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## FOOD SCIENCE & TECHNOLOGY | RESEARCH ARTICLE

# Market structure, trader behaviour and performance of small ruminants marketing in Benin, West Africa

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**Abstract:** Livestock markets are characterised by imperfections, distortions, and efficiency problems that impact livestock marketing. The purpose of this research was to analyse the sheep and goat marketing system in Benin using the structure-conduct-performance (SCP) approach. Primary data were collected from 215 small ruminant traders selected from 21 markets to calculate the market concentration degree, marketing margin, and efficiency. The four largest traders' concentration ratio (CR<sub>4</sub>) and Hirschman Herfindahl Index (HHI) show that small ruminant markets have an effective competition structure. These markets were unconcentrated, and barriers to entry were nonexistent, except for trading capital. Small ruminants sold in markets differed according to the animal's body condition, ecotype, age, sex, and coat colour. These attributes and periods of sale are the main factors that influence

### ABOUT THE AUTHORS

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### PUBLIC INTEREST STATEMENT

In Benin, small ruminant herding is a cultural activity practiced by 90% of the population. Small ruminant population in Benin was estimated at around 3,368,288 head in 2019. Sheep and goats are easy to keep because of their small size and low fodder requirements. Their breeding plays a fundamental role at economic, ecological, environmental and cultural levels. For many households, small ruminant farming is an important survival strategy in the face of impoverishment and deterioration of food security, linked to high urban population growth. The demand for small ruminant meat in particular is growing rapidly, and local production is far below this demand. Efficient marketing of small ruminants can lead to increased production and higher incomes for breeders and traders. Particular attention should therefore be paid to the marketing of small ruminants and the market failures.

pricing. Transport costs, animal feed and care costs, transport, and market taxes were the main transaction costs faced by the traders. The total transaction costs per sheep and goats were estimated at  $742.7 \pm 530.7$  XOF and  $663.2 \pm 463.6$  XOF respectively (XOF is a common and official currency of the eight member states of the West African Economic and Monetary Union. 1 USD = 612,38 XOF). Average marketing margin was  $5,869.2 \pm 4,357.7$  XOF per sheep and  $3,851.2 \pm 1,597.8$  XOF per goat. The marketing efficiency was 78.8% for sheep and 78.9% for goats. This depended significantly on the type of trader, whereby wholesalers were the least efficient. Efficiency, including transaction costs and marketing margins, did not vary significantly between sheep and goats. To improve the efficiency of small ruminant marketing, attention needs to be given to improving the road infrastructure that serves markets and formulating new marketing policies on taxes.

**Subjects:** Agriculture and Food; Food Laws & Regulations; Economics

**Keywords:** marketing; sheep; goats; structure; efficiency

## 1. Introduction

Small ruminants (sheep and goats) are an important economic and ecological niche in the agricultural systems of developing countries as they make a large contribution to household income, especially for the rural poor (Maikasuwa & Jabo, 2014). In Benin, small ruminant breeding is a cultural activity practiced by 90% of the population (Adote et al., 2011). Small ruminants account for 14% of livestock inputs, and their production is mostly directed towards agricultural markets that provide an important mechanism for trade (Phuu, 2016). Market participation and trade among livestock keepers are expected to be an important pathway out of poverty (Lysholm et al., 2020). Livestock markets play a fundamental role in livestock production and provide a platform for the exchange of property and wealth (Onduso et al., 2020).

Markets are important for a country's economic growth and sustainable development. They are essential for economic structural transformation, as they allow an optimal allocation of resources and open up channels linking the primary sector to other sectors of the economy (FAO, 2020). However, marketing systems in Benin face issues concerning efficiency in carrying out marketing operations, price formation, and problems of adjustment between production and consumption (Adégbola et al., 2016; Lutz et al., 2007). Agricultural markets are relatively unsophisticated and poorly integrated, prices vary considerably across regions and seasons, and marketing margins are high (Bergquist & Dinerstein, 2020; Sigei, 2014). Developing efficient marketing systems in most African countries, including Benin, remains a major challenge because of the lack of access to credit, poor market infrastructure, and high transport costs (Ayele et al., 2017; Bergquist & Dinerstein, 2020). The large number of actors involved in marketing systems complicates supply chains, with increased transaction costs and no significant value-added activities (Negassa et al., 2011). Agricultural supply markets in developing countries are also characterised by inadequate regulatory frameworks and the absence of essential functions required for a well-functioning and fully integrated market. These market failures, which lead to inefficient marketing systems, have an impact on production and constrain food security (KoffiTessio et al., 2007). Farmers' production and income can also be increased by a well-organised market (Ashenafi, 2017). An efficient marketing system, beyond the link it establishes between the producer and the consumer, makes a positive contribution to food security (KoffiTessio et al., 2007) and development. Indeed, marketing stimulates the production and specialisation of enterprises, thus leading to improved productivity in all sectors of the economy (Maikasuwa & Jabo, 2014). Agricultural marketing is the most significant energetic force in economic development and has a guiding and stimulating impact on the production and distribution of agricultural products (Ahmed, 2020). An effective small ruminant marketing system will provide a means to maximise the value of products and stimulate the equitable distribution of economic benefits among different market actors. Building an effective and efficient marketing system is

an important longterm strategy for adapting to sustainable agricultural development (Ruttoh et al., 2018). Understanding traders' needs and preferences is an important step in implementing market-responsive interventions in value chains (Mtimet et al., 2014). Small ruminant herpers also need to understand small ruminant markets, as this would enable them to choose a marketing segment and breed animals relevant to that segment to sell what is in demand in the market, rather than trying to sell what is available (Ojango et al., 2014). Thus, documented information on the structure, conduct, and performance of marketing is needed to address real problems, such as information asymmetry, poor infrastructure, pricing problems, and a lack of institutional support (Gemechu, 2018).

Studies on small ruminant markets and marketing in Benin have focused on the assessment of self-managed markets and a summary analysis of the small ruminant value chain (Mensah et al., 2017; Onibon, 2004). Their research did not provide an understanding of the functioning of the marketing system and the imperfections that characterise small ruminant markets. However, an informed policy decision regarding marketing improvement requires a good understanding of small ruminant markets through their organisational structure, the behaviours of market actors, and identification of marketing costs (Hailemariam et al., 2009). This paper aims to fill the information gap on small ruminant marketing in Benin using the structure conduct performance (SCP) approach.

## 2. Materials and methods

### 2.1. Theoretical background

The structure conduct performance (SCP) approach is used to analyse small ruminant marketing system performance to understand the structural and behavioural factors that influence livestock marketing. From neoclassical theory, the SCP approach is used as an analytical framework to postulate causal relationships between the market environment, internal behaviour of firms, and their performance (Ferguson, 1988). It is an attempt to compromise between the formal structures of economic theory and empirical observations of organisational experience in imperfect markets. The three main components of the SCP (structure, conduct, and performance) are influenced by basic conditions: physical, economic, legal, and social (Figure 1).

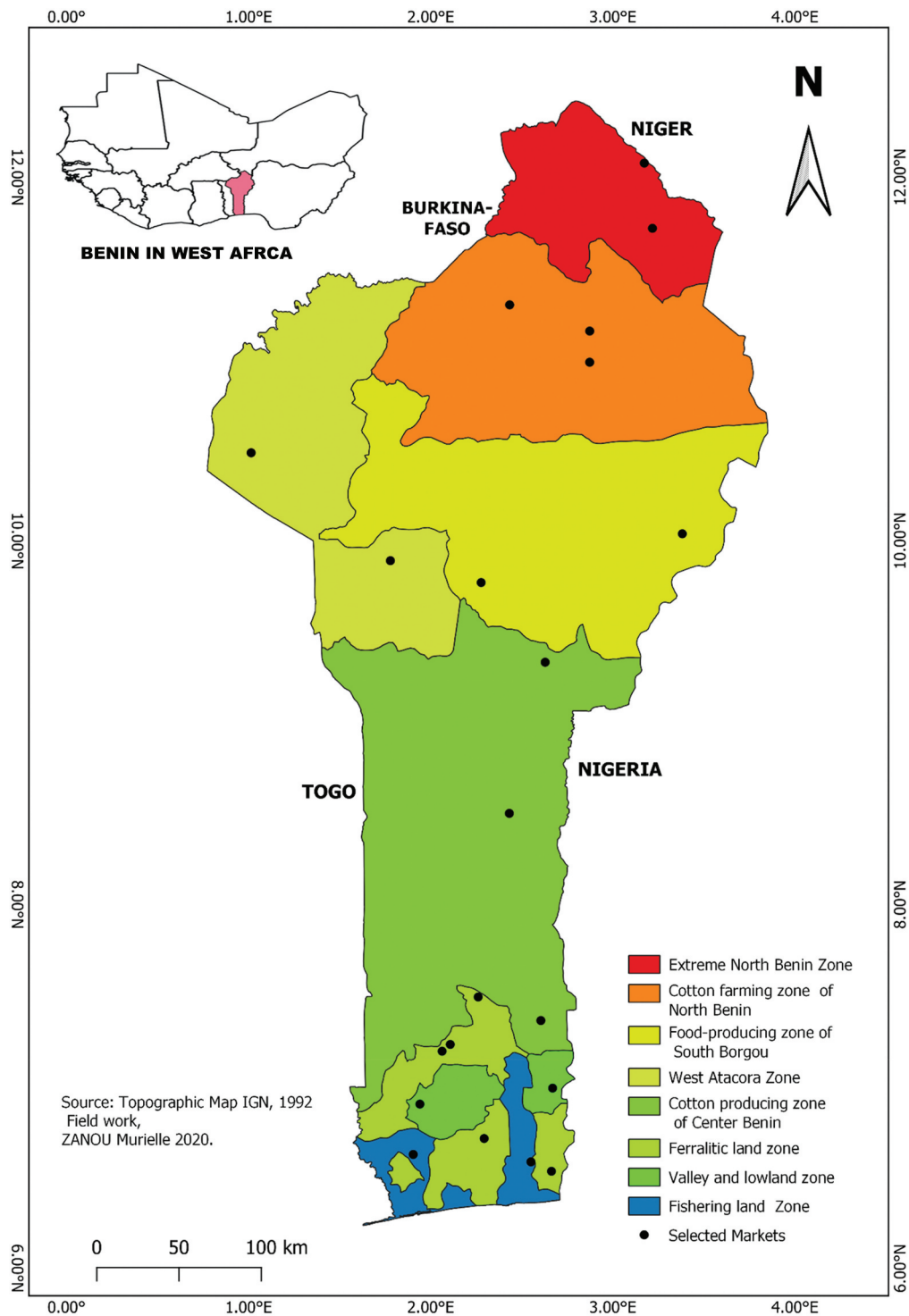
Market structure is defined as the set of organisational features of the market that determine the relationship between sellers and buyers (Bain, 1959; Harriss, 1979) and strategically influence competition and price formation in markets. Firms influence the nature of market competition and pricing policies. It also refers to the way a market is organised in terms of concentration or share.

Market conduct refers to the behavioural patterns and strategies adopted by traders and other market actors to affect or adjust to markets (Adégbola et al., 2016). These strategies depend on the structure and individual power of the traders in the market. The conduct includes pricing policies, tactics to exclude rivals, research and development strategies, sale techniques, strategies for mergers, acquisitions, partnerships, and so on (Ordofa et al., 2021).

Market performance expresses the economic outcome of market structure and actor behaviour (Ordofa et al., 2021). It refers to the impact of structure and actor behaviour on performance, measured in terms of variables such as prices, level of trade margins, marketing cost components, and efficiency (Kosgei, 2018; Miles, 2014).

The SCP approach implies that market structure determines the behaviour of firms, and behaviour determines various aspects of market performance, from which it follows that a particular type of market is associated with a particular type of performance (Kwamina et al., 2016). Some agricultural market analysts have considered this method to be one of the techniques that can determine agricultural marketing performance (Ajala & Adesehinwa, 2008; Ayele et al., 2017; Maikasuwa & Jabo, 2014; Silmi et al., 2020).

**Figure 1. Map of Benin showing the eight agro-ecological zones and 21 markets surveyed.**



## 2.2. Study area

Benin is located in West Africa in the tropical zone between the parallels 6°30' and 12°30' of northern latitude and the meridians 1° and 30°40' of east longitude. It is limited to the north by the Republic of Niger; to the northwest by Burkina Faso; to the west by Togo; to the east by Nigeria; and to the south by the Atlantic Ocean. Benin's national territory is divided into eight agroecological zones (AEZs) based on the relative homogeneity of the climatic and agropedological parameters,

cropping and breeding systems, and population density. Two communes in each agroecological zone and one market per commune were selected. However, local collection, primary markets, and assembly or secondary markets coexist in the pastoral areas of Benin. With the advent of self-managed livestock markets in the 1970s, assembly markets have been classified into two: self-managed livestock markets and traditional livestock markets (Onibon, 2004). To consider this diversity of markets, one more market in AEZ 2 and AEZ 5, and three others in AEZ 6 were selected with the assistance of the “Association Nationale des Organisations Professionnelles des Eleveurs de Ruminants” (ANOPER). A total of twentyone markets were selected for this study based on three criteria: type of market, degree of importance of the market in small ruminants’ marketing, and accessibility of markets (Figure 2).

### 2.3. Sampling and data collection

The data used for this research came from focus group discussions and individual questionnaire-based interviews. In each of the 21 markets chosen, a focus group was organised with five to ten market managers and traders. Subsequently, a list of the most regular traders was drawn, and a sampling frame was used. Due to resource availability and market days, 10 traders per market were selected in each market, except for the south’s largest market (livestock market of Zè), where 15 traders were surveyed. Systematic random sampling was used to select respondents from the trader list. A total of 21 focus groups and 215 individual interviews were conducted between November and December 2020. Focus group discussions were conducted on market characteristics and infrastructure, types of actors, and organisation of small ruminant purchases and sales, whereas data related to the identity of traders, purchase and sale strategies and prices, traders’ behaviour, and transaction costs were collected during direct interviews. Focus groups and individual interviews were conducted on market days using an interview guide and a questionnaire digitised on the KoboCollect platform.

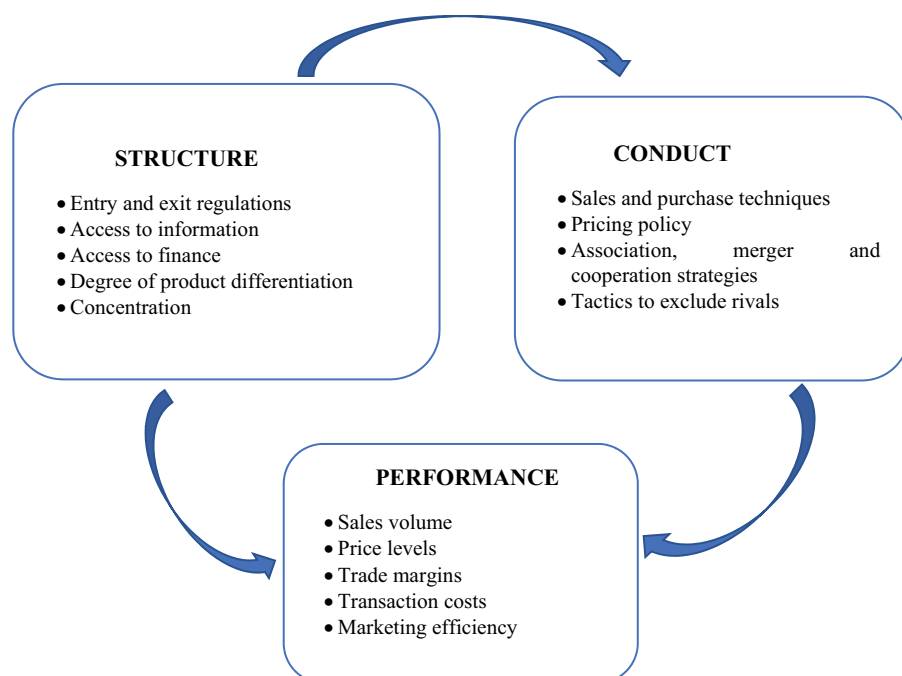
### 2.4. Data analysis

#### 2.4.1. Analysis of the market structure

In empirical studies, the variables used to determine structure include market concentration, degree of product differentiation, and barriers to entry (Silmi et al., 2020). Generally, market

**Figure 2. Structure Conduct Performance elements.**

Source: Adapted from Adégbola et al. (2016) and Miles (2014).



concentration is measured using the concentration rate ( $CR_x$ ) and the Hirschman Herfindahl Index (Silmi et al., 2020). In this study, the four-firm concentration rate ( $CR_4$ ) considers the four largest traders, and is obtained from the following formula:

$$CR_4 = \frac{\text{Sales volume of the four largest traders}}{\text{Total sales volumes}} * 100 \quad (1)$$

If  $CR_4 = 0$ , the market is said to be pure and in perfect competition; if  $0 < CR_4 < 40$ , the market is in effective competition; if  $40 \leq CR_4 < 60$ , the market is a loose oligopoly; if  $60 \leq CR_4 < 90$ : the market is a tight oligopoly; and if  $CR_4 \geq 90$ , the market is a monopoly (Jumono et al., 2017; Naldi & Flamini, 2014).

Hirschman Herfindahl Index (HHI) includes all traders in his calculation:

$$HHI = \sum_{i=1}^n MS^2 \quad (2)$$

where  $MS = \frac{V_i}{\sum_{i=1}^n V_i}$  with  $V_i$  is the number of small ruminants sold by trader  $i$ , and  $\sum_{i=1}^n V_i$  is the total number of small ruminants sold by all traders.

Values below 0.15 indicate unconcentrated markets, while values in the range of 0.15 to 0.25 indicate moderately concentrated markets, and an HHI value above 0.25 indicates highly concentrated markets (Naldi & Flamini, 2014).

In this study, we considered market entry and exit conditions, access to information, and access to finance as the most important barriers to small ruminant marketing. The degree of product differentiation was evaluated by assessing traders' knowledge of various small ruminant breeds.

#### 2.4.2. Analysis of market conduct

There are no uniform procedures for analysing market behaviour. The behaviour of actors in small ruminant markets was determined in this study using variables such as buying and selling practices and pricing practices. Traders established a hierarchy of pricing criteria as perceived by traders. A mean rank was calculated for the criteria as well as Kendall's W concordance coefficient.

#### 2.4.3. Evaluation of market performance

The most important indicators for assessing marketing performance are marketing costs, margins, and efficiency (Ayele et al., 2017). Marketing costs include transportation and handling costs, feeding and care costs, taxes, and communication costs. These costs were calculated (mean and standard deviation).

Marketing margin (MM) represents the price paid for a set of marketing services, and its value reflects the structural efficiency of the marketing system (Ajala & Adesehinwa, 2008).

$$\text{Marketing margin} = \text{Selling price} - \text{Purchase price} \quad (3)$$

Marketing efficiency is defined as the ratio of output to input. Marketing inputs represent marketing costs, while market outputs are marketing margins (Ajala & Adesehinwa, 2008). It is obtained using the following formula (Kpenavoun et al., 2019):

$$\text{Marketing efficiency} = 100 - \frac{\text{Marketing Cost}}{\text{Marketing margin}} \times 100 \quad (4)$$

A positive value indicates efficient marketing and a negative value, the opposite.

In addition, Pearson's chi-square and Fischer's ANOVA tests were used to compare the structure, conduct, and performance indicators between sheep and goats. Kendall's nonparametric test was used to rank potential constraints on the marketing of small ruminants classified by traders.



### 3. Results

#### 3.1. Small ruminant traders' characteristics

Men accounted for 86% of small ruminant traders (Table 1). Although traders were involved in several activities, livestock trading was the main economic activity (85.1%). Only 22.3% belonged to the association of livestock traders. More than half of the traders (59.1%) had no education. Traders were classified into three types: wholesalers (18.6%), semi-wholesalers (31.6%), and retailers (49.8%). Wholesalers were involved in buying large quantities of small ruminants and selling them mostly in and around the urban centres of Parakou, Zè, and Djougou. They often sent animals from northern Benin by truck, which could contain up to 500 small ruminants. Semi-wholesalers were traders mostly in contact with herders, as they went to villages and the farthest markets for purchases. Retailers buy and resold retail outlets.

Traders had an average of 13.7 years of experience trading small ruminants (Table 1). The average number of years of experience was not significantly different depending on the species of small ruminants sold. For all traders, average starting capital was estimated at 63,674.4 XOF and average current capital was 298,534.9 XOF (with XOF, a common and official currency of the eight member states of the West African Economic and Monetary Union, including Benin. 1 USD = 612,38 XOF). Starting capital and current capital varied significantly at the 5% threshold depending on the type of small ruminant traded.

Furthermore, six small ruminant marketing periods were identified. Aïd el-kebir and Christmas/New Year periods were known by all traders and constituted periods of high activity for 92.3% and 56.6% of sheep traders and 92.7% and 62.8% of goat traders, respectively (Table 2).

#### 3.2. Market structure

##### 3.2.1. Market concentration and entry conditions

The four-trader concentration ratio ( $CR_4$ ) calculated by type of traders and species of small ruminants was below 40% (Table 3), indicating effective or monopolistic competition. The Hirschman–Herfindahl index was below 0.15, indicating that small ruminant markets were unconcentrated. The wholesale market  $CR_4$  and HHI indices were higher than those of the semi-wholesaler and retail markets.

In some markets, traders hold livestock trading cards. However, most of these cards were acquired long after the trading began. According to 43.7% of small ruminant traders surveyed, the payment of a tax of 100 or 200 XOF per head of small ruminants brought to the market was a condition for entry to markets, but only 21.5% of traders considered this payment a barrier to entry into small ruminant markets. Similar to these entry taxes, some markets also have two exit taxes: the exit tax per head of small ruminants purchased at the market and the veterinarian's pass. For 23.6% of traders, these exit conditions constituted barriers to trading small ruminants.

##### 3.2.2. Trader access to funding and information

Approximately 94.9% of small ruminant traders conducted their business with their own funds, and only 7% had benefited from credit over the past five years (Table 4). Of these beneficiaries, 80% received credit in cash, and 23.3% received credit in kind (sheep or goats). Customers, parents, and neighbours offered credit in cash. The sources and types of credit were independent of small ruminant species.

Less than half of the surveyed traders were informed about various aspects of small ruminant marketing, such as animal prices (93.6%), places of supply (88.2%), places of sale (81.7%), available breeds (48.4%), animal transport (39.8%), and small ruminant diseases (40.9%). Access to information on supply or sale differed statistically between sheep and goats, unlike the other types of information mentioned above. Traders obtained information from their peers (94.6%), breeders,



**Table 1. Small ruminant traders' characteristics**

Variables		Sheep traders (n = 168)		Goat traders (n = 191)		All traders (215)	
		%	%	%	%	%	$\chi^2$
Gender	Woman	17.3	15.7	14	13.9***		
	Man	82.7	84.3	86			
Education level	None	58.9	58.6	59.1	0.2 <sup>ns</sup>		
	Primary	28	28.3	27.9			
	Secondary and more	13.1	13.1	13.0			
Main activity	Agriculture	7.1	12	11.2	33.1***		
	Handicraft	1.2	0.5	0.9			
	Trade other products	2.4	1.6	1.9			
	Livestock trade	88.1	85.9	85.1			
	Livestock breeding	1.19	0	0.9			
Membership of an association of livestock trader	No	88.1	76.4	77.7	48.1***		
	Yes	11.9	23.6	22.3			
Type of trader	Semi-wholesaler	25.6	33	31.6	15.1***		
	Retailer	52.4	48.7	49.8			
	Wholesaler	22	18.3	18.6			
Knowledge of small ruminant breeds	Yes	99.4	92.7	93	41.8***		
	No	0.6	7.3	7			
Year-round practice of small ruminant trade	Yes	93.4	91.6	89.8	21.7***		
	No	6.6	8.4	10.2			
Quantitative variables		Mean ± Sd	Mean ± Sd	Mean ± Sd	t		
Experience in small ruminant trade (in year)		13.9 ± 9.4	13.6 ± 9.4	13.7 ± 9.5	0.4 <sup>ns</sup>		
Starting capital (in XOF <sup>a</sup> )		67,261.9 ± 66,578.4	59,926.7 ± 60,738.39	63,674.4 ± 60,642.3	4.1***		
Current capital (in XOF)		30,0654.8 ± 230,856	280,026.2 ± 21,1387.3	29,8534.9 ± 23,6888.5	5.5***		

\*\*\*: significant at the 1% level; ns: not significant; Sd = Standard deviation.

<sup>a</sup>XOF is a common and official currency of the eight member states of the West African Economic and Monetary Union. 1 USD = 612,38 XOF on 18/02/2023.

**Table 2. Traders' perception of marketing periods**

Periods of activity (%)	Sheep trader (n = 168)			Goat trader (n = 191)		
	High	Medium	Low	High	Medium	Low
Aïd el-kebir	92.3	6.6	0.6	92.7	5.8	1
Easter	0	17.3	26.3	0	23.	22.6
Ramadan	17.3	39.9	38.7	12.6	46.1	37.2
Christmas/ New year	56.6	42.3	1.2	62.8	37.7	0
Vodoun Festival	13.7	28	45.8	12.6	37.7	38.74
Throughout the year	3.6	40.5	58.9	3.7	34.5	63.4

family members, carriers, and input suppliers in face-to-face discussions and using information and communication technologies (Table 5). The majority (97.9%) of traders who obtained information on the marketing of small ruminants were satisfied.

### 3.2.3. Differentiation of small ruminants

Almost all sheep (99.4%) and goat (92.7%) traders had knowledge of the breeds of small ruminants they traded (Table 3). Generally, they distinguished three main groups of breeds (Djallonké, Sahelian, and crossbreeds) according to size, coat colour, fur, horn, and other features. The availability of different breeds in the market varies according to the period of trade. According to the perceptions of sheep traders, Djallonké animals were more likely to be sold throughout the year (41.1%) and during the Aïd el-kebir festival (35.7%), while Sahelian breeds (97%) were mostly sold during the Aïd el-kebir festival (Table 6).

With regard to goats, Djallonké breeds were sold more during Christmas and New Year celebrations (54.4%) and throughout the year (35.6%), whereas Sahelian breeds were sold more during ordinary periods (45.5%) and the Aïd el-kebir festival (35.6%). There were statistically significant relationships at the 1% level between the trading periods of Djallonké sheep and Djallonké goats, and between the trading periods of sheep and goat crossbreeds.

## 3.3. Traders' behaviour

### 3.3.1. Buying and selling practices

To acquire small ruminants, very few sheep (10.7%) and goat (6.8%) traders relied on fellow traders, family members, or brokers. In fact, 89.3% and 93.2% of sheep and goat traders, respectively, bought animals themselves. After purchase, most of traders sold sheep (93.4%) and goats (94.8%). Approximately 16% of traders resold small ruminants on the same day of purchase, and 75% managed to sell the animals purchased between 2 and 10 days after purchase. The time between purchase and sale was found to be significantly related to the type of trader (wholesalers, semi-wholesalers, or retailers) at the 1% level. When traders were unable to sell all the small ruminants brought to the market, they adopted different attitudes (Table 7). For sheep, 48.8% of traders took them home and brought them back to the same market on the next market day, 29.2% took them to another market, 16.7% left them in the market for the next market day, and only 5.4% sold them to other traders at low prices. For goats, the same attitudes were observed, with percentages like those for sheep. Furthermore, analyses showed that the type of trader had a highly significant relationship with trader attitudes observed for both sheep and goats.

**Table 3. CR4 and HHI index**

Small ruminant species	CR4 (%)				HHI		
	Wholesalers	Semi-wholesalers	Retailers	Wholesalers	Semi-wholesalers	Retailers	
Sheep	25.1	20.3	17.7	0.041	0.032	0.025	
Goats	25.4	12.1	15.5	0.037	0.019	0.022	

**Table 4. Funding of traders**

Variables		Sheep trader (n = 168) %	Goat trader (n = 191) %	Small ruminants trader (n = 215)	
				%	$\chi^2$
Source of funding	Own funds	94	95.3	94.9	2.5 <sup>ns</sup>
	Parents	4.8	3.7	4.2	
	Neighbours	1.2	1	0.9	
Funding in last 5 years	No	92.9	93.7	93	1.3 <sup>ns</sup>
	Yes	7.1	6.3	7	
Funding type	Cash	66.7	46.7	66.7	2.8 <sup>ns</sup>
	Kind	16.7	20	20	
	Both	16.7	13.3	13.3	
Source of cash credit	Customers	8.3	13.3	15.4	3.9 <sup>ns</sup>
	Parents	33.3	26.7	46.1	
	Neighbours	41.7	26.7	38.5	

<sup>ns</sup>not significant.

**Table 5. Access to information**

Variables		Sheep trader (n = 168) %	Goat trader (n = 191) %	Small ruminants trader (n = 215)	
				%	$\chi^2$
Access to information	No	61.9	59.2	56.7	15.1***
	Yes	38.1	40.8	43.3	
Information types	Supply places	82.8	91	88.2	7.3 <sup>ns</sup>
	Sale places	84.4	80.8	81.7	1.0 <sup>ns</sup>
	Available breed	64.1	47.4	48.4	21.1***
	Transport	54.7	39.7	39.8	20.8***
	Small ruminant diseases	54.7	43.6	40.9	22.6***
	Price	28.1	23.1	93.6	20.0***
Information channels	ICT	96.9	100	97.9	10.6***
	Face to face	84.4	79.5	80.6	1.9 <sup>ns</sup>
Information sources	Trader	93.8	93.6	94.6	16.9***
	Breeder	67.2	80.8	74.2	14.9***
	Family	71.9	76.9	76.3	15.4***
	Supplier	4.7	3.8	3.2	1.5 <sup>ns</sup>
	Carrier	26.6	19.2	20.4	3.1 <sup>ns</sup>
Level satisfaction	Dissatisfied	0	1.3	1.1	6.4 <sup>ns</sup>
	Neutral or indifferent	1.6	1.3	1.1	
	Satisfied	82.8	76.9	77.4	
	Very satisfied	15.6	20.5	20.4	

\*\*\*: significant at 1% level; <sup>ns</sup>not significant.

**Table 6. Traders' perception of best trade period of small ruminant breeds**

Periods (%)	Djallonké		Sahelian		Crossbreed	
	Sheep	Goats	Sheep	Goats	Sheep	Goats
Christmas/ New year	11.3	54.4	1.2	45.6	14.9	44.5
Ramadan	11.9	1	0	7.8	13.1	2.6
Aid el-kebir	35.7	7.3	97	35.6	35.1	15.7
Vodoun	0	1.6	0.6	4.7	4.2	1
Easter	0	0	0	0.5	3	7.3
Throughout the year	41.1	35.6	1.12	5.8	29.8	28.8
$\chi^2$	88.4***		16.1***		113.6***	

\*\*\*: significant at 1% level; <sup>ns</sup>:not significant.

### 3.3.2. Pricing practices for small ruminants

More than 75% of traders set prices because of the bargaining process between the buyer and seller. However, livestock prices were initially given by traders based on the purchase price of animals, attributes, trade periods, etc. Apart from purchase price, several factors are likely to influence small ruminant selling prices. Kendall's test results show that there was not much variability in the ranking of factors influencing price setting, since the probability associated with Kendall's concordance coefficient (0,515 for sheep and 0,573 for goats) was significant at the 1% threshold. The six most important factors influencing the price of small ruminants were the animal's body condition, breed, trade period, age, sex, and coat colour (Table 8). In addition to these six criteria, seller type, number of animals purchased from seller and animal origin, presence of informal brokers, and market management committees could also have an impact on animal prices.

### 3.4. Market performance

Small ruminant marketing incurs high transaction costs. Transport costs were estimated at an average of  $466.9 \pm 415.5$  XOF and  $398.9 \pm 383.4$  XOF respectively per head of sheep and goats (Table 9). Feeding and care costs, were on average  $190.6 \pm 130.2$  XOF per sheep and  $197.8 \pm 170.8$  XOF per goat. Communication costs and small equipment costs such as ropes, feeding and drinking troughs were respectively  $104.8 \pm 73.3$  XOF and  $111.6 \pm 70.2$  XOF per sheep and  $88.4 \pm 64.5$  XOF and  $102.5 \pm 36.2$  XOF per goat. Market taxes which represented marketplace fees and animal market entrance fees were estimated at an average of  $138.9 \pm 68.1$  XOF per sheep and  $135.9 \pm 76.5$  XOF per goat. Transaction fees, directly related to animals sold in market, were estimated at an average of  $122.4 \pm 47.8$  cfa per sheep and  $121.7 \pm 43.8$  XOF per goat. Loading and unloading costs were estimated to average  $100 \pm 36.9$  XOF and  $75 \pm 28.9$  XOF per sheep and  $89.3 \pm 28.3$  XOF and  $116.7 \pm 28.9$  XOF per goat respectively. Transport taxes, animal inspection costs, security or guarding, and intermediary costs varied between 100 and 200 XOF per head of small ruminants.

Transport costs, feed and care costs, small equipment costs, and communication costs were incurred by more than 50% of traders, whereas market taxes and transaction fees were supported by less than 50% of traders (Table 7). Loading and unloading costs, taxes during transport, animal inspection costs, guarding costs, and formal intermediary costs were incurred by less than 10% of the traders.

Small ruminant traders sold an average of  $535.4 \pm 416.9$  sheep and/or  $427.5 \pm 272.3$  goats per year. These values represent approximately 95% of the small ruminants that were purchased. The number of animals purchased and sold varied significantly at the 1% threshold between wholesalers and semi-wholesalers, and between wholesalers and retailers. Average marketing margin was  $5,869.2 \pm 4,357.7$  XOF per sheep and  $3,851.2 \pm 1,597.8$  XOF per goat head

**Table 7. Buying and selling practices**

Variables		Sheep (n = 168)		Goat (n = 191)	
		Percentage	$\chi^2$ (Depending on type of trader)	Percentage	$\chi_2$ (Depending on type of trader)
Time between purchase and sale of small ruminants	Same day	17.3	40.8***	16.2	60.2***
	2 to 5 days	32.1		26.2	
	5 to 10 days	46.4		52.9	
	10 to 20 days	2.4		4.2	
	More than one month	1.8		0.5	
Attitude in case of non-disposal of all small ruminants on market day	Bringing in another market	29.2	36.1***	24.6	30.3***
	Take them home and bring back for next market	48.8		59.2	
	Leave in market for next market	16.7		10.5	
	Selling to other traders at low prices	5.4		5.8	

\*\*\*: significant at 1% level; Type of trader: Wholesalers, semi-wholesalers and retailers.

**Table 8. Factors influencing price as perceived by traders**

Factors influencing pricing	Sheep (n = 168)		Goat (n = 191)	
	Average rank	Prioritisation	Average rank	Prioritisation
Body condition of animal	3.3	1	2.7	1
Breed	3.5	2	4.3	5
Trade period	4.1	3	4.0	2
Animal Age	4.1	4	4.0	3
Animal Sex	4.3	5	4.2	4
Coat colour	6.2	6	5.5	6
Seller type	6.5	7	7.1	8
Quantity required	6.9	8	6.4	7
Animal origin	7.3	9	7.5	9
Presence of intermediary	9.5	10	9.7	10
Market Management Committee	10.2	11	10.5	11
<b>Statistics</b>				
<b>W of Kendall (concordance)</b>	0.515		0.573	
<b><math>\chi^2</math></b>	720.9***		681.6***	

\*\*\*: significant at 1% level.



**Table 9. Transaction Costs in XOF<sup>a</sup>**

Costs	Sheep Trader (n = 168)					Goat trader (n = 191)				
	Wholesaler	Semi-wholesaler	Retailer	All traders	Proportion of traders supporting %	Wholesaler	Semi-wholesaler	Retailer	All traders	Proportion of traders supporting %
Loading	116.7 (±40.8)	66.7 (±28.9)	100	100 (±36.9)	7.1	100	25	100	89.3 (±28.3)	3.6
Animal Transport	884.4 (±520.9)	429.7 (±360.3)	365 (±333.3)	466.9 (±415.5)	67.9	732.1 (±603.7)	431.9 (±358.2)	297 (±286.1)	398.9 (±383.4)	63.9
Tax during transport	125 (±90.1)	0	176.9 (±105.3)	167.2 (±101.9)	9.5	150	0	200 (±109)	195 (±103.9)	5.2
Unloading	75 (±35.3)	50	100	75 (±28.9)	2.4	100	0	100	116.7 (±28.9)	1.6
Animal feeding and care	266.3 (±161.6)	134.4 (±67.8)	165 (±104.5)	190.5 (±130.2)	70.2	319.5 (±186.3)	112.4 (±52.9)	195.6 (±181.2)	197.8 (±170.8)	72.8
Market tax	152.5 (±104.5)	160.5 (±48.9)	121.7 (±47.3)	138.9 (±68.1)	4.7	130.8 (±121.7)	158.9 (±60.1)	127.3 (±56.6)	135.9 (±76.5)	29.8
Animal Inspection	125 (±90.1)	300 (±173.2)	100	196.4 (±148.9)	4.2	200	100	200	180 (±44.7)	2.6
Security/guards	25	143.3 (±30.1)	71.2 (±54.5)	92.5 (±59.6)	4.8	50	0	175 (±35.3)	133.3 (±76.4)	1.6
Communication costs	148.4 (±70.6)	91.3 (±80.3)	81 (±56.8)	104.8 (±73.3)	54.8	142.7 (±72)	52.4 (±33.2)	89.1 (±59.1)	88.4 (±64.5)	60.2
Intermediary costs	200	200	200	200	13.1	200	0	197.1 (±12.1)	197.2 (±11.8)	9.4
Transaction fees	120 (±42.2)	115.5 (±45)	125.9 (±50.5)	122.4 (±47.8)	4.7	100	114.8 (±36.2)	128 (±48.7)	121.7 (±43.8)	46.1
Small equipment	82.9 (±44.5)	133 (±41.8)	116.3 (±88.1)	111.6 (±70.2)	68.4	85.7 (±33.2)	108 (±41.1)	105.9 (±32)	102.5 (±36.2)	75.9

(±): Standard deviation.

<sup>a</sup>XOF is a common and official currency of the eight member states of the West African Economic and Monetary Union. 1 USD = 612.38 XOF on 18/02/2023.

**Table 10. Marketing efficiency**

Variables	Sheep trader (n = 168)					Goat trader (n = 191)				
	Wholesaler	Semi-wholesaler	Retailer	All traders	Anova p-value	Wholesaler	Semi-wholesaler	Retailer	All traders	Anova p-value
a) Total number of heads purchased per year	782.2 (±570.4)	515 (±313.3)	402 (±292.5)	535.4 (±416.9)	0.0000	650.7 (±358.7)	416.4 (±185.7)	319.7 (±215.2)	427.5 (±272.3)	0.0000
b) Total number of heads sold	746.5 (±547.5)	493.3 (±300)	384.8 (±283.6)	512 (±400.3)	0.0000	623 (±347.1)	405.4 (±182.3)	303 (±210.1)	410.7 (±264.5)	0.0000
c) Percentage of animal sold	95.4	95.78	95.7	95.6		95.7	97.4	94.8	96	
d) Average unit purchase price (in XOF <sup>a</sup> )	22,666.8 (±9165.9)	24,803.8 (8704.6)	26,123.7 (±13,905.5)	24,823.4 (±11,402.7)	0.3472	16,884.5 (±5474.9)	16,642.1 (±3410.3)	17,301.3 (±5287.4)	16,961.1 (±4687.7)	0.7271
e) Average unit selling price (in XOF)										
27,558.7 ± 11,990	30,525.8 (±11,442.1)	32,675.8 (±18,206.8)	30,692.6 (±14,969.6)	0.2589	20,375.4 (±6602.9)	20,371.7 (±4048.3)	21,457.8 (±6413.4)	20,812.3 (±5666.5)	0.4897	
f) Marketing margin per head (in XOF) f = d - e	4891.8 ± 3891	5722 (±3223)	6552.1 (±5157.3)	5869.2 (±4357.7)	0.1804	3490.9 (±1730.9)	3729.6 (±1248.1)	4156.5 (±1776.3)	3851.2 (±1597.8)	0.1024
g) Total marketing costs per SR head (in XOF)	1000.6 (±648.3)	735.1 (±362.5)	636.8 (±509.3)	742.7 (±530.7)	0.0000	844.6 (±613.6)	609.9 (±343)	629 (±455.7)	663.2 (±463.6)	0.0496
h) Trader's profit per SR head (in XOF) h = f - g	384.5 (±3886.1)	4983.7 (±3194.5)	5753.9 (±5141.5)	5022.9 (±4358.4)	0.1070	2623.6 (±1605.6)	3120.3 (±1256.5)	3434.1 (±1777)	3140.6 (±1579.8)	0.0477
i) Marketing efficiency (%)	69.6 (±21.1)	83.1 (±13.1)	81.3 (±17.3)	78.8 (±18)	0.0000	71.5 (±19.4)	81.3 (±14.1)	80.4 (±13)	78.9 (±15.4)	0.0053

(±): Standard deviation.

<sup>a</sup>XOF is a common and official currency of the eight member states of the West African Economic and Monetary Union. 1 USD = 612.38 XOF on 18/02/2023.

**Table 11. Marketing constraints**

Constraints	Sheep		Goat	
	Average rank	Prioritisation	Average rank	Prioritisation
Insufficient capital	2.5	1	2.8	1
Difficult access to credit	3.8	3	3.9	3
Unattractive pricing mechanism	5.8	4	5.7	4
Low profit	3.6	2	3.4	2
High transport costs	5.9	5	6.0	5
Inadequate market information	8.2	11	7.94	10
Storage problems	7.7	8	6.9	7
High losses due to death of animals	7.1	7	7.86	9
No standard measure for purchase	8.1	10	7.97	11
Poor road network	5.9	6	6.43	6
High taxes	7.7	9	7.4	8
Price fluctuations	11.5	12	11.5	12
Statistics				
W of Kendall	0.467		0.438	
$\chi^2$	832.4***		872.3***	

\*\*\*: significant at the 1% level.

(Table 10). The margin was not distributed according to trader type. The total marketing costs which were estimated at  $742.7 \pm 530.7$  XOF for sheep and  $663.2 \pm 463.6$  XOF for goats, differed according to sheep type traders (at the 1% threshold) and goat type traders (at the 5% threshold). The marketing profits of small ruminants were estimated at an average of  $5,022.9 \pm 4,358.4$  XOF per sheep and  $3,140.6 \pm 1,579.8$  XOF per goat. Marketing profit did not vary according to the type of sheep trader, and there was a significant difference in marketing profit at the 5% level between goat wholesalers and retailers. The marketing efficiency was 78.8% for sheep and 78.9% for goats. It varies between the types of traders.

### 3.5. Marketing constraints

Several constraints have hampered the marketing of small ruminants (Table 11). The six most important constraints according to traders were insufficient capital, low profits, difficult access to credit, unattractive pricing mechanisms, high transport costs, and poor road networks. These six problems were ranked in the same order for sheep and goats. In addition to these constraints, losses due to animal deaths and animal storage problems ranked 7th and 8th respectively among sheep traders but 9th and 7th place for goat traders. Market and transport taxes are also constraints. The last three difficulties faced by traders are inadequate market information, lack of standard measures for purchasing, and fluctuating animal prices.

## 4. Discussion

### 4.1. Market organization

Small ruminant traders in Benin were predominantly men. Low proportion of women in small ruminant trade can be explained, according to Mtimet et al. (2014), by the fact that women are more responsible for household chores and small ruminant breeding than livestock trading.

Among the six marketing periods identified, Aïd el-kebir and Christmas/New Year were two periods during which sheep and goat demand was high and their prices increased. Sangaré et al. (2005) have also shown that in West Africa, the peak demand for sheep is around religious festival periods (Aïd el-kebir, Christmas), and that to meet this exceptional demand quantitatively and qualitatively, breeders and traders engage in small ruminant fattening (Adote et al., 2011).

#### **4.2. Market concentration**

Small ruminant markets are structurally monopolistically competitive and unconcentrated. They were characterised by the presence of a significant number of traders and buyers and few barriers to entry and exit. However, the presence of many traders and buyers does not guarantee competition and marketing efficiency unless these actors have good knowledge of the functioning of these markets (Kassa, 2017). Sheep and goats were not replaced imperfectly because of their attributes. Furthermore, traders do not control small ruminant markets. Instead, strong competition exists between traders. Kifle (2014) identified weakly concentrated small ruminant markets in the Afar region of Ethiopia. This type of market could facilitate the entry of new traders into small ruminant trade. It was noted that wholesalers were less numerous, but more competitive than retailers and semi-wholesalers. Becoming a wholesaler requires more operating capital and is riskier than other types of traders.

#### **4.3. Barriers to market entry and exit**

Capital and access to credit are important financial constraints for new traders. Access to credit can facilitate possession of capital. However, owing to the risky nature of small ruminant marketing, traders obtain little credit from banks and other financial institutions. Almost all small ruminant traders in Benin's markets operate on their own funds, similar to large ruminant traders in Kenya (Onduso et al., 2020). To counteract difficulties in accessing credit, approximately 15% of small ruminant traders buy animals on credit from their suppliers if a strong bond of trust or kinship is established between the suppliers and them. Non-repayment of credit weakens the business of suppliers, most of whom are traders.

Access to information on small ruminants through traders and family members demonstrates the existence of a social alliance, based mainly on kinship and friendship, between traders seeking information. This could affect market performance in terms of access to market information for new traders who do not belong to these information networks, in line with Ajala and Adesehinwa (2008) on pig marketing in Nigeria.

In this study, holding a trading card is not a difficulty for potential new traders, as shown by Kifle (2014). Nor does it oblige those who have it to pay more tax. This is just a recognition card for traders by the market management committees. There are no apparent strong restrictions on entry and exit from small ruminant trade. New small-ruminant traders can enter the market and compete with older traders. Access to adequate information on small ruminant supply, demand, and prices allows traders to make decisions with minimal risk of loss. This indicates a high degree of market transparency, and reflects an efficient marketing system. Belay (2009) showed that the lack of adequate information leads traders to increase their marketing margins to protect themselves from the risk of price falls.

Trading small ruminants did not require large investments in equipment or buildings; any trader who wanted to stop this activity could do so without a great loss. The presence of brokers in 52.4% of markets was considered by some traders to be a barrier for small ruminant buying and selling, especially when these brokers were informal and abused the trust of buyers and sellers. Therefore, the breeder's organisation ANOPER is struggling to convert or eliminate brokers in markets.

#### **4.4. Differentiation of small ruminants**

The three breeds of sheep and goats (Sahelian, Djallonké, and crossbreeds) that exist in Benin (Adote et al., 2011) are known to traders and differ in their attributes and availability. Unlike Sahelian breeds, Djallonké and crossbreeds are available full-time, and their trade periods are similar. Indeed, Sahelian sheep are in accordance with Islamic requirements (white coat, etc.), and are therefore more popular during the Aïd el-kebir. Sahelian goats were also sold during the Aïd el-

kebir period, but much more throughout the year. This market differentiation of small ruminants is the main feature of monopolistically competitive markets. According to Cayla (2003), this differentiation is as objective (derived from the attributes of small ruminants) as it is subjective (depends only on the perception of small ruminant buyers). Traders in monopolistic competition are driven by trends in changing preferences and product differentiation (Todorova, 2021). This differentiation allows market organisations to temporarily receive a monopoly surplus or rent, as if they were in a monopoly market (Rodrigues, 2014).

#### **4.5. Buying and selling practices**

Most traders did not associate with other traders for purchases or sales. In addition, they did not have purchase contracts with suppliers or sales contracts with customers. Traders did not engage in unfair or exclusionary tactics against rivals, let alone in collusive associations. Market performance could not be negatively impacted by these practices, which is consistent with highly competitive structure markets. Distances to other markets, road state, low-level equipment, and market security explained the different attitudes of traders when not all animals were sold on the market day. Moving animals to other markets entails additional transport costs, which could make traders less competitive in marketing. Leaving animals in the market the next day was only possible in a few small ruminant markets in Benin, as most markets were not adequately equipped. This attitude also held by traders in Sudan entailed feeding, storage, and guarding costs (Awad et al., 2013) that impact marketing performance.

#### **4.6. Price fixing**

According to Krugman et al. (2012), in a monopolistically competitive market, the number of traders and prices are determined by two relationships: the first is that the more traders, the greater the competitive pressure and the lower the prices; the second is that the more traders, the lower the quantity sold and, therefore, the higher the average cost. In Benin's small ruminant markets, the price-setting mechanism is mostly controlled by traders, and sometimes by informal brokers. This pricing mechanism has also been observed in Ethiopia's live cattle market (Zekarias & Teshale, 2019). Several factors influencing small ruminants' prices in Benin, such as the animal's body condition, breed, purchase period, age, sex, and coat colour, also affect the pricing of oxen in Kenya, as shown by Onduso et al. (2020). In general, the higher the animal's body condition score, the more expensive the animal is. Sahelian breed animals are preferred and more expensive than Djallonke because they have a superior body size. During some trade periods, such as the Aïd el-kebir, Christmas/New Year, and Ramadan, animal prices increased relatively. In addition, males were more expensive than females. Regarding coat colour, white sheep were more popular and more expensive, while brown goats were more popular. Buying animals directly from breeders is profitable for traders. Traders can revise animal prices if buyers choose several prices. According to traders, some buyers prefer animals from Burkina and Niger because they are taller. However, it should be noted that this factor is linked to the breeds, as animals from these countries were most often of the Sahelian breed. The informal presence of brokers in some markets, especially those in southern Benin, influenced the purchase price of animals in that they discussed prices according to profit they could make on transactions and on buyer experience.

#### **4.7. Transaction costs**

Transport costs represent approximately 50% of the total sheep and goat marketing costs. This finding agrees with those of Hailemariam et al. (2009), Onono et al. (2015), and Onduso et al. (2020) for Kenya and Ethiopia. Difficulty in accessing small ruminant markets accounts for high transport costs, that impact traders' profits and consequently, the efficiency of small ruminant marketing. The highest transport and communication costs observed at the wholesaler level are explained by the fact that they travel long distances to buy and sell animals and also because they use semi-wholesalers or brokers to buy animals, and therefore communicate a lot with these people. Transport costs vary according to distance, road quality, and the means of transport used (Aoudji et al., 2011; Onduso et al., 2020). The construction or rehabilitation of roads leading to markets can reduce transportation costs. A reduction in transport costs will decrease total marketing costs and therefore improve small ruminant marketing performance. Transport and market taxes account for at least 20% of total marketing costs. While formal brokers were perceived as a barrier by some traders, transactions were necessarily conducted in some

markets through informal brokers. Sellers and buyers were then left to the broker rules. Hailemariam et al. (2009) suggest that policymakers should devise enforce to law and order in markets so that buyers and sellers can operate freely. ANOPER has worked to remove brokers (formal and informal) in self-managed markets.

#### **4.8. Efficiency**

Small ruminant marketing in Benin induces positive efficiency indices, but lower than those estimated by Maikasuwa and Jabo (2014), who obtained an efficiency of 133% for sheep and 146% for goats in their study in the Sokoto metropolis in Nigeria. However, a comparison of our results with those of Feven (2010) shows that sheep marketing in Benin is more efficient than that in the Menz district in Ethiopia. Market efficiency is influenced by market structure and competition between traders. Sheep prices are higher than goat prices. This justifies traders' claims that marketing sheep requires more capital than marketing goats. The higher purchase and resale prices for sheep lead to higher margins and profits from sheep marketing than from goat marketing, but the marketing efficiency indices for the two species are statistically equal. Insufficient capital, low profit, difficult access to credit, and high transport costs impact the performance of small ruminant marketing, which is in line with Ajala and Adesehinwa's (2008) findings in Nigeria.

#### **4.9. Marketing constraints**

Despite the efficiency of marketing small ruminants in Benin, twelve problems, namely insufficient capital, low profit, difficult access to credit, unattractive pricing mechanisms, high transport costs, poor road networks, storage problems, high losses due to animal death, high taxes, inadequate market information, lack of standard measurement for purchases, and price fluctuations hampered marketing performance. Some of these constraints are linked. Poor road conditions between small ruminant markets lead to increased transaction costs, which in turn affects traders' profits. High taxes (during transport and in markets) and losses due to the death of animals also lead to lower traders' profits. In addition, 73.8% and 69.1% of sheep and goat traders lost an average of 5.9 ( $\pm 5.4$ ) sheep and 6.8 ( $\pm 6.7$ ) goats per year due to transport conditions, diseases, and other causes. These issues were clearly reflected in transaction costs.

Capital is necessary for all businesses. Traders complain of insufficient capital because there is a large supply of small ruminants, but they often cannot afford to buy as much as they want; they are limited by their capital. This difficulty was a barrier for all traders, especially new traders. Based on trust and networks, some elders buy animals on credit and pay once the sale is assured. Few traders have access to credit, which increases their lack of capital. Furthermore, between the buying and selling periods, traders had to store animals for a few days. Not all traders have enclosures or suitable spaces to handle this storage. During this period, they faced expenses related to feeding, care, and so on. From one market to another, some traders were obliged to pay costs for livestock security and guards, while others incurred additional expenses for transport. Small ruminants are sold based on their directly observable attributes. However, these attributes do not necessarily reflect the value of small ruminants. The establishment of a unit of measurement of sale (e.g., weighing) could facilitate the harmonisation of purchase and sale prices and avoid large price differences between two small ruminants with the same attributes in the same market. The inadequacy of market information and price fluctuations between markets lead traders (especially from the north who come to sell in the markets of the South) to sell animals at prices lower than the purchase price. In doing so, they find themselves in debt.

Regarding the relationship between structure, conduct, and performance, Todorova (2021) demonstrated that monopolistically competitive markets are characterised by strong competition, easy entry and exit, low opportunism, accessible and abundant information, and positive but minimal transaction costs. This research is in line with this, although efforts should be made to further reduce transaction costs and improve efficiency. Monopolistic competition, when transaction costs are positive, is the true form of competition and social optimum, whereas perfect competition becomes an ideal, hypothetical,



and unrealistic benchmark (Todorova, 2021). Thus, Benin's small ruminant markets, for the moment, have a structure, but actions must be taken to improve trader behaviour and marketing performance. With increasingly complex supply chain relationships, traders and other actors in small ruminant value chains need to be well-informed about the best decision models to achieve profit maximisation. Therefore, subjective norms have a significant impact on behavioural intention to purchase efficiency (Pop et al., 2022). Recently a body of scientific knowledge has exploited machine learning method, algorithms in the trading environment in dynamic evaluation to determine trends and patterns in customer behaviour and capture customer attitudes and feelings (Hopkins, 2022; Kliestik et al., 2022b, 2022a; Nica et al., 2022). In future studies, these aspects should guide additional efforts to examine changes in consumer behaviour and explore how decision-makers in supply chains decide on the best pricing strategy to maximise profit.

## 5. Conclusion

Based on the SCP approach, our research showed that sheep and goat marketing is efficient. Small ruminant markets in Benin are unconcentrated, monopolistic, or effective competition markets. These markets are characterised by the presence of many traders, most of whom sell both species. These traders offer small ruminants differentiated by attributes such as body condition, breed, age, sex, and coat colour, with prices varying according to these attributes as well as trade period. Capital and limited access to credit were identified as the most important barriers to entry by new traders. Traders did not engage in unfair or exclusionary tactics, let alone in collusive associations that could negatively influence small ruminant marketing performance. Even if the marketing of small ruminants is efficient, reducing transport costs (by improving transport infrastructure), equipping markets, eliminating brokers (formal and informal), and reducing numerous taxes (transport taxes, market taxes, and transaction fees) by a better organisation of markets will considerably improve small ruminant marketing efficiency in Benin. This study provides useful implications for marketers and policymakers. Our study points to possibilities for improving marketing. It is expected that this research will serve as a basis for interesting extensions on the subject of small ruminant marketing. This study this study does not confirm or reject traditional SCP or efficient structure hypotheses, so future studies can be conducted in this regard. A more in-depth analysis of the behaviour of traders and buyers would establish a closer relationship between conduct and performance. As the temporal aspect was not considered in this research, one extension would be to study the variations between the marketing periods identified in this paper. Further research on price formation and price variation between markets and over several marketing periods could provide a more complete analysis of performance. Another interesting extension would be to analyse the different value chains in the small ruminant sector.

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## Ethics approval and consent to participate

All traders gave their consent before conducting the interview.

#### Data availability

The datasets used and/or analyzed during the current research are available from the corresponding author on reasonable request.

#### Disclosure statement

No potential conflict of interest was reported by the author(s).

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#### References

- Adégbola, P., Komlan-Ahihou, C., Adégbidi, A., Adetonah, S., Coulibaly, A., Mensah, O., & Montcho, M. (2016). Marketing of Jews mallow in Agbedranfo local area in the Southwest of Benin. *African Journal of Marketing Management*, 8(3), 20–31. <https://doi.org/10.5897/ajmm2016.0486>
- Adote, M. S., Azando, E., & Awohouedji, Y. (2011). Biodiversity in animal husbandry zones: Small ruminants. In B. Sinsin & D. Kampman (Eds.), *Atlas de la Biodiversity Atlas of West Africa* (Vol. 1, pp. 506–518). Elsevier.
- Ahmed, Y. A. (2020). Structure, conduct, and performance (SCP) of fruit marketing in Ethiopia. *Journal of Marketing and Consumer Research*, 68. <https://doi.org/10.7176/JMCR/68-01>
- Ajala, M. K., & Adesehinwa, A. O. K. (2008). Analysis of pig market in ZangoKataf local government area of Kaduna state Nigeria. *Tropicicultura*, 26, 229–239. <http://www.tropicicultura.org/text/v26n4/229.pdf>
- Aoudji, A. K. N., Adégbidi, A., Agbo, V., Ganglo, J. C., & Lebailly, P. (2011). Costs and value added in the marketing of teak Poles in South Benin. *Cahiers Agricultures*, 20(6), 480–486. <https://doi.org/10.1684/agr.2011.0529>
- Ashenafi, G. (2017). Challenges and opportunities of milk production under different urban dairy farm sizes in Ethiopia. *Global Journal of Dairy Farming and Milk Production*, 5(1), 274–280.
- Awad, E., Arshad, F., Mohamed, Z., & Ismail, M. (2013). Marketing of sheep in Sudan, Profile of the market system and production: A case of study of North Kordofan and Khartoum States, Sudan. *Trends in Applied Sciences Research*, 8(1), 26–35. <https://doi.org/10.3923/tasr.2013.26.35>
- Ayele, S., Zemedu, L., & Gebremdhin, D. (2017). Analysis of market structure, conduct and performance of beef cattle: The case of dugda district, east shoa zone, Oromia regional state, Ethiopia. *Journal of Biology, Agriculture and Healthcare*, 7(5), 5–11. <https://www.iiste.org/Journals/index.php/JBAH/article/view/35956/36952>
- Bain, J. S. (1959). *Industrial organization*. John Wiley and sons.
- Belay, H. (2009). Performance of cattle marketing in Jijiga zone, Somali Region, Ethiopia (Unpublished MSc thesis, University of Mekelle, Ethiopia).
- Bergquist, L. F., & Dinerstein, M. (2020). Competition and entry in agricultural markets: Experimental evidence from Kenya. *American Economic Review*, 110(12), 3705–3747. <https://doi.org/10.1257/aer.20171397>
- Cayla, D. (2003). *The theory of monopolistic competition: A perspective for a deepening of the theories of the firm*. HALSHS. <https://halshs.archives-ouvertes.fr/halshs-00110494> Accessed 14 May 2021
- FAO. (2020). Summary of the state of agricultural commodity markets. In *Agricultural markets and sustainable development: Global value chains, smallholders, and digital innovations*. (pp. 32). <https://doi.org/10.4060/cb0677en>.
- Ferguson, P. R. (1988). The structure-conduct-performance paradigm. In *Industrial economics: issues and perspectives* (pp. 7–22). Palgrave: London, Springer. [https://doi.org/10.1007/978-1-349-19211-3\\_2](https://doi.org/10.1007/978-1-349-19211-3_2).
- Feven, T. (2010). Price and Performance Analysis of Indigenous Sheep Breed Marketing in Menz Districts of Ethiopia (Unpublished MSc thesis, Haramaya University, Ethiopia).
- Gemechu, A. (2018). Determinants of dairy value chain upgrading by smallholder farmers in central Ethiopia. *World Journal of Dairy & Food Sciences*, 13(1), 09–17. <https://doi.org/10.5829/idosi.wjdfs.2018.09.17>
- Hailemariam, T., Getachew, L., & Dawit, A. (2009). Market structure and function for live animal and meat exports in some selected areas of Ethiopia. Research Report. EIAR.
- Harriss, B. (1979). There is method in my madness: Or is it vice versa? Measuring agricultural market performance. *Food Research Institute Studies*, 17(2), 197–218.
- Hopkins, E. (2022). Machine learning tools, algorithms, and techniques in retail business operations: Consumer perceptions, expectations, and habits. *Journal of Self-Governance and Management Economics*, 10(1), 43–55. <https://doi.org/10.22381/j sme10120223>
- Jumono, S., Abdurrahman, A., & Fath Mala, C. M. (2017). Market concentration index and performance: Evidence from Indonesian banking industry. *International Journal of Economics and Financial Issues*, 7(2), 249–258. <https://econpapers.repec.org/RePEc:eco:journ1:2016-01-28>
- Kassa, T. (2017). Structure and conduct of honey market in Chena District Kaffa Zone, Southern Ethiopia. *World Journal of Agricultural Sciences*, 13(1), 45–52. <https://doi.org/10.5829/idosi.wjas.2017.45.52>
- Kifle, Z. (2014). Assessment of the Performance of the Goat Marketing System in Afar Region, Ethiopia (Unpublished MSc Thesis, University of Mekelle, Ethiopia).
- Kliestik, T., Kovalova, E., & Lázároiu, G. (2022b). Cognitive decision-making algorithms in data-driven retail intelligence: consumer sentiments, choices, and shopping behaviors. *Journal of Self-Governance and Management Economics*, 10(1), 30–42. <https://doi.org/10.22381/j sme10120222>
- Kliestik, T., Zvarikova, K., & Lázároiu, G. (2022a). Data-driven machine learning and neural network algorithms in the retailing environment: Consumer engagement, experience, and purchase behaviors. *Economics, Management, and Financial Markets*, 17(1), 57–69. <https://doi.org/10.22381/emfm17120224>
- Koffi-Tessio, E. M., Sedzro, K., Tossou, K. A., & Yovo, K. (2007). Structure, transaction costs and food market integration in togo. *Proceedings of international conference on African association of agricultural economists (Accra, Ghana, August 2007)*, *AgEcon Search*, 507–511. <http://ageconsearch.umn.edu/bitstream/52187/2/Koffi-Tessio.pdf>
- Kosgei, R. C. (2018). Analysing market conduct and performance of honey marketing in West Pokot, Kenya. *Scholars Journal of Economics, Business and Management*, 58, 786–792. <https://doi.org/10.21276/sjebm.2018.5.8.10>
- Kpenavoun, S., Assogba, R., Degbey, H., Abokini, E., & Achigan-Dako, E. (2019). Market structure and performance of watermelon (*Citrullus lanatus*) in Benin. *Scientific African*, 3, e00048. <https://doi.org/10.1016/j.sciaf.2019.e00048>

- Krugman, P., Obstfeld, M., Melitz, M., Capelle-Blancard, G., & Matthieu Crozet, M. (2012). Chapter 8: Firms in the Global Economy: Export Decisions, Outsourcing, and Multinational Enterprises. *International economics* (9th ed. (pp. 155–191). Pearson Education. <https://cdn.prexams.com/8978/International%20Economics%20Theory%20and%20Policy%20Book%209th%20Edition.pdf>
- Kwamina, E. B., Nam, C.N.A., & Ockie, J.H.B. (2016). A Systems Thinking Approach to the Structure, Conduct and Performance of the Agricultural Sector in Ghana. *Systems Research and Behavioral Science*, 35(1), 39–57. <https://doi.org/10.1002/sres.2372>
- Lutz, C., Erno, K. W., & Tilburg, A. (2007). Maize market liberalisation in Benin: A case of hysteresis. *Journal African Economics*, 16(1), 102–133. <https://doi.org/10.1093/jae/ejk008>
- Lysholm, S., Johansson Wensman, J., Munyeme, M., & Fischer, K. (2020). Perceptions and practices among Zambian sheep and goat traders concerning small ruminant health and disease. *PLoS ONE*, 15(6), e0233611. <https://doi.org/10.1371/journal.pone.0233611>
- Maikasawa, M. A., & Jabo, M. S. (2014). Analysis of sheep and goat marketing in Sokoto Metropolis, Sokoto State, Nigeria. *International Journal of Agricultural Sciences and Veterinary Medicine*, 2(1), 185–198.
- Mensah, S. E. P., Adégbola, P. Y., Edénakpo, A. K., Adjovi-Ahoyo, N., Tossa, I. G., & Fatunbi, A. O. (2017). Innovation opportunities in small ruminants livestock sector in Benin. Guide book 2, Forum for Agricultural research in Africa. FARA.
- Miles, D. (2014). Statistics research: Measuring customer behaviour profitability: using marketing analytics to examine customer and marketing behavioural patterns in business ventures. *Academy of Marketing Studies Journal*, 18, 145–168. [https://www.researchgate.net/publication/267211485\\_JOURNAL\\_ARTICLE\\_Applied\\_Statistics\\_Research\\_Measuring\\_Customer\\_Behavior\\_and\\_Profitability\\_Using\\_Marketing\\_Analytics\\_To\\_Examine\\_Customer\\_And\\_Marketing\\_Behavioral\\_Patterns\\_In\\_Business\\_Ventures](https://www.researchgate.net/publication/267211485_JOURNAL_ARTICLE_Applied_Statistics_Research_Measuring_Customer_Behavior_and_Profitability_Using_Marketing_Analytics_To_Examine_Customer_And_Marketing_Behavioral_Patterns_In_Business_Ventures)
- Mtimet, N., Baker, D., Audho, J., Oyieng, E., & Ojango, J. (2014). Assessing sheep traders' preferences in Kenya: A best-worst experiment from Kajiado County. *UMK Procedia*, 1, 63–73. <https://doi.org/10.1016/j.umkpro.2014.07.009>
- Naldi, M., & Flamini, M. (2014). *The CR4 index and the interval estimation of the Herfindahl- Hirschman Index: An empirical comparison*. HALSHS, hal-01008144. <https://hal.archives-ouvertes.fr/hal-01008144>
- Negassa, A., Rashid, S., & Gebremedhin, B. (2011). Livestock production and marketing in Ethiopia. Ethiopian Support Strategy Program II, Working Paper, 26, Washington, D.C, IFPRI.
- Nica, E., Sabie, O.-M., Mascu, S., & Luțan, A. G. (2022). Artificial intelligence decision-making in shopping patterns: consumer values, cognition, and attitudes. *Economics, Management, and Financial Markets*, 17(1), 31–43. <https://doi.org/10.22381/emfm17120222>
- Ojango, J. M. K., Oyieng, E. P., Audho, J., & Okeyo, A. M. (2014). Utilizing technology to improve market access and livelihood security among pastoralists in eastern Africa: A case for the indigenous sheep in Kenya: Baseline household survey report, ILRI, Nairobi, Kenya.
- Onduso, R., Onono, J. O., & Ombui, J. N. (2020). Assessment of structure and performance of cattle markets in western Kenya. *Tropical Animal Health and Production*, 52(2), 725–732. <https://doi.org/10.1007/s11250-019-02062-2>
- Onibon, P. (2004). *Capitalisation et evaluation des marches à bétail autogérés au nord Benin* (pp. 1–57). Capitalization document, Inter-reseaux, Ressources.
- Onono, J. O., Amimo, J. O., & Rushton, J. (2015). Constraints and efficiency of cattle marketing in semiarid pastoral system in Kenya. *Tropical Animal Health and Production*, 47, 691–697. <https://doi.org/10.1007/s11250-015-0779-6>
- Ordofa, G., Zemedu, L., & Tegegne, B. (2021). Structure conduct and performance of dairy market in Ada'a Berga district, Ethiopia. *Cogent Food & Agriculture*, 7(1), 1918878. <https://doi.org/10.1080/23311932.2021.1918878>
- Phuu, Z. (2016). Analysis of structure, conduct and performance of cabbage market in central district of Botswana (Unpublished MSc Thesis, University of Nairobi, Kenya). Collections Faculty of Agriculture & Veterinary Medicine (FAG / FVM).
- Pop, R. A., Dabija, D. C., Pelau, C., & Dinu, V. (2022). Usage intentions, attitudes, and behaviours towards energy-efficient applications during the COVID-19 pandemic. *Journal of Business Economics and Management*, 23(3), 668–689. <https://doi.org/10.3846/jbem/2022/16959>
- Rodrigues, C. (2014). *Les marchés imparfaitement concurrentiels (Note de cours)*. Ecole supérieure du professorat et de l'éducation, Université Aix-Marseille, 2014. <http://eloge-des-ses.com/wp-content/uploads/2016/04/OPAE-March%C3%A9s-imparf-conc-CR.pdf>
- Ruttoh, J. K., Bett, E. K., & Nyairo, N. (2018). Empirical analysis of structure and conduct of tomato marketing in Loitoktok, Kajiado County, Kenya. *International Journal of Agricultural Extension and Rural Development*, 6(4), 628–638. <http://ir-library.ku.ac.ke/handle/123456789/23160>
- Sangaré, M., Thys, E., & Gouro, A. S. (2005). *Feeding local sheep: Sheep fattening techniques, choice of animal and duration*. Synthèse du Centre International de Recherche-Développement sur l'Élevage en zone Subhumide (CIRDES). Fiche n° 13.
- Sigei, G. (2014). Determinants of market participation among small-scale pineapple farmers in Kericho county, Kenya (Unpublished MSc thesis, Egerton University, Kenya).
- Silmi, B., Yoesdiarti, A., Miftah, H., & Sumantri, A. (2020). Analysis of structure, conduct, performance (scp) robusta coffee commodities (coffea canephora). *Indonesian Journal of Applied Research*, 1(2), 118–127. <https://doi.org/10.30997/ijar.v1i2.59>
- Todorova, T. (2021). Some efficiency aspects of monopolistic competition: innovation, variety and transaction costs. MPRA Paper No. 109919, American University in Bulgaria, Munich Personal RePEc Archive (MPRA). <https://mpra.ub.uni-muenchen.de/109919/>
- Zekarias, B., & Teshale, W. (2019). Market structure conduct and performance of live cattle in Borana Pastoral area: The case of Moyalle District, Oromiya Regional State. *International Journal for Modern Trends in Science and Technology*, 5(10), 29–37. <https://doi.org/10.32474/CIACR.2018.04.000189>



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