Analysis of the marketing channels of an indigenous smallholder cattle breed at risk of losing genetic diversity: The case of the Lagune cattle in Benin

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Abstract

This study was undertaken to investigate the marketing channels of Lagune cattle and identify market potentials, constraints, and opportunities for its increased commercialisation. It was based on literature research and field surveys conducted between February and April 2022 in six localities of the Ouémé department in southeast Benin, where the largest population of this breed is found. One hundred seventy-three (173) producers of Lagune cattle and 20 butchers were included in the field survey. The marketing channels were identified, the different actors were described, and their average profit margins were estimated and compared. The results show that Lagune cattle production in rural and peri-urban areas is characterised by specific breeding practices. The direct producers-consumers channel was the most important commercialisation channel for this breed, followed by the producers-retailers (butchers)-consumers one. A net margin per animal of 107,391 FCFA and 33,407 FCFA was obtained by producers and butchers, respectively. The benefit-cost ratio for producers and butchers was 8.43 and 3.31, respectively, indicating that the capital invested by these two groups of actors was globally recovered. The results further show that despite its extensive characteristics, smallholder Lagune cattle farming is profitable. Finally, issues related to improving conditions for controlling cattle flows and slaughters in Ouémé department should be discussed to promote the breed and increase its commercialisation.

Keywords: commercialisation channels, farm gate, Lagune breed

1 Introduction

Livestock farming is a source of income, social status, and food for many households worldwide (Thornton, 2010). It represents a form of savings that can be rapidly mobilized through the sale of animals whenever cash is needed (Alary *et al.*, 2011; FAO, 2012), and contributes therefore to food security and poverty reduction, especially in rural settings (Smith *et al.*, 2013). In Benin, it is the second largest agricultural activity after crop production and contributed about 13.3 % of the agricultural GDP in 2021 (DSA, 2022).

Domestic meat production mainly relies on cattle, which contribute approximately 50 to 60 % of the locally produced meat each year (Dognon *et al.*, 2018). The national cattle herd size was estimated at approximately 2.62 million head in 2021 (FAOSTAT, 2022). Although there has never been a breed census, it is accepted that this herd is composed of 31 % taurine breeds (Borgou, Lagune, and Somba), 7.7 % zebu (White Fulani, Goudali, Djelli, and M'Bororo), and 61.3 % hybrids derived from crossbreeding (Youssao, 2015). In 2014, Benin exported approximately 144,428 heads of cattle (81.75 % of marketed domestic animals) to Nigeria and other countries in West Africa (PAFILAV, 2014).

The Lagune cattle are mainly reared in southern Benin; they are remarkably well adapted to the prevailing local conditions and, due to their achondroplasia, that is genetically founded dwarfism, are tolerant to trypanosomosis, a parasitic

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disease spread by tsetse flies (Murray *et al.*, 1982; Thévenon & Berthier, 2015). The small-sized and rustic animals are easier to rear, even by poor people, than zebu breeds (Rege, 1999). Furthermore, compared with other breeds, the meat of Lagune cattle has better technological, organoleptic, and sensory qualities (Salifou *et al.*, 2013).

Despite these advantages, the breed is still regarded as a minor breed, less prioritised in national livestock development programmes in Benin and other West African coastal countries where it exists, and has consequently attracted insignificant marketing research. The actors involved in the process of moving Lagune cattle from producers to consumers are therefore not known. At the same time, this dwarf West African shorthorn taurine breed is increasingly subjected to crossbreeding with zebu breeds due to the preference of farmers for larger-framed animals (Ahozonlin *et al.*, 2019). According to UA-BIRA (2017), the main factor in the increasing crossbreeding of the Lagune cattle breed is the inability of different stakeholders to properly appreciate the breed. Indeed, it is perceived as having low productivity because of its small mature size (Leroy *et al.*, 2016; Wilson, 2018).

However, in a recent study, Kinkpe *et al.* (2019) showed that (small sized) West African taurine breeds fetch higher hedonic prices than zebu breeds. The authors also highlighted the absence of Lagune cattle in formal livestock markets in Benin. To add value to this neglected breed, it is important to investigate its flow from production areas to consumption points and identify the different actors involved in its marketing, their respective profit margins, and constraints.

Therefore, the current study sought to bridge this knowledge gap. Specifically, it aimed to map the marketing channels of Lagune cattle, determine the profit margins and ascertain challenges faced by Lagune cattle producers and traders in southeast Benin to identify key points for improvement.

Theoretical framework

The livestock marketing channel is a group of actors and activities required to bring a product (for example, live animals, meat, milk, eggs, leather, manure) from producers to consumers (Rich *et al.*, 2009). By studying the core activities of each of the marketing channel actors, their relationships, and the constraints they face, it becomes possible to identify potential entry points to assist them in improving their revenues.

Marketing channel analysis is a methodology that develops markets for small farms by building on actual market demand and profits. Marketing channels can be divided into two types: the direct marketing channel, in which producers undertake all marketing activities and directly sell products to consumers without middlemen, and the indirect marketing channel, in which one or more middlemen are involved in marketing activities (Kotler & Armstrong, 2012). A marketing channel analysis must enable understanding of the functioning of markets, that is the participation of different actors and their relationships (Schmitz & Knorrina, 2000; Pietrobelli & Saliola, 2008), the main constraints of production, and, consequently, the competitiveness of producers. The relationships between different actors include both vertical and horizontal relationships. While the vertical relationship concerns upstream or downstream relationships in the channel, the horizontal relationship defines relationships between firms in the same link of the channel (Kadigi *et al.*, 2013). In the livestock marketing channel, different activities are directly linked, and value creation is the priority of the actors. The livestock marketing channel can be influenced by the production scale (Mpairwe *et al.*, 2015). For these authors, the scale of production regroups small-scale, large-scale and medium-scale producers. Marketing channel analysis plays an important role for rural development (Marsden *et al.*, 2000).

2 Materials and methods

2.1 Study area

The study was conducted in the Ouémé department (Fig. 1) in southeast Benin. This department covers an area of 1281 km² (INSAE, 2015). It has a subequatorial climate characterised by two rainy seasons that extend from April to July (long) and from October to November (short), and two dry seasons from August to September (short) and from December to March (long) (Adomou, 2005). The average annual temperature varies from 25 °C to 30 °C, and the annual rainfall ranges from 1100 mm to 1300 mm (Adomou, 2005). The major natural vegetation or biomes found in the Ouémé region are mainly rainforest, savannah, mangrove, and wetlands. According to the Land Cover Classification System (LCCS) developed by Di Gregorio & Jansen (1998), the major land cover types are cultivated and managed terrestrial areas, natural and semi-natural terrestrial vegetation, cultivated aquatic or regularly flooded areas, and natural and semi-natural aquatic or regularly flooded vegetation. In cultivated and managed terrestrial areas, trees, shrubs, herbaceous, graminoid, non-graminoid crops, and managed lands were distinguished (Di Gregorio & Jansen, 1998).

For the purpose of this study, the Ouémé department was divided into two zones (rural and peri-urban) based on criteria defined by André *et al.* (2014). The rural zone, characterised by a low population density, is located far from urban

centres like the Porto-Novo municipality, and encompasses the municipalities of Adjohoun, Dangbo, and Aguégués. The main economic activities in this zone include agriculture, livestock, and fisheries. In contrast, the peri-urban zone, including the municipalities of Akpro-Missereté, Adjarra, and some areas of Porto-Novo, is the transitional zone between urban and rural areas. This zone has a moderate population density and a mix of land uses, including commercial and industrial activities, crop and livestock farming, and horticulture. It is characterised by a rapidly progressing urbanisation and residential density.

Fig. 1: *Map showing the study locations in the Ouémé department in southeast Benin with upper left inset depicting Benin within Africa and lower left inset the Ouémé department within Benin.*

2.2 Sampling and data collection

A total of 173 Lagune cattle producers (103 in rural and 70 in peri-urban areas) and 20 butchers, located exclusively in Porto-Novo, were surveyed. Face-to-face interviews using a paper-based questionnaire were carried out for data collection. Several types of data were collected from both producers and butchers; these included their socio-economic and demographic characteristics (age, gender, level of education, marital status, access to credit, labour), cattle breeding and marketing practices of the producers, sources of cattle for butchers, inputs and outputs and related monetary values, marketing constraints and opportunities for both producers and butchers.

2.3 Data analysis

Data collected were entered into a database designed using Excel software. All statistical analyses were performed using the Statistical Package for Social Sciences Version 20 (IBM Corp., 2011). Cross-tabulations with the calculation of Chi-square (χ^2) statistics were used to associate categorical variables that characterise Lagune cattle herds. The mean and standard deviations of quantitative variables were also calculated and compared across zones and among actors of marketing channels using the non-parametric Kruskal-Wallis independent sample test. The student t-test was used to compare the margins realised by the different actors in marketing channels. For the calculation of the gross margin, the variable costs related to the production of the output were deducted from the selling price as follows:

$$GM = GR - VC \tag{1}$$

where GM is the gross margin (GM), GR and VC are gross revenues and variable costs, respectively. Variable costs include costs related to fodder, health care, and ropes, while fixed costs or investment costs are related to depreciation of the shelter (wooden stable without holding pens) built for cattle by some producers. Regarding the butchers, the variable costs regrouped the set of costs related to animal purchasing, transportation, and health control, and the fixed costs or investment costs concerned trading license and depreciation of equipment (refrigerator or freezer, grinder, slicer and scales).

For the calculation of the net margin, the fixed costs that occurred during the production or sale of the output were deducted from the obtained GM as follows:

$$NM = GM - investment\ costs \tag{2}$$

where NM is the net margin, and GM is the gross margin.

The benefit-cost ratio (BCR) was used to analyze the profitability of the activity. An activity is considered economically profitable when the BCR exceeds 1 and is not economically profitable when the BCR is lower than 1. When BCR = 1, the production activity does not generate any loss or profit. The student t-test was used to assess the differences in economic variables between peri-urban and rural producers and between producers and butchers.
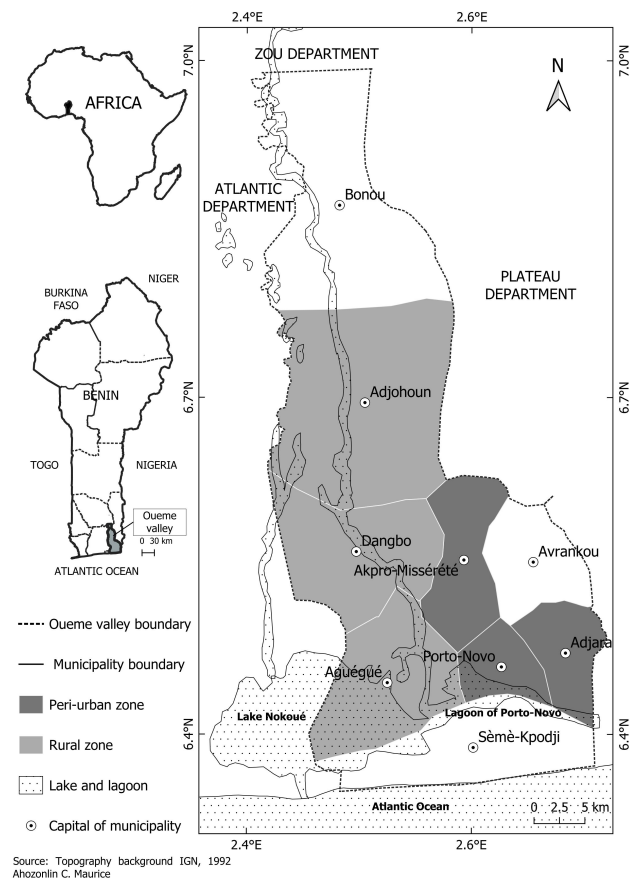
Table 1: *Socio-economic characteristics (in %) of Lagune cattle producers surveyed in the Ouémé region of southern Benin.*

| Variables	Overall (n=173)	Peri-urban (n=70)	Rural (n=103)	χ^2	P-value
Religion				9.230	0.010
Christianism	82.1	82.9	82.1		
Islam	5.8	0	5.8		
Indigenous	12.1	17.1	12.1		
Socio-cultural group				35.169	0.001
Goun	87.9	70	100		
Tori	11	27.1	0		
Other	1.2	2.9	0		
Education level				4.223	0.121
None	77.5	70.0	82.5		
Some years primary	15.0	18.6	12.6		
Some years secondary and more	7.5	11.4	4.9		
Main occupation				93.118	0.001
Crop farming	64.2	21.4	93.2		
Livestock farming	10.4	10.4	1		
Other	25.4	25.4	5.8		
	mean ± SD				
Age	48.7±11.30	44.8±10.38	50.2±11.33	-	0.011

3 Results

3.1 Socio-economic characteristics of the Lagune cattle marketing channel actors

Table 1 presents the socio-economic characteristics of the surveyed Lagune cattle producers. Lagune cattle farming was mostly practiced by men (97 %) who represented the majority of the individual producers (89 %). Their average age was 48.7 ± 11.30 years and varied between zones ($P < 0.001$). All surveyed butchers were located in Porto-Novo municipality. Most of them were illiterate (65 %) and married (95 %). They belonged to the Yoruba socio-cultural group (80 %) and practiced Islam (80 %). Most (70 %) purchased cattle through direct cash payments at farm gate.

3.2 Marketing channels of the Lagune cattle

Two marketing channels were identified. The first and most important channel (C1) was the channel producers-consumers, where animals were sold at the farm gate to consumers for slaughtering at ceremonies or funerals. The second channel (C2) was the producers-retailers (butchers)-consumers channel (Fig. 2). In C2, the producers directly sell their animals to retailers (butchers) at the farm gate or sometimes at the slaughterhouse through a contact person (*agblaanon*). Afterwards, the butchers slaughter the purchased animals in the only one slaughterhouse that exists in

the Porto-Novo municipality and process and sell the meat to consumers in their meat shop.
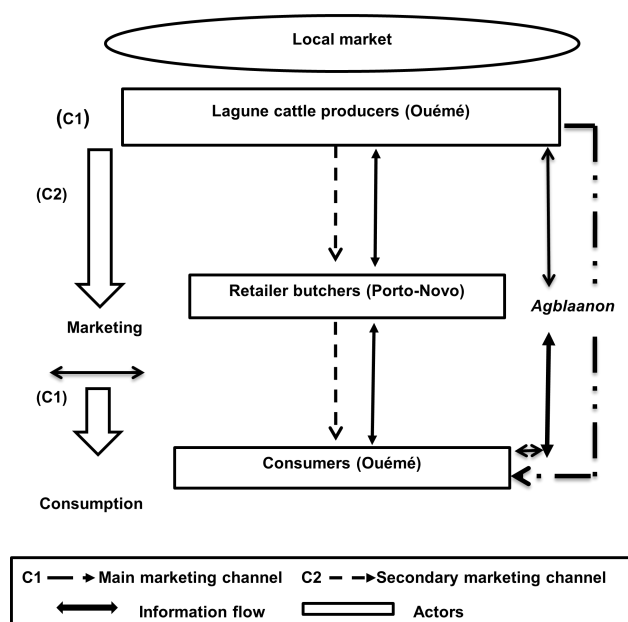
Fig. 2: *Marketing channels of Lagune cattle in southeast Benin.*

The "*agblaanon*" are members of cattle farmers' associations in the production areas. Some of them also raise Lagune cattle. They are key actors in the search of buyers of Lagune cattle, but they do not buy cattle for resale. In

the rural and peri-urban production areas where this study was carried out, there were two categories of buyers: buyer-consumers of Lagune cattle at the farm gate for ceremonies/funerals or breeding purposes, and buyers-consumers of raw meat from butchers. Each of these two channels was specific to a production area (Fig. 3): C1 was found in rural areas, such as Dangbo, Adjohoun, and Aguégués, whereas C2 existed in peri-urban areas (Porto-Novo, Adjarra, and Akpro-Missereté).
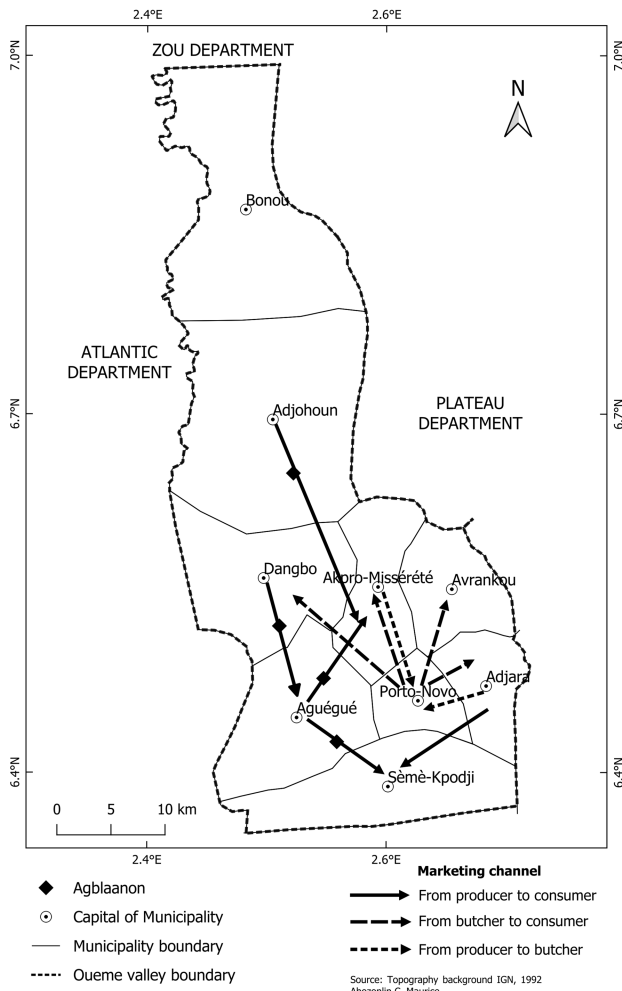

Fig. 3: *Spatial representation of the marketing channels of Lagune cattle in southeast Benin.*

3.3 Marketing channel actors of Lagune cattle

The Lagune cattle marketing channel in southeast Benin involved four actors embedded in the two marketing channels: producers, *agblaanon*, retailers (butchers), and consumers. The producers were the first actors in the Lagune cattle marketing channel. Their activities involved the breeding and sale of live animals. They sold their animals with or without a contact person (*agblaanon*) to buyers (butchers and consumers). The buyers' purpose was either slaughtering for ceremonies or funerals, or using the animals for breeding on-farm. Lagune cattle were mostly sold at farm gates because there was no formal livestock market where transactions could occur. The selling price of the different categories of animals (calves, heifers/young bulls, cows and bulls) was set according to their size and conformation. In addition to the selling price, buyers paid the seller an amount (varying from 3,000 FCFA to 5,000 FCFA per purchased animal) which represents the cost of the rope used to tie the purchased animal.

The *agblaanon* were mainly found in rural areas. In certain villages, they were key actors in Lagune cattle marketing. When the purchase was made through an *agblaanon*, the buyer had to pay a fee of 10,000 FCFA for each head of cattle purchased. This fee was donated to the producers' association fund and used for collective activities.

Butchers were found only in the Porto-Novo municipality, the nearest urban centre. However, the surveyed Lagune cattle producers rarely sold their animals directly to butchers. Sale to butchers only occurred when the animals were either sick or injured or when the owner was in urgent need of cash. In this case, the producer transported the animals to the selling place and covered the transportation costs. The purchasing price, imposed by the butcher, varied between 50,000 FCFA and 80,000 FCFA per head. The price for a kilogram of Lagune cattle meat in a butcher's shop ranged from 2,500 FCFA (meat with bones) to 2,700 FCFA (meat without bones) and was not different from the price paid for a kilogram of meat from other cattle breeds.

Consumers are actors who buy live animals or meat through one of the two channels: they either purchase live animals directly from producers at the farm gate or through a *agblaanon*, or only buy pieces of raw meat from a butcher's shop.

3.4 Relationships between actors in the distribution channels of Lagune cattle

Municipalities were grouped according to the relationships existing between actors of marketing channels to account for the spatiality of the functions related to the marketing channels of Lagune cattle. Considering the physical, exchange, and information functions performed by different actors, three types of relationships between actors in the distribution channels of Lagune cattle were identified (Fig. 4a, 4b, and 4c). Only the "producer-to-consumer" relationship with sometimes the intervention of *agblaanon* (Fig. 4a) was found in Group 1, which was present in the rural localities of Adjohoun, Aguégués, and Dangbo. Indeed, the market-

ing of the Lagune cattle in these localities was done among three actors, including two main actors (producers and consumers) and sometimes *agblaanon*. This marketing channel was characterised by an exchange function based on the transfer of animal ownership rights (purchase-sale). The rationale underlying such an exchange is mainly the negotiation of the terms of profit for each actor. Group 2 was represented only in the municipality of Porto-Novo with a "butcher to consumer" relationship (Fig. 4b). In this relationship, characterised by physical and exchange functions, the animals purchased from the producers are transformed into meat and sold to consumers. Group 3 included several localities (Porto-Novo, Adjarra, and Akpro-Missereté) with three relationships, "producer to consumer", "producer to butcher" and "butcher to consumer", characterised by physical, exchange and information functions (Fig. 4c).
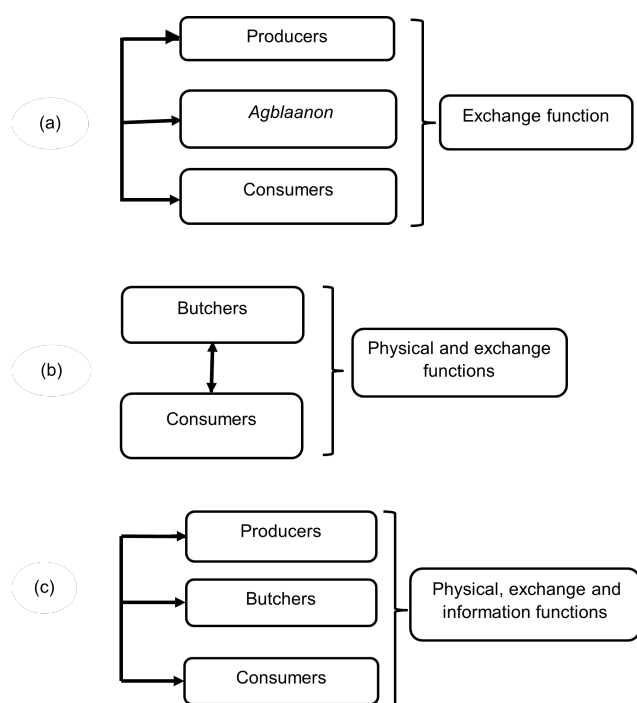

Fig. 4: *Function of actors in the relationship "producer to consumer" (a), "butcher to consumer" (b), and "producer to consumer"; "butcher to consumer" and "producer to butcher" (c).*

3.5 Marketing constraints and opportunities

According to the respondents (interviewed producers and butchers), the main constraints in the marketing of Lagune cattle were the lack of physical livestock markets (95 %) in the vicinity of the farms, lack of adequate marketing information (78.6 %), and the absence of institutional support services (80 %). All producers included in the current study recognised the importance of Lagune cattle for ceremonies and

funeral purposes, which opens an opportunity for its marketing.

3.6 Profit margins in the Lagune cattle marketing channel

The profit margins realised by Lagune cattle producers and butchers were calculated considering the production and marketing costs incurred by each actor (Table 2 and Table 3). The results indicate that producers realised higher ($P < 0.001$) average profit margins per animal (107,391 FCFA) than butchers (33,407 FCFA). Consequently, the gross margin, net margin, and benefit-cost ratio per animal varied significantly ($P < 0.001$) between producers and butchers. Yet, producers located in floodplains that experience repeated flooding during the rainy season in the Ouémé Valley plain had to purchase fodder more often than others (Table 2).

Table 2: *Estimated production costs, revenues and margins realised (FCFA/animal sold) by Lagune cattle producers in the rural and peri-urban zones of southern Benin.*

Variable	producers (%) facing costs (n=173)	Rural zone (n=103)	Peri-urban (n=70)	P-value
Gross revenue*	-	128,786	111,472	0.043
Animals sold y^{-1}	-	2	1	
Variable costs*	-	7,068	3,198	0.051
Fodder	55	5,083	0	
Health care	45	1,059	1,826	
Rope	100	925	1,373	
Herd size	-	11	4	
Fixed costs*	20	5,496	9,714	0.024
Total annual production costs†	-	12,564	12,912	
Gross margin‡	-	121,718	108,274	0.056
Net margin‡	-	116,222	98,560	0.064
Benefit-cost ratio	-	9.25	7.63	0.058

*FCFA animal^{-1} y^{-1}; †per animal; ‡FCFA animal sold^{-1} y^{-1}

4 Discussion

The socio-economic characteristics of the actors involved in the two marketing channels of Lagune cattle were determinant factors in their choice of the marketing channel. The absence of a physical formal market, of abattoirs, and butcher's shops across the production areas necessitated direct contact between producers and consumers. Thus, the Lagune cattle were mainly sold at the farm gate, often without a third party. This mode of commercialisation of Lagune cattle is certainly favoured by the small herd sizes and the

Table 3: *Lagune cattle purchasing and processing costs, revenues and margins (FCFA/kg meat; FCFA/animal sold) realised by butchers in Porto-Novo, southern Benin.*

Variable	Amount (in FCFA)	Butchers (%) facing costs (n=20)
Gross revenue (per animal)	137,228	-
Meat price (per kg)	2,500–2,700	-
Lagune cattle slaughtered*	8	-
Variable costs (per animal)	84,569	-
Animal purchasing costs	77,344	100
Transportation costs	5,881	100
Veterinary inspection	1,344	35
Fixed costs		
(Trading licence + depreciation)	8,681	100
Total annual production costs per animal	93,250	-
Gross margin (FCFA/animal sold)	52,660	-
Net margin (FCFA/animal sold)	33407	-
Benefit-cost ratio	3.31	-

*per year and per butcher.

low number of marketable animals per herd. As a result, the formal marketing channel for this breed is currently underdeveloped. However, informal physical markets exist for other cattle breeds in this region where seasonal herd mobility leads to increasing presence of zebu herds from the country's north and represents a favourable factor. The fact that the Lagune cattle were mainly sold at the farm gate confirms the finding of Kinkpe *et al.* (2019), who reported the absence of Lagune cattle in formal livestock markets in Benin. Lagune cattle farming remains a purely traditional family activity and is therefore not oriented towards the large consumer markets located in urban centres. This partly explains the small Lagune cattle herd sizes, as reported by Ahozonlin & Dossa (2022). Similar findings were reported from Togo for the Somba breed (Adanléhoussi, 2003) and from South Africa for indigenous beef cattle (Marandure, 2015). Furthermore, the informal Lagune cattle market is characterised by localised sales among producers, generally at farm gates, or between producers and other actors, forming various market segments.

The average net margins realised by the Lagune producers (Table 2) and butchers (Table 3) in the Lagune cattle marketing channels were positive, implying that Lagune cattle marketing is profitable for all involved actors. However, producers earn the highest profit margins and yield the highest benefit-cost ratio. The significant difference in average net margins and benefit-cost ratio between producers and butchers in favour of the first actors as calculated in this study can be explained by the low production costs of Lagune cattle, which are raised in low-input systems. However, compared with butchers, the producers bear more risks, including fertility problems of the animals, diseases, and theft. In addition, animals, especially breeding females, are raised for up to 15 years to reach an average of nine calvings per cow (Ahozonlin & Dossa, 2020) before being sold. However, it is worth noting that the animals' purchasing prices are imposed by butchers. Furthermore, in most cases butchers were not controlled by veterinary services and did not pay trading license fees and value-added taxes. The inspection of cattle meat by veterinary services is essential for certifying its sanitary quality. By paying licence fees and value-added tax, butchers remain active members of the butchers' association; the latter plays a crucial role in the formal cattle marketing channel in Ouémé department. An unequal distribution of the net margins among actors in cattle marketing channels was also reported by Kadekoy-Tigague (2003) in Central African Republic and ANOPER (2014) in Benin.

The size and body condition of the Lagune cattle were factors that influenced their sales prices at the farm gate. While the demand for Lagune cattle by buyers (consumers) was a function of its price, it was also related to the better quality of its meat (Salifou *et al.*, 2013). Indeed, the factors influencing the choice of cattle vary among the actors of marketing channels (Kassie, 2007; Fadiga, 2013). However, in the current context, where the Lagune cattle is threatened by crossbreeding with zebu breeds, the identification of some subsets of consumers who prefer good quality beef produced extensively on natural pasture would be a prerequisite for its sustainable use and promotion as a purebred animal. Furthermore, the identification of new niche markets and easy access to the formal animal and meat market could be improved if Lagune cattle were certified for their extensive production system. It is expected that such labelling fosters community initiatives and policy development towards a more sustainable use of traditional breeds (LPP *et al.*, 2010). Another strategy for adding value to the Lagune breed is to label its meat. Again, such a label would allow consumers to differentiate beef from Lagune cattle from others at a butcher's shop. A similar approach has been successfully used to promote the Nguni cattle in South Africa (Musemwa *et al.*, 2008). Given that membership in a village association or group positively influences producers' participation in the livestock market (Lubungu *et al.*, 2012; Kyaw *et al.*, 2018), smallholder farmers could be empowered through community-based initiatives (Dossa *et al.*, 2009; Vanvanhossou *et al.*, 2021; Zoma-Traoré *et al.*, 2021).

Small cattle herd sizes imply low numbers of marketable cattle per producer; this does not encourage wholesale cattle

traders to invest in the creation of a livestock market and leads to low farm-gate prices offered by buyers in the Ouémé department. In addition, the increasing presence of zebu herds in the Ouémé valley, due to seasonal herd migration from the northern regions of the country, enables consumers and butchers to easily buy zebu cattle from transhumant herders, who, due to pressing financial needs, are forced to sell their animals at lower prices in the hosting areas of Ouémé department. Against this background, the sustainable use of the Lagune breed will likely depend on its entry into the formal livestock market and its promotion as a local "brand" to overcome its current limitation to consumption at ceremonies and funerals.

5   Conclusion

Lagune cattle farming, although a secondary activity for many producers and neglected by the public decision-makers in southern Benin, is a major activity in rural areas of the Ouémé department. Despite its extensive characteristics, Lagune cattle farming constitutes an important source of income for many producers. The absence of formal physical livestock markets and butcher's shops in the production areas has led to direct transactions between producers and consumers, which is the primary marketing channel for Lagune cattle. However, marketing opportunities for Lagune cattle remain largely unexplored. These opportunities include the potential to establish a specialty market for ceremonies as well as a niche market for consumers who specifically seek meat from animals raised solely on natural pasture. Additionally, the high quality of Lagune cattle meat, as affirmed by its consumers, presents an opportunity to promote this breed.

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