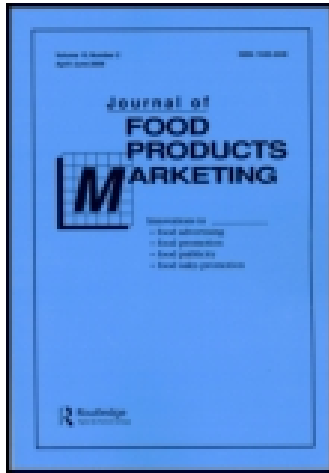


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### Marketing Channel Selection by Smallholder Farmers

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## **Marketing Channel Selection by Smallholder Farmers**

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*This article aims at analyzing Beninese smallholder farmers' selection of high value markets, such as export and processing-oriented marketing channels, in the pineapple supply chain. Four main marketing channels were investigated: rural, urban, and export fresh pineapple markets and processing-oriented markets. Primary data collected from 285 pineapple farmers through a field survey in different locations in South Benin were used to analyze simultaneous selection of multiple channels. A multivariate probit approach has been used in our empirical strategy. Farmers' characteristics, production systems features, quality attributes, and types of marketing context have been used as main explanatory variables. Results indicate the Beninese pineapple farmers select market channels with high values when they have the expertise and know-how for coping and complying with quality issues.*

**KEYWORDS** *marketing channels, smallholder farmers, supply chain, pineapple*

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## INTRODUCTION

Since the early 1980s, many sub-Saharan African countries have introduced economic reform in the form of structural adjustment programs, aiming at sustaining a liberalized market-oriented economy. Economic liberalization has given opportunities for smallholder farmers to diversify their products and to target so-called high value markets, such as export and processing-oriented market channels (Asfaw et al., 2010). However, participation of smallholder farmers in these markets still remains a major challenge in many developing countries, especially in sub-Saharan Africa. If factors affecting farmers' selection of high value markets can be better understood, then managerial and policy interventions could be implemented to support them.

The concept of market selection refers to the process by which several actors decide to sell in different marketing outlets to transact their (agricultural) products. This decision process is conditioned by the features, efficiency, and costs linked to the farmer's final decision (Obi, Pote, & Chianu, 2011). For example, market selection can be affected by information related to product availability, attributes, and prices, including frequency, quality, and cost of this information (van Schalkwyk et al., 2012). Second, it can depend on information about the counterparties in the transaction or suppliers' confidence in market conduct, transportation costs, and difference in price level (van Schalkwyk et al., 2012). Other scholars have highlighted drivers of market selection such as (i) physical access to markets and geographical distances; (ii) structure of markets (asymmetry of power relations); and (iii) the level of producers' expertise and know-how (IFAD, 2003; Blandon, Henson, & Islam, 2009). Finally, market selection has been explained also by analyzing the influence of issues such as product quality and compliance with quality standards and regulations (Dolan & Humphrey, 2000).

Though the empirical literature on modeling farmer's market selection has a relatively long history (Artle & Berglund, 1959; Coughlan et al., 2001; van Tilburg & van Schalkwyk, 2012), none of these studies has simultaneously modeled selection of different market outlets. Moreover, they only partially took into account the role of suppliers' bargaining power (Kabeer, 2002), while little attention has been given to product quality as a determinant factors. Finally, applications to cash crop products such as pineapple are still limited in the literature.

The objective of the study is to investigate how the characteristics of smallholder farmers (age and education level), their production systems (farm size and varieties), product quality (quality requirement and rejection rates), and marketing context (distance from market and the formality—i.e., written contract or not—and the duration of the buyer–seller relation), jointly affect selection of market channels. Four marketing channels have been

thoroughly investigated in the Beninese pineapple supply chain—namely, rural, urban, export, and processing-oriented markets.

The article begins with discussing our conceptual framework. The next section presents the data collection strategy and the econometric approach, followed by the main empirical findings. The article ends with concluding remarks and implications for policy-makers and practitioners.

## CONCEPTUAL FRAMEWORK

In this article we focus on modeling smallholder farmers' decisions on selection of different marketing channels. More specifically, we focus on analyzing factors affecting selection of high value marketing channels, such as export and processing-oriented markets, for a cash-crop product (pineapple) in Benin. We assume that the selection of different marketing channels, as well as their simultaneous use, is led by farmers' willingness to maximize their profit and conditional to a number of factors (Doll & Orazem, 1984). Previous studies highlight that smallholder farmers' selection of high value markets, such as export markets, is often limited by low crop productivity and market failures (Benfica, Tschirley, & Boughton, 2006; Boughton et al., 2007; Heltberg & Tarp, 2002; van Tilburg & van Schalkwyk, 2012). Other factors affecting market selection include farm size, farm assets, age of household head, transport ownership, and available infrastructure facilities (Benfica, Tschirley, & Boughton, 2006; Boughton et al., 2007). A recent study in South Africa showed that factors such as poor infrastructure, lack of transport, market information, and expertise on managing quality and contractual agreements have led to inefficient use of different market channels (Jari & Fraser, 2012). Another study on mango producers in Costa Rica showed four major factors affecting market selection, such as farm household characteristics, type of production system, price attributes, market context (i.e., having a written contract or not, geographical location, and distance to urban markets; Zuniga-Arias & Ruben, 2007), and farmer's bargaining power (Kabeer, 2002).

Following this literature, the present study further investigates factors affecting market selection, extending this list to drivers such as product quality attributes and type of contractual arrangements.

We assume that a farmer's decision to sell in a given market derives from the maximization of expected utility (i.e., profit) he or she expects to gain from this market (Frank & Glass, 1991; Salvatore, 2003). This utility is a function of a vector of factors ( $X_a^A$ ), unknown parameters  $\beta_a$ , and an error term  $\varepsilon$ , assumed to be independently  $N(0, \sigma^2)$  distributed (Equation 1). A farmer's decision to select a given market or not is made by evaluating the return in expected utility, taking into account the related investment and transaction costs (Kelsey, 1994; Lazear & Rosen, 1981). It is expected that

farmers will select the market channel that shows the most positive utility. The expected difference in utility is expressed as follows:

$$U_j = [\pi_{ij}^A - \pi_{ij}^0] = X_a^A \beta_a + \varepsilon^A, \quad (1)$$

where  $U_j$  is the unobserved expectation operator representing the expected utility difference,  $\pi_i^A$  is the utility derived from market  $i$  if selected by farmer  $j$ , and  $\pi_i^0$  is a stream of utility if market  $i$  is not selected. Farmers make a subjective comparison of market attributes and their own capacities to meet the markets' demands. They choose a market—rural, urban, export, or processing-oriented—only when it is perceived to offer a higher potential return (i.e., higher profit) than the alternative options. From Equation 1, we can infer the market selection decision model as being:

$$Y_{ij}^A = \begin{cases} 1 & \text{if } [\pi_i^A - \pi_i^0] \geq 0 \Leftrightarrow X_a^A \beta_a \geq -\varepsilon^A \\ 0 & \text{if } [\pi_i^A - \pi_i^0] < 0 \Leftrightarrow X_a^A \beta_a < -\varepsilon^A \end{cases} \quad (2)$$

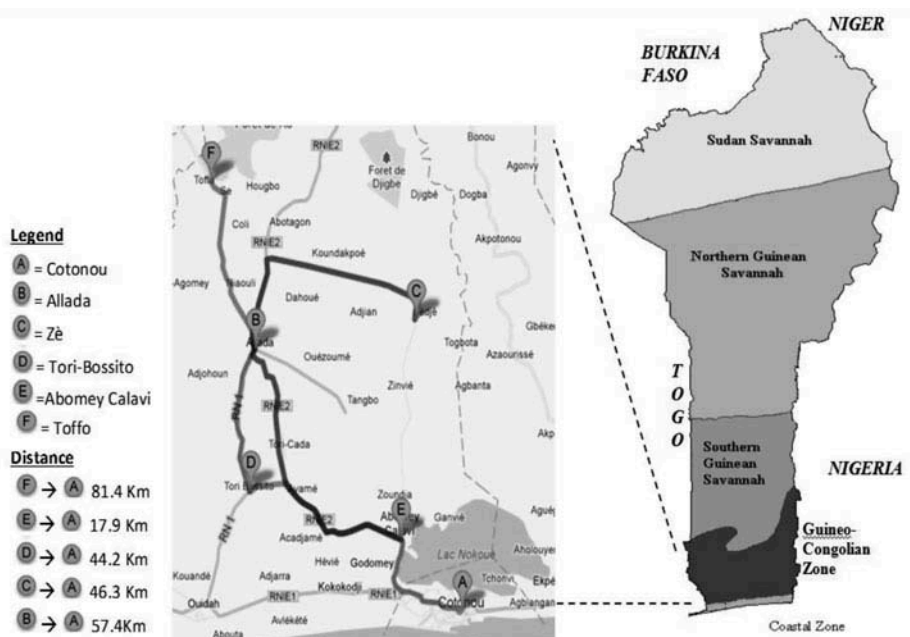
The selection of market  $i$  by farmer  $j$  is defined as  $Y_{ij}^A$ . The choice of farmer  $j$  to transact in market  $i$  ( $Y_{ij}^A = 1$ ) or not ( $Y_{ij}^A = 0$ ) is expressed as follows:

$$Y_{ij}^A = \begin{cases} 1 & \text{if } Y_{ij}^A = X_{ij}^A \alpha_{ij} + \varepsilon^A \geq 0 \Leftrightarrow X_{ij}^A \alpha_{ij} \geq -\varepsilon^A \\ 0 & \text{if } Y_{ij}^A = X_{ij}^A \alpha_{ij} + \varepsilon^A < 0 \Leftrightarrow X_{ij}^A \alpha_{ij} < -\varepsilon^A, \end{cases} \quad (3)$$

where  $\alpha_{ij}$  is a vector of estimators and  $\varepsilon^A$  is a vector of error terms under the assumption of normal distribution,  $Y_{ij}^A$  is the dependent variable, and  $X_{ij}^A$  is the combined effect of the explanatory variables.

## DATA COLLECTION AND EMPIRICAL STRATEGY

Data were collected in 2009 with a pretested, semistructured survey questionnaire consisting of a combination of closed questions, Likert scales with a 5-point format (Jamieson, 2004; Allen & Seaman, 2007), and open questions. More than 95% of the respondents were located in southern Benin, particularly in the Atlantic Department (Fassinou-Hotegni, Lommen, van der Vorst, Agbossou, & Struik, 2012). Respondents were selected from this area using a randomly stratified sampling scheme (StatPac, 2010), based on a set of criteria. These criteria included acreage under pineapple cultivation in 2009 (differentiated into small scale—less than 1 ha, medium scale—between 1 and 5 ha, and large scale—more than 5 ha), market channels supplied (rural, urban, regional, EU, or processing markets), and location of the farm (distance from the main urban market in Cotonou). Farmers were contacted with the assistance of agricultural extension services agents, who provided



**FIGURE 1** Pineapple production zone with data collection area and distance to the main urban market in South Benin.

**TABLE 1** Sample Sizes of Each Category of Farmer Per Location

Category of farmers <i>N</i> (%)	Locations/districts					Total
	Abomey-Calavi	Zè	Allada	Tori-Bossito	Toffo	
Small-scale [ $<1$ ha]	7 (2.46)	10 (3.51)	8 (2.81)	6 (2.11)	7 (2.46)	38 (13.33)
Medium-scale [1–5ha]	26 (9.12)	21 (7.37)	14 (4.91)	29 (10.18)	25 (8.77)	115 (40.35)
Large-scale [ $>5$ ha]	26 (9.12)	34 (11.93)	18 (6.32)	25 (8.77)	29 (10.18)	132 (46.32)
Total	59 (20.7)	65 (22.81)	40 (14.04)	60 (21.05)	61 (21.4)	285 (100)

*Note.* The sample includes both the first (217 farmers) and second marketing channels (68 farmers), as data were collected from both channels separately, making a total of 285 observations.

the names and addresses of lead farmers in each commune. Secondary data were also collected from the Council of the Pineapple Farmers' Association, other institutions, and libraries. This approach gave a sample of respondents from different villages across the Atlantic Department, as illustrated in Figure 1 and Table 1.

After data collection, incomplete questionnaires (for example, from farmers who did not provide accurate information or who were not willing to fully reply to questions) were discarded. This resulted in a final list of 217 respondents. Of these 217 farmers, 68 were selling through at least two market channels. The farmers were asked to name the two most important

market channels for distributing pineapples. As data were independently collected for each market channel, these two one-sided data sets were merged into a combined data set with a total of 285 observations.

Descriptive and econometric approaches were complementarily used in the data analysis. For the descriptive statistics, the independency between the explanatory factors for each selected market channel was tested using Pearson chi-squared ( $\chi^2$ ). Since the results from the descriptive statistics did not allow for isolating the marginal effects of specific explanatory variables, we ran simple and multivariate probit regressions. The following empirical specification was deduced from Equation 3:

$$\begin{cases} \text{UrbMarket}_j = \alpha_{0j} + \alpha_j \text{HHDCCharact}_j + \alpha_{1j} \text{ProdSystem}_j + \alpha_{2j} \text{ProdAttrib}_j + \alpha_{3j} \text{MarkAttrib}_j + \varepsilon^A \\ \text{LocMarket}_j = \beta_{0j} + \alpha_j \text{HHDCCharact}_j + \beta_{1j} \text{ProdSystem}_j + \beta_{2j} \text{ProdAttrib}_j + \beta_{3j} \text{MarkAttrib}_j + \varepsilon^B \\ \text{ExpMarket}_j = \gamma_{0j} + \alpha_j \text{HHDCCharact}_j + \gamma_{1j} \text{ProdSystem}_j + \delta_{2j} \text{ProdAttrib}_j + \delta_{3j} \text{MarkAttrib}_j + \varepsilon^C \\ \text{ProcMarket}_j = \theta_{0j} + \alpha_j \text{HHDCCharact}_j + \theta_{1j} \text{ProdSystem}_j + \theta_{2j} \text{ProdAttrib}_j + \theta_{3j} \text{MarkAttrib}_j + \varepsilon^D, \end{cases} \quad (4)$$

where  $\text{UrbMarket}_j$ ,  $\text{LocMarket}_j$ ,  $\text{ExpMarket}_j$ , and  $\text{ProcMarket}_j$  are dummy variables taking value 1 when farmer  $j$  selects an urban, rural, export. or processing market, respectively, and 0 otherwise;  $\text{HHDCCharact}_j$  represents a set of the household characteristics of farmer  $j$ ;  $\text{ProdSystem}_j$  represents the production systems of farmer  $j$ ;  $\text{ProdAttrib}_j$  is the set of pineapple quality attributes supplied by farmer  $j$ ;  $\text{MarkAttrib}_j$  is the set of market attribute factors perceived by farmer  $j$ ;  $\alpha_{ij}$ ,  $\beta_{ij}$ ,  $\gamma_{ij}$ , and  $\theta_{ij}$  are the coefficients to be estimated, and  $\varepsilon$  represents error terms.

A correlation matrix of variables used in the regression models and a description of each variable can be found in Table 2. Pearson correlation coefficients were used to measure the strengths of linear association between the variables. The results show that these coefficients are globally less than 0.39, indicating weak relations, which suggest that variables are sufficiently independent to be modeled together without concerns about multicollinearity (Verbeek, 2008).

Since a farmer was able to choose more than one marketing channel, we also tested simultaneity and correlation between different market channel selection decisions. We therefore ran two econometric models: a simple probit model with the assumption of independency in marketing channel choice and a multivariate probit model assuming a correlation and interdependence in farmers' marketing channel selection.

## RESULTS AND DISCUSSION

### Characteristics of the Marketing Channels

The characterization of the marketing channels is shown on Figure 2. The export-oriented marketing channels include both African (neighboring countries) and European Union (EU) markets. These markets are characterized by



**TABLE 2** Correlation Matrix, Mean, and Standard Deviation of Variables

Variables	Mean	SD	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16
<b>Dependent variables</b>														
Urban market (V1)	0.53	0.50												
Rural market (V2)	0.27	0.45												
Export market (V3)	0.13	0.33												
Processing market (V4)	0.07	0.26												
<b>Explanatory variables</b>														
Age of HH (V5)	38.1	10.5	1.00											
Education level HH (V6)	1.05	1.04	0.20	1.00										
Farm size (V7)	2.33	0.70	-0.38	-0.11	1.00									
Number of varieties (V8)	0.30	0.46	0.06	0.12	-0.03	1.00								
Quality required (V9)	1.94	0.84	0.15	-0.04	-0.10	-0.11	1.00							
Rejection (V10)	0.15	0.36	-0.03	0.06	-0.07	0.31	-0.09	1.00						
Distance (V11)	2.01	0.65	0.06	0.22	0.02	0.36	-0.10	0.19	1.00					
Incentive from buyers (V12)	2.18	1.02	0.39	0.26	-0.39	0.02	0.22	0.05	0.30	1.00				
Formality of transaction (V13)	1.33	0.68	0.13	0.07	-0.22	0.03	0.23	-0.10	0.17	0.29	1.00			
Relation duration (V14)	2.02	0.80	0.32	0.05	-0.23	0.02	0.07	0.07	0.05	0.28	0.15	1.00		
Bargaining power (V15)	2.16	0.51	-0.07	0.01	-0.01	0.36	-0.12	0.23	0.23	-0.06	-0.06	-0.01	1.00	
Written contract (V16)	0.14	0.34	0.10	0.10	-0.13	0.12	0.14	0.12	0.22	0.26	0.11	0.17	0.07	1.00

The following values were attributed to each variable:

(V1), (V2), (V3), and (V4) are dummy dependent variables presenting market channels (1 = participant, 0 = nonparticipant).

(V5): Age of surveyed household head (years).

(V6): Education level of household head (HHH) where 0 = no education, 1 = primary school, 2 = middle school, 3 = high school, 4 = university level.

(V7): Farm size (1 = large-scale > 5 ha; 2 = medium-scale 1–5 ha; 3 = small-scale < 1 ha).

(V8): Number of varieties: (0 = one cultivar: Smooth Cayenne or Sugarloaf; 1 = both cultivars).

(V9): Quality required: 1 = low quality or "Class C"; 2 = medium quality or "Class B"; 3 = high quality or "Class A"

(V10): Having faced rejection by buyers (1 = yes).

(V11): Distance (1 = <30 Km; 2= [30–60 Km]; 3 = >60 Km).

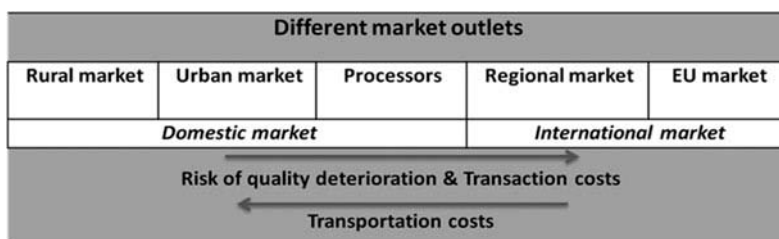
(V12): Incentive from buyers (1 = no incentive; 2 = low incentive; 3 = medium incentive; 4 = high incentive).

(V13): Formality degree (1 = no formal/spot market; 2 = low formality/reputation based; 3 = formal).

(V14): Relation duration with buyer (1 = short <5 years; 2 = medium 5–10 years; 3 = long-term >10 years).

(V15): Bargaining Power (1 = low; 2 = medium; 3 = high).

(V16): Having a written contract with buyer (1 = yes).



**FIGURE 2** Characterization of marketing channels.

higher quality and standards requirements and higher freighting costs, which increase the total transportation costs. The domestic markets include rural and urban markets for fresh and processed pineapple. They are characterized mostly by lower (or nonexistent) quality and standards requirements, except for dried pineapples, which are also targeted at EU markets. The processing factories in Benin are mostly traditional and only partly industrialized, either processing pineapple into juice, packed in bottles (0.25 liter or 0.33 liter), or drying them. This market channel is less developed and is dominated by individual processors and farmers. The juice is sold mainly on domestic markets, while the dried pineapples are exported. Because of time and distance, the gap between harvesting the fruit and its consumption and the risk for fruit deterioration is much higher in international markets than domestic markets. Finally, the international market has hierarchical forms of governance structure. This implies that the transaction costs (Hobbs, 1997; Teece, 1986; Williamson, 1983) in this supply chain are higher than in domestic markets.

### Farm Characteristics and Market Attributes

Smallholder farmers with less than 1 ha of pineapple farmland are the most dominant (46%) in the study area, with only few (13%) of them cropping on more than 5 ha (Table 3). This result reveals the issue of economies of scale where farmers individually own a small piece of land scattered over different villages, as a consequence of the current land access constraints in southern Benin (Floquet & Mongbo, 1998). This scattered production increases the searching and assembly costs for the buyers (mostly wholesalers) from urban and regional markets.

When looking at market channels supplied by smallholder pineapple farmers as presented in Table 3, it can be inferred that smallholder farmers intervene in almost all marketing channels. Their contribution to EU markets is 17%, to processing factories 25%, to regional markets 28%, to rural and urban wholesalers 52%, and to retailers 61%. Results from the econometric regression presented earlier provide a further explanation of the influence of farm size on marketing channel selection.

**TABLE 3** Farm Characteristics and Market Attributes by Marketing Channel (%)

	Wholesalers									
	Retailers					Wholesalers				
	Rural Market N = 18	Urban market N = 2	Rural market N = 60	Urban market N = 149	Regional market N = 7	Exporters N = 29	Processors N = 20	Total N = 285		
Buyers in the pineapple supply chains										
<i>1) Cultivated land surface (%)</i>										
Small <1ha	N = 132	0	51.7	52.4	28.6	17.2	25	46.3		
Medium 1–5 ha	N = 115	100	35	36.2	42.8	58.6	60	40.4		
Large > 5 ha	N = 38	0	13.3	11.4	28.6	24.2	15	13.3		
<i>2) Bargaining power of farmers (%)</i>										
Low	N = 18	0	6.7	4.7	0	3.5	25	6.3		
Medium	N = 202	50	38.3	83.9	85.7	72.4	55	70.9		
High	N = 65	50	55	11.4	14.3	24.1	20	22.8		
<i>3) Distance from farm to the central urban market (%)</i>										
<30 Km	N = 59	50	1.7	29.5	0	3.4	0	20.7		
[30–60 Km]	N = 165	50	56.7	64.4	71.4	55.2	40	57.9		
>60 Km	N = 61	0	41.7	6.1	28.6	41.4	60	21.4		
<i>4) Having a written contract with you buyer (%)</i>										
No	N = 246	100	93.3	85.9	100	65.5	80	86.3		
Yes	N = 39	0	6.7	14.1	0	34.5	20	13.7		
<i>5) Relation duration with you buyer (%)</i>										
Short <5 Years	N = 87	50	35	31.54	14.29	17.24	25	30.53		
Medium [5–10 Years]	N = 104	0	33.33	40.94	42.86	24.14	35	36.49		
Long term >10 Years	N = 94	50	31.67	27.52	42.86	58.62	40	32.98		

1) Pearson  $\chi^2$  ( $df = 12$ ) = 22.18 Pr = 0.036.2) Pearson  $\chi^2$  ( $df = 12$ ) = 64.27 Pr = 0.000.3) Pearson  $\chi^2$  ( $df = 12$ ) = 100.29 Pr = 0.000.4) Pearson  $\chi^2$  ( $df = 6$ ) = 18.09 Pr = 0.006.5) Pearson  $\chi^2$  ( $df = 12$ ) = 14.65 Pr = 0.262.

N = Number of observations.

Farmers were asked to describe their bargaining power in each of the market channels in which they sell their products. They were considered to have low bargaining power when the buyer is the dominant actor in price setting and a medium bargaining power when an average price is agreed after a period of bargaining between buyer and seller. When farmers have full control of the price, they were considered to have high bargaining power in the transaction. Table 3 shows that more than 70% of the respondents have a medium bargaining power, and most of them have some opportunity to raise the prices initially proposed by the buyers. This applies to almost all the identified marketing channels (Table 3). In the rural market channel, the majority of farmers (55%) have a high bargaining power. This can be explained by the farmer's closeness to this market. In the other channels, the farmers may have to bear higher transportation costs and reduce their price if they cannot find buyers at the preferred price. This highlights the problem of a poor road infrastructure and the importance of physical distance in marketing decisions (Andersen & Buvik, 2002).

To assess the influence of physical distance on marketing channel choice, we controlled for the farmers' geographical distribution in our sampling strategies (Table 1 and Figure 1). Most of the farmers (58%) are located between 30 and 60 km from the main urban wholesale pineapple market (Dantokpa Market in Cotonou). Twenty-one percent of the farmers were selected from the Abomey-Calavi commune (17.9 km from Dantokpa market in Cotonou) and 21% from Toffo (81.4 km). Pineapple shipments are organized using a truck (locally known as *bâché*) as measurement unit (i.e., 2.3 to 2.5 tons) for all operations from farm to urban or regional markets. The use of this means of transportation commonly leads to quality deterioration where pineapples loaded at the bottom of the truck are damaged. Wholesalers in Dantokpa market confirmed that the recorded losses due to inappropriate transportation can be as high as 20%. Appropriate transportation facilities (use of carton boxes, pallets, and cooling conditions) in combination with larger trucks to cover long distances would reduce losses and therefore reduce transportation cost disadvantages for distant large producers.

Table 3 shows that more than 86% of farmers do not have a written contract with their buyers; those who have a binding contract arrangement are mostly selling to exporters (35%) and, to a lesser extent, to wholesalers in urban (14%) and rural (8%) markets. Some processing factories have started to require written contracts with their supplying farmers. In most cases, these contracts state the quantity and quality of pineapples demanded and the risks and the duration of the contract. Almost all the contracts (93%) last for a maximum of 2 years (i.e., one pineapple cropping season) if the contract is signed before starting production, and for 1 year if it is signed during the pineapple growing period. The contract is renewed if the previous one was satisfactory to the parties involved. The renewals of such contracts can lead to short- (<5 years), medium- (5–10 years), and long-term (>10years)

transaction relationships between farmers and buyers. The data show that most pineapple farmers have at least 5 years of trading experience with their buyers (70%).

This analysis highlights that market channel selection is significantly different between farmers and depends on their bargaining power, the distance from central urban market, and the existence of contractual relationships with buyers.

### Influence of Quality Attributes

The study also focuses on evaluating the influence of the (physical) quality of the pineapple on the selected marketing channel. To do this, farmers were asked to provide information about the different quality levels of their pineapples. They were asked to use the following three quality levels: class A—high quality or “extra” class; class B—medium quality; and class C—low quality. Pineapples of class A meet the standards of the Codex Alimentarius (Codex-Stan, 1993) and are eligible for EU market and supermarkets. Class B pineapples have a medium size and weight (slightly <1 kg). Slight deformations are accepted, but the fruits should be free of any contamination, and they can also be eligible for the EU, domestic, and regional markets. The last class is characterized by a very low weight (<0.7 kg), with significant deformations. Class C is mostly sold in domestic markets and to some traditional pineapple juice processing factories.

On average, 33% of pineapples produced are class A, 26% class B, and 41% class C pineapples. This heterogeneity in the quality of the harvested products may result from the prevailing weather conditions and/or the different production systems used by farmers. The results show that class C pineapple is not accepted in the export market (Table 4). However—certainly because of the lower price—it is often preferred by wholesalers from the regional (71%), rural (55%), and urban (36%) markets. The export market remains the marketing channel with the highest quality requirements: 55.2% of class A and 44.8% of class B pineapples are sold there. Class A pineapples are also sold to some domestic and regional markets, including rural retailers (44%), urban wholesalers (39%), processing factories (30%), and some Nigerian wholesalers (14%).

Pineapples of class C are delivered to the domestic or regional markets. Farmers were asked if they had experienced rejections in the selected marketing channels. Their answers are reported in Table 4. Results indicate that only 6% of farmers have experienced rejection of their products. In general, the buyers reject pineapples of bad quality. This result confirms the findings of Nicklin et al. (2006), who concluded that a major barrier for sustainable market access and the generation of high income by smallholder farmers is their low capacity to supply uniform products (in quality and quantity) as requested by foreign buyers.

**TABLE 4** Quality Attributes by Marketing Channels

	Retailers			Wholesalers			Exporters N = 29	Processors N = 20	Total N = 285
	Rural Market N = 18	Urban market N = 2	Rural market N = 60	Urban market N = 149	Regional market N = 7				
Buyers in the pineapple supply chains									
1) <i>Quality requirement in each market channel (%)</i>									
Low Quality	N = 110 38.9	50.0	55.0	36.2	71.4	0.0	50.0	41.4	
Medium Quality	N = 82 16.7	50.0	38.3	24.8	14.3	44.8	20.0	26.0	
High Quality	N = 93 44.4	0.0	6.7	38.9	14.3	55.2	30.0	32.6	
2) <i>Farmer has experienced rejection of produce (%)</i>									
No	N = 243 94.4	50	65	90.6	100	89.7	90	94.4	
Yes	N = 42 5.6	50	35	9.4	0	10.3	10	5.6	

Pearson  $\chi^2$  ( $df = 12$ ) = 46.77 Pr = 0.000.

Pearson  $\chi^2$  ( $df = 6$ ) = 28.18 Pr = 0.000.

N = Number of observations.

## Econometric Findings on Determinants of Market Selection

An econometric approach was used to test effects of the different factors on the selection of a particular market channel. Results are reported in Table 5 and 6.

Looking at Table 5, the likelihood ratios chi-squares (LR  $\chi^2$ ) of 104.9, 80.9, 54.5, and 41.3, all with  $p$  values of less than 0.001, tell us that each of the four models is statistically significant—that is, it fits significantly better than a model with no predictors. Table 6, which shows correct prediction rates of 78.6%, 81.4%, 88.4%, and 93.3%, shows that the models have good predictive values. The Wald chi-square statistic that was used to test for the overall significance of the variables included in the model is significant at the 1% level. This result implies that the subsets of coefficients are jointly significant and the explanatory power of the factors included in the model is satisfactory.

The likelihood ratio test of the null hypothesis of independency between the market channel decision ( $\rho_{21} = \rho_{31} = \rho_{41} = \rho_{32} = \rho_{42} = \rho_{43} = 0$ ) is significant at 1%. Therefore, the null hypothesis that all the  $\rho$  (Rho) values are jointly equal to 0 is rejected, indicating the goodness-of-fit of the model. Hence, there are differences in market selection behavior among farmers, which are reflected in the likelihood ratio statistics. Separately considered, the  $\rho$  values ( $\rho_{ij}$ ) indicate the degree of correlation between each pair of dependent variables. The  $\rho_{21}$  (correlation between the choice for urban and rural markets) and  $\rho_{31}$  (correlation between the choice for export and urban markets) are both negative and statistically significant at the 1% level (Table 6). This finding leads us to the conclusion that farmers delivering to the urban market are less likely to deliver to local markets ( $\rho_{21}$ ). Equally, those involved in export marketing channels are less likely to send their pineapples to the urban market ( $\rho_{31}$ ). Even though we can observe negative correlations between the other marketing channel alternatives, these correlations are not (statistically) significant.

Farmers' household characteristics also play a role in marketing channel selection. Young farmers have a preference for selling to the urban market, while older farmers prefer rural market outlets. There are conflicting explanations about the relationship between age (V5) and decision making in the literature. Old farmers may make their decisions more easily than young farmers, because the older farmers might have accumulated capital or a long-term relationship with their clients (in the rural market), or they might have preferential access to credit due to their age, availability of land, or family size (Sall et al., 2000; Adegbola & Gardebroek, 2007). By contrast, the young farmers might have a longer planning horizon or be more willing to take risks (Zegeye et al., 2001). The results also show that age does not significantly affect the farmer's decision to sell to other markets, such as export markets or processing factories.

**TABLE 5** Simple Probit Model With the Assumption of Non-correlation Between Market Channel Choices

Factors description	Market channels			
	Urban Market (V1)	Rural Market (V2)	Export Market (V3)	Process Market (V4)
<i>Household characteristics</i>				
Age of HH (V5)	-0.03 (0.01)***	0.03 (0.01)***	0.01 (0.01)	-0.01 (0.02)
Education level HHD (V6)	-0.07 (0.09)	0.01 (0.10)	0.10 (0.10)	-0.05 (0.14)
<i>Production system</i>				
Farm size (V7)	-0.01 (0.14)	0.33 (0.15)**	-0.24 (0.18)	-0.36 (0.23)
Number of varieties (V8)	-0.81 (0.22)***	0.85 (0.21)***	0.09 (0.28)	-0.61 (0.37)*
<i>Product attributes</i>				
Quality requirement (V9)	0.20 (0.11)*	-0.29 (0.12)**	0.30 (0.15)***	-0.23 (0.19)
Rejection (V10)	-0.13 (0.27)	0.64 (0.26)**	-0.48 (0.38)	-0.72 (0.52)
<i>Market context</i>				
Distance (V11)	-0.65 (0.16)***	0.03 (0.16)	0.47 (0.22)**	1.23 (0.35)***
Incentive (V12)	-0.13 (0.11)	-0.05 (0.12)	0.16 (0.15)	0.48 (0.20)**
Formality (V13)	-0.50 (0.16)***	0.03 (0.18)	0.42 (0.16)***	0.07 (0.24)
Relation duration (V14)	0.01 (0.12)	-0.17 (0.12)	0.20 (0.15)	-0.17 (0.21)
Bargaining power (V15)	-0.19 (0.18)	0.40 (0.18)**	0.16 (0.24)	-0.41 (0.25)
Written contract (V16)	1.14 (0.30)***	-0.95 (0.34)***	-0.25 (0.32)	-0.16 (0.46)
Constant	3.68 (0.80)***	-3.01 (0.83)***	-4.24 (1.13)***	-2.46 (1.31)**
Number of observations	285	285	285	285
<i>LR</i> $\chi^2$ (degree of freedom)	104.89 (12)***	80.96 (12)***	54.51 (12)***	41.34 (12)***
Pseudo $R^2$	0.27	0.24	0.25	0.29
Correct prediction	78.60%	81.40%	88.42%	93.33%

Robust standard errors in brackets (STATA SE controls for the model's robustness—using the “robust” option).

\*Significant at 10%, \*\*significant at 5%, \*\*\*significant at 1%.



**TABLE 6** Multivariate Probit Model With the Assumption of Correlation Between Market Channel Choices

Factors description	Market channels			
	Urban Market (V1)	Rural Market (V2)	Export Market (V3)	Process Market (V4)
<i>Household characteristics</i>				
Age of HHD (V5)	-0.03 (0.01)***	0.03 (0.01)***	0.01 (0.01)	-0.01 (0.01)
Education level HHD (V6)	-0.08 (0.09)	0.01 (0.10)	0.14 (0.11)	-0.10 (0.11)
<i>Production system</i>				
Farm size (V7)	-0.01 (0.14)	0.30 (0.16)*	-0.22 (0.19)	-0.24 (0.21)
Number of varieties (V8)	-0.78 (0.19)***	0.80 (0.22)***	0.19 (0.27)	-0.60 (0.36)*
<i>Product attributes</i>				
Quality requirement (V9)	0.20 (0.11)*	-0.28 (0.12)**	0.30 (0.14)**	-0.17 (0.19)
Rejection (V10)	-0.23 (0.24)	0.67 (0.29)**	-0.42 (0.36)	-0.54 (0.43)
<i>Market context</i>				
Distance (V11)	-0.61 (0.17)***	0.07 (0.20)	0.41 (0.22)*	1.22 (0.31)***
Incentive (V12)	-0.12 (0.11)	0.01 (0.12)	0.18 (0.13)	0.49 (0.19)**
Formality (V13)	-0.48 (0.16)***	0.02 (0.16)	0.43 (0.22)**	0.12 (0.19)
Relation duration (V14)	0.03 (0.12)	-0.16 (0.12)	0.17 (0.16)	-0.25 (0.20)
Bargaining power (V15)	-0.14 (0.17)	0.40 (0.20)**	0.14 (0.20)	-0.39 (0.26)
Written contract (V16)	1.08 (0.31)***	-0.85 (0.32)**	-0.31 (0.46)	-0.32 (0.39)
Constant	3.46 (0.77)***	-3.14 (0.75)***	-4.25 (1.12)***	-2.76 (1.16)**
$\rho_{21}$			-0.80 (0.12)***	
$\rho_{31}$			-0.55 (0.18)***	
$\rho_{41}$			-0.14 (0.15)	
$\rho_{32}$			0.12 (0.12)	
$\rho_{42}$			-0.04 (0.13)	
$\rho_{43}$			-0.08 (0.12)	
Number of observations			285	
Wald $\chi^2$ (degree of freedom)			414.09(44)***	
Likelihood ratio test Ho: $\rho_{21} = \rho_{31} = \rho_{41} = \rho_{32} = \rho_{42} = \rho_{43} = 0$ ; $\text{Ch}^2(6) = 141.359$ ***				

Robust standard errors in brackets (STATA SE controls for the model's robustness—using the “robust” option).

\*Significant at 10%, \*\* significant at 5%, \*\*\* significant at 1%.

Another household characteristic that may affect a farmer's decision is the education level of farmer (V6). Differences in education levels did not influence farmers' decision making. This unexpected result could be explained by the low number of farmers with a higher level of education. More than 70% of respondents did not reach primary school level, affecting their aptitude to access accurate and up-to-date market information and their capacity to sell in markets requiring a high level of knowledge and information. This result suggests a need to improve smallholder farmers' capacity to access and use up-to-date production and market information systems through local dialects or traditional information channels.

The characteristics of the farmer's production system are the second set of variables that could affect market channel selection. Here, two main variables were analyzed: farm size (V7) and the number of varieties of pineapples produced (V8). We found a positive and significant correlation between both these variables and the likelihood of targeting rural markets (Tables 5 and 6). This might be due to the high transportation costs of shipping pineapple to urban markets or the difficulty of complying with international market quality norms and standards. Most large-scale farmers (>5 ha) sold part (or all) of their harvest to rural markets. Another reason could be that in some periods of the year—especially in December and during Ramadan (the Muslim fasting period of one month)—pineapple prices on rural markets are high enough for farmers to make proper profit margins without having to bear the transportation costs to more remote markets.

The export market is the market channel with the highest quality requirements (V9;  $p < 0.05$ ), and farmers who choose to supply international markets are those who are able to comply with high quality norms and standards. Farmers with certification (Fair Trade, Organic Production, GlobalGAP) are able to sell their produce at higher prices in EU markets. However, not all of the pineapples produced under these standards are sold to international markets, because very small and very big fruits do not fit in the available packaging boxes. This could explain the positive significant relation between high-quality products and the urban market channel ( $p < 0.1$ ). We also found that farmers with lower pineapple quality, especially class C, often choose to supply the rural market. As these pineapples are the lowest quality, it is not surprising that some farmers experience rejection on this market (V10), which is shown to be a significant association. It may be that farmers targeting rural markets have already faced rejections in alternative markets.

The farmers explained these quality and rejection issues to be the result of their low awareness of the quality required by some markets that they supply; they use production systems copied from the Ivory Coast and do not adjust them to the agro-pedological conditions in Benin (Fassinou-Hotegni et al., 2012). Another factor affecting outlet choice is the market context in which the farmer is embedded. We found that the selection of the export

and processing markets was positively and significantly affected by physical distance (V11), at a level of significance of 5% and 1%, respectively. This implies that those supplying the export (including the Nigerian) market and processing factories are generally further away from the urban markets. This finding could be explained by the lack of availability of logistical facilities to access urban markets. It was also found that the selection of urban market—point A on Figure 1—is negatively related to the remoteness of the farm. It can be inferred that farmers who sell their products to this market are generally closer to it—all other parameters being constant.

Farmers often receive incentives (V12) from their buyers in terms of gifts, financial support (in-kind or as a loan), or market information and technical training. These practices are common in pineapple supply chains, notably in outgrowing systems (or contract farming), where we assumed that customer loyalty may affect long-term relationships. The results show that the presence of incentives positively ( $p < 0.05$ ) affects the processing and export marketing channels selection but is not significant in the other two markets. The impact of the degree of formality (V13) in the buyer–seller relationship on the marketing decision was also studied. This showed a positive ( $p < 0.001$ ) correlation with the international market selection, which, in other words, is characterized by a more hierarchical form of governance structure. In contrast, the urban markets are characterized by less formal market relationships between buyers and sellers. The results also revealed that farmers have a high level of bargaining power (V15) only with rural market buyers. Overall, farmers' bargaining power can be improved if they have access to accurate marketing information, such as up-to-date market prices and quality requirements, as well as access to new varieties that will allow them to adapt their production systems to meet market demand.

Unexpectedly, buyers on urban markets are beginning to require formal written contracts (V16) similar to those used in outgrowing schemes (Arinloye et al., 2012) for export markets. This may be due to the buyers' attempts to safeguard their investments and reduce uncertainty and possible opportunistic behavior (cheating or free riding) that sometimes occurs among pineapple farmers who deal with several markets simultaneously. Sometimes farmers default on agreements by selling their produce to other buyers who offer higher prices, a practice known as *side-selling* (Suzuki, Jarvis, & Sexton, 2011). This factor is negatively correlated with the decision to choose rural markets. Finally, the models did not show the duration of the buyer–seller relationship (V14; whether short-, medium-, or long-term) to have any significant influence on the farmer's decision-making. The study did not investigate the market prices and cost variations across the different marketing channels. As market selection heavily relies on relative costs and prices, empirical evidence would have added more to the understanding of the marketing selection process. Further research may focus on this limitation and clarify the influence of investments and operational costs (information searching,

product collecting and transportation costs, cooling facilities, informal sunk costs, etc.) and market price variations (in local, urban, regional, and EU markets) on smallholder farmers' marketing channel selection.

## CONCLUSION

This article has analyzed the influence of the characteristics of smallholder farmers, their production systems, product quality, and the marketing context on their marketing channel selection. Results show that the idea that smallholder farmers are excluded from international markets is rejected, even though the high value marketing outlets (export and processing-oriented) are supplied mostly by the medium- and large-scale farmers. The results of the two econometric models show that the dependency or independence of household level marketing decisions can be empirically tested. The empirical results also shed some light on the contemporary issue of marketing channel selection in perishable supply chains in West Africa, helping us to disentangle the reasons why farmers (sequentially or simultaneously) choose different marketing channels. It was found that those involved in export marketing channels are less likely to send their pineapples to the urban market. Even though we observed negative correlations between some choices of marketing channels, these correlations are not (statistically) significant. This result is consistent with a marketing channel selection study in African countries (Bellemare & Barrett, 2006) that found strong evidence to support the hypothesis that sellers make their market channel selection and selling volume decision sequentially rather than simultaneously.

One important result of our analysis is that the produce of pineapple farmers who sell into rural market channels is characterized mostly by low quality. This is strongly related to their poor access to market information (about quality and prices), their low education levels, and their weak capacity to comply with international market requirements. The low level of international market selection by Benin's smallholder farmers is also the result of competition—particularly with Ghana and the Ivory Coast—where farmers make more use of the newly introduced MD2 variety, developed by Fresh Del Monte in Costa Rica in 1994 (only grown experimentally in Benin). MD2 has rapidly become popular among Western consumers, and its introduction has reduced the demand for the Smooth cayenne variety in EU markets (Suzuki et al., 2011; Vagneron, Faure, & Loeillet, 2009).

A farmer's bargaining power and his or her physical distance from markets were identified as major determinants of marketing channel selection. Improving the present infrastructure may help to overcome the latter issue. The gaps (in time and distance) between harvesting fruit and its consumption in the international markets are significant. This means that fruit destined for regional and international markets is at greater risk of deterioration compared to national markets.

This study found that smallholder farmers select multiple marketing channels as a strategy to safeguard their investments and to maximize their incomes in the long term. This strategy also helps them to reduce the uncertainties associated with rejections from the export markets and guarantees them market access. Smallholder farmers' ability to sell in any market channel shows that they have potential, which should be reinforced. This could be achieved through providing technical and organizational assistance and support in capacity building, access to inputs, markets, and credit, and the establishment of export logistics. The study did not investigate the market prices and cost variations across the different marketing channels. Since market selection heavily relies on relative costs and prices, empirical evidence in this area would have added more to the understanding of the marketing selection process. Further research may address this limitation.

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