 5% level ( $p < 0.05$ ). Producers under pressure to organize or participate in ceremonies were 2.7 times more likely to adopt group sales than those without such obligations.

#### **4.4.3. Sale through SIPI Store**

Adoption of the SIPI store sale mode was influenced by compliance with quality standards, cashew cultivation area, unit sale price, and semi-wholesaler status.

Compliance with quality standards had a positive effect on SIPI sales adoption at the 5% level ( $p < 0.05$ ). Producers who meet quality standards were 4.16 times more likely to adopt this mode of sale than those who do not.

Cashew cultivation area negatively influenced the adoption of SIPI sales at the 1% level ( $p < 0.01$ ). An increase in cultivation area reduced the likelihood of adopting this mode by approximately 50% (odds ratio = 0.54).

The unit sale price negatively affected SIPI sales adoption at the 1% level ( $p < 0.01$ ). A one-unit increase in price reduced the likelihood of adopting SIPI sales by 3% (odds ratio = 0.98).

Semi-wholesaler status positively influenced SIPI sales adoption at the 1% level ( $p < 0.01$ ). Semi-wholesalers were 2.62 times more likely to sell through the SIPI store than non-semi-wholesalers.

#### **4.4.4. Mixed Sale Mode of Cashew Nuts**

The adoption of mixed sales was influenced by whether the producer engages in a secondary activity, the need to purchase inputs, the need for construction, and need to acquire equipment. The practice of a secondary activity had a positive influence on mixed sales at the 1% significance level ( $p < 0.01$ ). Producers engaged in another activity outside of agriculture were 5.81 times more likely to adopt mixed sales than producers solely involved in cashew cultivation.

The need to purchase inputs had a negative effect on the likelihood of adopting mixed sales at the 1% significance level ( $p < 0.01$ ). Producers who choose to buy inputs for cultivation were less likely to adopt mixed sales than those who do not. This likelihood was estimated to be 62% lower (odds ratio = 0.37).

Similarly, the need for construction and the need to purchase equipment negatively affected the probability of adopting mixed sales at the 1% significance level ( $p < 0.01$ ). Thus, producers with construction needs were less inclined to adopt mixed sales than other producers, with a likelihood reduced by over 90% (odds ratio = 0.1). When a producer opted to purchase equipment, they were less likely to adopt mixed sales, with a reduction of over 69% in likelihood (odds ratio = 0.31) compared to producers without this need.

**Table 5: Estimated parameters of the full logistic regression models**

Individual sale				Group sale				Sale at the SIPI store				Mixed sale			
Parameters	Coef.	p	Odds	Parameters	Coef.	p	Odds	Parameters	Coef.	p	Odds	Parameters	Coef.	p	Odds
(Intercept)	-6.14	0.00	0	(Intercept)	-9.81	0.00	5.5E-05	(Intercept)	11.66	0.00	115723.9	(Intercept)	3.79	0.00	44.31
DISTM	0.18	0.03	1.2	Prixunitairekgvi	0.03	0.00	1.0E+00	QUAN [No]	1.26	0.12	3.53	TAME	-0.02	0.71	0.98
SEX[Male]	-0.67	0.08	0.51	Wholesaler [Yes]	-1.24	0.01	2.9E-01	QUALI [Yes]	1.43	0.03	4.16	NACA	0.004	0.88	1
TAME	0.05	0.32	1.05	Sourcesin[Family]	0.63	0.51	1.9E+00	SUPACAJ	-0.656	0.00	0.52	ACTSE [No]	1.76	0.00	5.81
ACC[Yes]	0.45	0.31	1.58	Sourcesin[From myself]	2.05	0.03	7.8E+00	TAME	0.05	0.35	1.05	CSavalou [In Savalou]	0.5	0.19	1.65
NACA	-0.01	0.54	0.99	Sourcesex[Colleague]	0.31	0.82	1.4E+00	Prixunitairekgvi	-0.03	0.00	0.97	ACHA [Yes]	-1.13	0.04	0.32
SERVU[Yes]	1.87	0.00	6.47	Sourcesex[ Grouping]	-4.71	0.00	9.0E-03	SENSI [None]	-1.9	0.16	0.15	Construction [Yes]	-2.30	0.00	0.1
SUPACAJOU	0.40	0.02	1.49	Sourcesex[ Journal]	14.38	0.99	1.8E+06	SENSI [Moderate]	-1.99	0.13	0.14	ACHAE [Yes]	-1.24	0.00	0.29
APP[Yes]	1.07	0.22	2.92	Sourcesex[Suppliers]	16.92	0.99	2.2E+07	SOUCI [None]	1.7	0.2	5.46				
NbrePla	-0.59	0.01	0.56	Sourcesex[From myself]	-0.82	0.49	4.4E-01	SOUCI [Slight]	-0.57	0.66	0.57				
Prixunitairekgvi	0.01	0.04	1.01	Sourcesex[Agents]	-0.27	0.87	7.7E-01	Semi. Wholesaler[Yes]	1.49	0.00	4.42				
CSavalou [In Savalou]	0.52	0.23	1.69	AMOF[Use Labor]	0.3	0.61	1.3E+00								
				ACC[Yes]	-1.77	0.01	1.7E-01								
				ALPHA[Yes]	0.8	0.1	2.2E+00								
				SUPACAJOU	0.24	0.21	1.3E+00								
				Ceremony [Yes]	0.99	0.05	2.7E+00								
Null deviance: 316.49 on 253 df Residual deviance: 249.14 on 242 df AIC: 273.14 R <sup>2</sup> (Cox and Snell): 0.23 R <sup>2</sup> (Nagelkerke): 0.33 Percentage of well-classified observations: 76.38%				Null deviance: 295.13 on 253 df Residual deviance: 159.21 on 238 df AIC: 191.21 R <sup>2</sup> (Cox and Snell): 0.41 R <sup>2</sup> (Nagelkerke): 0.60 Percentage of well-classified observations: 85.83%				Null deviance: 249.13 on 253 df Residual deviance: 185.04 on 243 df AIC: 207.04 R <sup>2</sup> (Cox and Snell): 0.22 R <sup>2</sup> (Nagelkerke): 0.36 Percentage of well-classified observations: 80.31%				Null deviance: 270.48 on 253 df Residual deviance: 211.06 on 246 df AIC: 227.06 R <sup>2</sup> (Cox and Snell): 0.21 R <sup>2</sup> (Nagelkerke): 0.32 Percentage of well-classified observations: 85.83%			

*Source: Authors*

**Table 6: Estimated parameters of reduced logistic regression models**

Individual sale				Grouping sale				Vente au magasin SIPI				Vente mixte			
Parameters	Coef.	p	Odds	Parameters	Coef.	p	Odds	Parameters	Coef.	p	Odds	Parameters	Coef.	p	Odds
(Intercept)	-5.57	0.00	0	(Intercept)	-8.38	0.00	2.28E-04	(Intercept)	9.28	0.00	10801.5	(Intercept)	3.84	0.00	46.70
DISTM	0.18	0.04	1.2	Prixunitairekgvi	0.03	0.00	1.04E+00	SUPACAJ	-0.62	0.00	0.54	ACHA[Yes]	-0.99	0.06	0.37
SERVU[Yes]	2.43	0.00	11.32	Wholesaler[Yes]	-1.04	0.03	3.5E-01	Prixunitairekgvi	-0.02	0.00	0.98	ACHAE[Yes]	-1.15	0.00	0.31
SUPACAJOU	0.41	0.01	1.51	Sourcesin[Family]	0.55	0.57	1.74E+00	Semi.Wholesaler [Yes]	0.97	0.01	2.63	ACTSE[No]	1.66	0.00	5.25
NbrePla	-0.51	0.02	0.60	Sourcesin[From myself]	2.04	0.03	7.71E+00					Construction [Yes]	-2.33	0.00	0.1
Prixunitairekgvi	0.01	0.01	1.01	Sourcesex[Colleague]	0.14	0.91	1.15E+00								
				Sourcesex[Grouping]	-4.60	0.00	1.0E-02								
				Sourcesex[ Journa]	13.30	0.99	5.98E+05								
				Sourcesex[Suppliers]	15.51	0.99	5.45E+06								
				Sourcesex[From myself]	-0.89	0.44	4.08E-01								
				Sourcesex[Agents]	-0.17	0.92	8.44E-01								
				ACC[Yes]	-1.35	0.03	2.6E-01								
				ALPHA[Yes]	0.99	0.04	2.71E+00								
Null deviance: 316.49 on 253 df				Null deviance: 295.13 on 253 df				Null deviance: 249.13 on 253 df				Null deviance: 270.48 on 253 df			
Residual deviance: 260.66 on 248 df				Residual deviance: 165.12 on 241 df				Residual deviance: 185.04 on 243 df				Residual deviance: 212.91 on 249 df			
AIC: 272.66				AIC: 191.12				AIC: 207.04				AIC: 222.91			
R <sup>2</sup> (Cox and Snell): 0.19				R <sup>2</sup> (Cox and Snell): 0.40				R <sup>2</sup> (Cox and Snell): 0.13				R <sup>2</sup> (Cox and Snell): 0.20			
R <sup>2</sup> (Nagelkerke): 0.27				R <sup>2</sup> (Nagelkerke): 0.59				R <sup>2</sup> (Nagelkerke): 0.21				R <sup>2</sup> (Nagelkerke): 0.30			
Percentage of well-classified observations: 76.77%				Percentage of well-classified observations: 85.04%				Percentage of well-classified observations: 81.50%				Percentage of well-classified observations: 85.83%			

Source : Authors

## **5. Discussion**

### **5.1. Socio-Economic Characteristics of Small-Scale Cashew Producers**

The surveyed cashew producers were almost evenly distributed between the two municipalities (49% in Bantè versus 51% in Savalou). Most respondents were male (74%). This gender disparity can be attributed to restrictive customary land tenure laws that limit women's access to land (Sali et al. 2020). In other words, women do not inherit land, let alone cashew plantations. Only men inherit land from their parents and subsequently pass it on to male descendants. This finding aligns with Koné (2011) in her article "Women and Land: Understanding, Asking the Right Questions, and Taking Action on Land Tenure in West Africa," where she notes that women rarely receive or inherit valuable land with exclusive and permanent rights. Similarly, Tandjiekpon (2010), in a study conducted in the savannah region, explain that women most often access small plots of land from their husbands for seasonal farming. These plots, typically degraded and infertile, are usually too small to be economically viable for perennial crops. Adjobo and Yabi (2020), in a study on cashew nut sales in the municipalities of Djougou, Tchaourou, and Glazoué, found that men dominate cashew production. Uwagboe et al. (2010) reported in Nigeria that women owning cashew plantations represent only 15.5% of producers.

Most of the cashew producers surveyed are married (79%) and engage solely in agricultural activities (66.53%). Assogba et al. (2017) found that agriculture is the primary livelihood activity for producers in northeastern Benin. The average age of producers is 47 years, with an average of 19 years of experience in cashew production. This indicates that cashew farming is predominantly an adult occupation. The average age observed in this study is consistent with findings by authors in Senegal (Basse et al. 2022), in Mozambique (Mole 2000), and in Tanzania (Topper and Kasuga 2003), who reported average ages of 48 and 51 years for cashew plantation owners. Lawal et al. (2011) noted in Nigeria that cashew farmers have an average age of 56 years. These results confirm that cashew farming is primarily undertaken by older producers seeking to secure income for their inactive years (e.g., retirement).

The average cashew farm size was 4 hectares, confirming that this study focuses on small-scale cashew producers. The reported farm size in this study is larger than that found by Arouna et al. (2010).

### **5.2. Trading Modes**

The concept of agricultural marketing is underpinned by driving forces. Access to reliable market outlets provides incentives for farmers to increase production and expand subsistence farming to commercial production (Adams et al. 2020). Reliable market access also promotes regional income growth, food security, and poverty and hunger reduction (Ma et al. 2024). Therefore, there must be channels for farmers to sell their products. However, in reality, farmers are primarily faced with several options, including outlets with relatively higher margins and lower sales risk (Bannor et al. 2022). The literature has revealed that individuals' (including farmers') choice of market outlet is subject to their demographic, institutional, and farm-level characteristics (Bannor and Sharma 2017; Bannor et al. 2019; Jitmun and Kuwornu 2019; Oppong-Kyeremeh et al. 2019; Bannor et al. 2021; Amfo et al. 2022). Therefore, the choice of market outlet is crucial for producers.

In the present study, the typology of producers classified them into four sales methods: individual sales, group sales, sales to SIPI stores, and mixed sales. Individual sales were the most common (31.5% of producers), followed by group sales (26.8%), mixed sales (22.4%), and sales to SIPI stores (19.3%). Producers in individual sales category mainly face health-related household challenges and believe they obtain the best prices while needing urgent financing for construction projects. On average, they sell 1,269 kg of cashew nuts this way. The

group sales producers belong to an association and use this method to fund construction projects, purchase equipment, and buy inputs. They sell an average of 3,705 kg of cashew nuts collectively. Producers selling to SIPI stores have large cashew nut quantities, meet quality standards, and have contracts with SIPI. Their farms do not face urgent financial needs. On average, they sell 3,720 kg to SIPI stores. Producers using mixed sales face multiple urgent financial needs, such as cash shortages, ceremonial expenses, health issues, construction, equipment, and input purchases. On average, they sell 3,146 kg of cashew nuts through this method. In contrast, Anato et al. (2024) found only two trading modes (individual and group sales) in Bantè. Likewise, Degla and Ahodode (2021) reported two cashew trading modes in northwestern Benin (individual and group sales), noting that group sales reduce transaction costs but remain less prevalent (62% still prefer individual sales). Adjobo and Yabi (2020) identified three modes (individual, group, and mixed sales), finding that group sales offer higher prices per kilogram and provide access to capacity-building training and material/financial support. In Ghana, Bannor et al. (2022) revealed that the cashew marketing outlets are brokers, buying companies and exporters (companies and individuals who buy and export cashew nuts directly). But, most farmers preferred to sell cashew nuts to exporters because they usually offered slightly higher prices than other buying agents/companies.

### **5.3. Determinants of the Adoption of a Trading Mode by Small-Scale Cashew Producers**

Selecting the right marketing channel is vital for farmers as it determines their access to markets, impacts income through price realization, and affects the cost-efficiency of reaching consumers. The appropriate channel enhances market reach, improves profitability, and supports the sustainability of their farming operations, directly influencing their livelihood and economic stability (Ma et al. 2024).

The factors influencing the choice of individual selling by small-scale cashew producers in the present study, revealed that the distance between the village and the nearest market, contact with extension services, the area under cashew cultivation, the number of cashew plantations, and the unit selling price of cashew are the most determining.

The distance between the village and the nearest market had a positive impact on the likelihood of adopting individual selling, with a significant level of 5% ( $p < 0.05$ ). In terms of rationality, this can be interpreted as a strategy for sellers to adapt to distance. When markets are farther away, producers may feel increased pressure to explore alternative selling methods, such as individual selling. This approach could be seen as a rational response to the need to maximize their sales opportunities and minimize the costs associated with traveling to more distant markets. Thus, farmers in rural areas adopt direct selling strategies not only out of necessity but also as a thoughtful approach to optimize their income in a context of increased distance. This finding supports the idea that remoteness encourages producers to explore alternative sales options. Other authors have also reported distance as a limiting factor in market access (Muto and Yamano 2009; Barbier 2023). Thus, producers located far from markets are more likely to adopt individual selling methods, thus highlighting the importance of distance in this decision-making process.

The interaction between the producer and extension services had a positive impact on the adoption of individual selling, with a significant level of 1% ( $p < 0.01$ ). Producers who are in contact with extension agents or participate in demonstrations organized by them are more likely to adopt individual selling methods. Mabah et al. (2013) showed that being in contact with extension services increases the likelihood of adopting the technical package by approximately 2.4%. Regular contact with agricultural extension agents allows farmers to be better informed about available new technologies and their nature, which in turn influences

their adoption decision (Adesina and Zinnah 1993; Lambrecht et al. 2014). Furthermore, this regular contact would enhance the efficiency of technology use through learning (O’Gorman 2015).

The area dedicated to cashew cultivation had a positive effect on the adoption of individual selling. Indeed, for each additional unit of cashew area, the likelihood that the producer chooses individual selling was 1.51 times higher than that of a producer who does not adopt it. Producers with larger cultivated areas were more likely to adopt direct selling methods, highlighting the importance of farm size in the decision-making process. Similarly, Bannor et al. (2022) noted that farmers with larger cashew farms sell cashew nuts to buying companies and exporters, while those with smaller farms 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, thus confirming these findings.

The correlation between the number of cashew plantations and the adoption of individual selling was negative, with a significant level of 5% ( $p < 0.05$ ). With a greater number of plantations, producers may benefit from economies of scale, encouraging them to adopt sales strategies that maximize efficiency rather than resort to individual selling. Adjobo and Yabi (2020) revealed that producers with many cashew plantations are less inclined to choose individual selling, often preferring bulk selling strategies to maximize profits. Similarly, Ndiaye et al. (2021) observed a similar negative correlation, highlighting that producers with numerous plantations favor established distribution channels over direct sales.

The unit selling price of cashew had a positive impact on the adoption of individual selling, with a significant level of 5% ( $p < 0.05$ ). When the unit selling price increases, it means that producers can potentially achieve a higher profit per unit sold. This prospect of increased profit encourages sellers to adopt individual selling methods, as these allow them to maximize their revenues. By being directly involved in the sale, producers can better control prices and selling conditions, providing them with greater flexibility and improved profit margins. Moreover, producers may view individual selling as a rational strategy to meet increased demand or to offset production costs. By choosing this method, they engage in a proactive approach to optimize their income in a market where the unit price is favorable. Thus, the adoption of individual selling becomes an informed decision, driven by economic considerations and the pursuit of profit maximization. A higher unit price can make individual selling more attractive to producers, as they can achieve better profits by selling directly to consumers rather than through intermediaries. This result has been mentioned by several authors. Bannor and Sharma (2017) found that the price determined kinnow farmers’ choice of pre-harvest contractors in India. In Côte d’Ivoire, Mariam (2018) found that in the long term, an increase in the field price of cashew causes an increase in production of 0.42%. Similarly, a 1% increase in exports and cultivated areas lead to an increase of 0.91% and 0.18%, respectively, in the supply of raw cashew nuts.

Group selling was positively and significantly influenced by the unit selling price at the 1% level ( $p < 0.01$ ). These results are consistent with those obtained by Belem (2017) and Adjobo et al. (2020). The price at which the producer sells cashew nuts has a positive impact on the likelihood of adopting this trading method. It should be noted that producer support through training on credit encourages the adoption of group selling. Dossa and Miassi (2018) and Ouédraogo and Dakouo (2017) demonstrated that access to credit is a prerequisite for adoption. Internal sources of adoption advice had a positive effect on the adoption of group selling at the 5% level. The more a farmer is in an environment where peers adopt group selling, the more likely they are to do so as well. Advice from internal sources, such as peers or community organizations, promotes the adoption of group selling, as they provide support and context-specific information. Producers who receive advice from peers are thus more likely to adopt group selling practices, reinforcing the idea that internal sources play a key role in this dynamic.

Muthini (2015) mentioned that 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.

Compliance with quality standards, available cashew cultivation area, unit selling price, and semi-wholesaler status influenced the adoption of sales through the SIPI warehouse by producers.

Several studies highlight the importance of various factors in the adoption of SIPI warehouse sales by producers. Indeed, compliance with quality standards is crucial for accessing markets such as SIPI, thereby ensuring the satisfaction of consumer requirements. Similarly, the available cashew area directly influences producers' capacity to meet the store's demands, thereby affecting their decision to adopt this sales channel. Moreover, the unit selling price is a key determinant of the profitability of this method, encouraging producers to engage in it when conditions are favorable. Holding semi-wholesaler status provides producers with logistical and negotiation advantages, thus facilitating their adoption of SIPI warehouse sales. Bezaw (2019) reported that accesses to credit, market information, extension service, and education have positive and significant effect on formal traders market outlets relative to wholesale outlets while accesses to market has negative and significant impact on formal traders outlets relative to wholesalers' market channel. Bannor et al. (2019) found that buying companies and exporters purchase cashew nuts in bulk, pay ready cash, offer higher prices, and require higher quality standards than brokers. 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.

The adoption of mixed sales strategies by producers was influenced by the practice of a secondary activity as well as needs related to the purchase of inputs, construction, and equipment. Engaging in a secondary activity allows producers to diversify their income, which encourages the adoption of mixed sales methods. This diversification is essential for producers' financial stability. The need to acquire input is also critical, as it often requires additional financial resources. Thus producers who invest in high-quality inputs are more likely to adopt mixed selling strategies to maximize their returns. The need for adequate infrastructure such as storage or sales facilities plays a determining role. Likewise, producers with access to appropriate infrastructure are more inclined to adopt mixed sales.

These results confirm the rational choice theory since most of these producers seek to maximize the benefits of cashew trade. Although group selling offered farmers the highest margin (Degla and Ahodode 2021), producers are still predominantly practicing individual selling. Therefore, considering the rational choice theory, rational cashew producers sell their nuts through channels that allow them to obtain a higher margin (satisfaction).

## 6. Conclusion

The objective of this study was to characterize the current cashew nut trading modes used by small-scale producers in the municipalities of Bantè and Savalou, located in Central Benin. Four trading modes were identified: individual selling, group selling, sales to the SIPI warehouse, and mixed selling. Individual selling and SIPI warehouse sales were most common in the municipality of Savalou, accounting for 53.8% and 53.1% respectively, whereas in Bantè, group selling and mixed selling were predominant, with 52.9% and 50.9% respectively. Individual selling is more commonly practiced by small producers in both Bantè and Savalou. Five factors were identified as determinants of individual selling: the distance between the village and the nearest market, contact with extension services, cashew cultivation area, the number of cashew plantations, and the unit selling price of cashew nuts. Variables such as wholesaler status, internal and external sources of advice, access to credit, ceremonial pressures,

compliance with quality standards, semi-wholesaler status, engagement in secondary activities, input purchase needs, construction needs, and equipment needs were among the factors influencing the adoption of group selling, SIPI warehouse selling, and mixed selling strategies. These results could help define concrete recommendations for decision-makers, including cooperatives, authorities, and companies like SIPI, to support small cashew producers in Benin. It is essential to implement training programs aimed at teaching producers the best practices for growing and marketing cashew nuts. Additionally, facilitating access to markets by developing online sales platforms or organizing agricultural fairs would be beneficial. It is also crucial to establish partnerships with cooperatives to ensure a regular supply of high-quality cashew nuts. Finally, offering financing solutions tailored to the needs of small producers, such as low-interest loans or grants for purchasing inputs and equipment, would enable producers to invest in their operations and improve their productivity. Some research perspectives arising from the results of the study on the marketing methods of cashew nuts in Benin include the need to conduct comparative studies to evaluate the effectiveness of different marketing methods, such as individual sales, group sales, sales at the SIPI store, and mixed sales, not only in other regions of Benin but also in other cashew-producing countries. Furthermore, it would be relevant to assess the impact of training programs on the agricultural and commercial practices of cashew producers in order to improve their market performance. This study is limited to the analysis of the marketing methods of cashew nuts in two specific municipalities, which may restrict the generalization of the results to other regions. Additionally, reliance on self-reported data could introduce biases in the producers' responses.

### **Ethics approval and consent to participate**

The study is part of a PhD program. The data collection and analysis methods used were validated by the Applied Statistics and Informatics Unit in accordance with current guidelines and regulations. The data were collected anonymously and authorization was received from the communal cashew producer cooperatives in each municipality.

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