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Sociotechnical characterization of quail farming in the autonomous district of Abidjan, Côte d'Ivoire

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Abstract

The present study was conducted among 100 poultry farmers through a formal survey from July to December 2021 in the autonomous district of Abidjan (Côte d'Ivoire). With no information on quail farming organization, the objective was to understand the social and technical characteristics. It appears that the municipality of Bingerville has a significantly higher difference than the other municipalities ($p < 0.05$), unlike Marcory, which has the lowest rate of farms. Quail farming consists of 8% nationals and 92% non-nationals, with 89.8% men and 10.2% women, of which those in the age group of 30 to 45 years account for 65.31% ($p < 0.01$). The age groups of 45 years and above, and 20 to 30 years represent 18.37% and 10.20%, respectively. Among the 98% educated quail farmers, 48.98% have a higher education level, 38.78% have a secondary level, and 10.20% have a primary level. As for quail farming experience, 71.43% have less than 3 years, 14.29% have between 3 and 6 years, and over 6 years. Furthermore, the farms are of mono-specific type (14.29%) and plurispecific type (85.71%) with cage housing (72.45%) and floor housing (27.55%). The quails, originating from hatcheries (8.16%) or purchased (91.84%), are managed in single flocks (85.71%) or multiple flocks (14.29%) for the purpose of reproduction (97.96%) or meat production (14.29%). Quail farming is practiced by all populations with diversified techniques in the district.

Keywords: Quail farming; Poultry farmers; Characteristics; Autonomous district of Abidjan

1. Introduction

Poultry farming constitutes an important source of animal protein and income in Côte d'Ivoire (MIRAH, 2014; Yao, 2022). After traditional and modern poultry, which accounted for 70% and 30% of the total stock in 2001, there is increasing interest in short-cycle poultry such as quail. Quails are attractive for their early meat production (at 5 weeks old) and egg-laying performance (200 to 300 eggs per year) (ITELV, 2012; Sarabmeet and Mandal, 2015; Mondry, 2016), as well as their droppings' use in agriculture. Quail eggs and meat are highly valued for their excellent flavor and high nutritional value (Kouatcho, 2015; Kayang *et al.*, 2006; Ukashatu *et al.*, 2014).

Despite these advantages, quail farming remains a secondary economic activity in Côte d'Ivoire and appears to be relatively unknown in the scientific community. Research on quail farming in Côte d'Ivoire is recent, with some studies focusing on feed (Djinandji *et al.*, 2022) and housing (N'Zué *et al.*, 2019). Currently, there is no existing data on the profile of quail farmers in Côte d'Ivoire. This study aims to identify the characteristics of quail farmers and their farming practices in the Autonomous District of Abidjan. The research aims to gain insights into the organization, characteristics, and constraints of the quail farming sector, with the goal of potentially improving farming practices and promoting quail production among the population.

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2. Materials and Methods

2.1. Study Area

This study was conducted from July to December 2021 in the Autonomous District of Abidjan, located in the southern region of Côte d'Ivoire. Established in 2011 by decree No. 2011-263 of September 28, the Autonomous District of Abidjan was further specified by law No. 2014-454 of August 5, 2014. The district comprises 11 municipalities (Adjamé, Attécoubé, Cocody, Koumassi, Marcory, Port-Bouet, Plateau, Treichville, Yopougon, Abobo) and 4 sub-prefectures (Bingerville, Anyama, Songon, and Brofodoumé). It experiences a subequatorial climate, characterized by short and long rainy seasons and two dry seasons.

2.2. Data Collection Methodology

Data was collected through interviews and observations conducted with quail farmers. Due to a lack of information on the location and number of quail farms, the "snowball" selection method was used, where the first farmers selected helped identify other quail farmers (Salganik and Heckathorn, 2004). Questionnaires were administered through individual semi-structured interviews with the farmers. The observations and questionnaires covered the location of the farms, the socio-economic profile of the farmers, and the farming systems and practices.

2.3. Statistical Analyses

The collected data was entered into Microsoft Excel (Office 2013). Statistical analyses were performed using R software (version 3.3.1). Descriptive statistics were used to calculate frequencies, means, standard deviations, and other relevant measures for both qualitative and quantitative variables.

3. Results and Discussion

3.1. Distribution of Registered Quail Farms in the Autonomous District of Abidjan

Figure 1 presents the distribution of quail farms. Bingerville, Port-Bouët, Yopougon, and Abobo municipalities account for over 70% of the registered quail farms in the district. Bingerville and Port-Bouët are the most representative with proportions of 27.55% and 20.41%, respectively. Statistical analyses indicate that the proportion of farms in Bingerville is significantly higher than in other municipalities ($p < 0.05$). Similarly, Port-Bouët's proportion is significantly higher compared to other municipalities except Bingerville. The proportions of farms in Yopougon and Abobo (12.24% and 10.20%, respectively) are statistically similar ($p > 0.05$). The other municipalities have relatively low proportions, below 10%, and differ significantly from each other ($p < 0.05$).

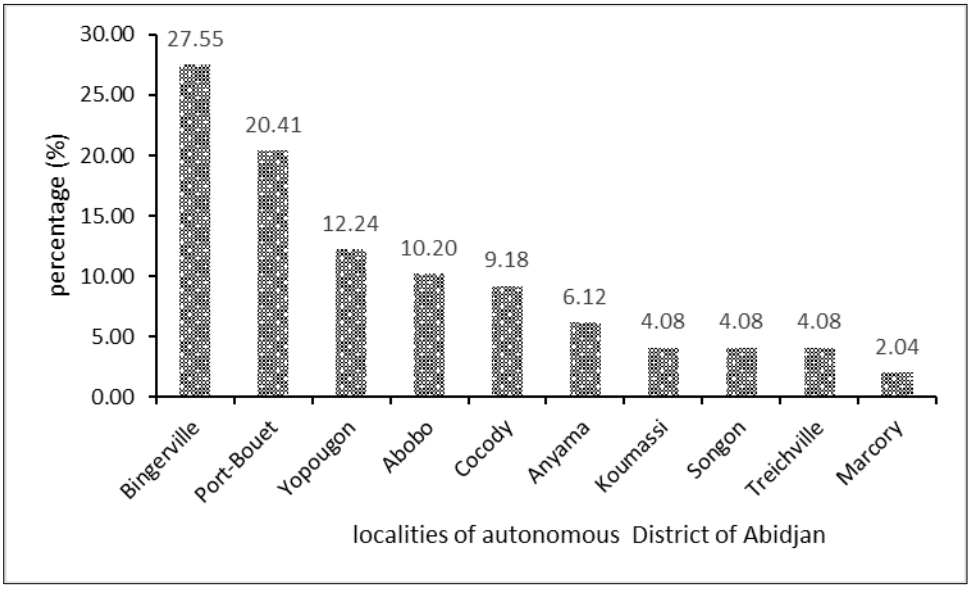

Figure 1 Distribution of Quail Farms in the Autonomous District of Abidjan.

3.2. Nationalities and genders of quail farmers in the Autonomous District of Abidjan.

Figures 2 and 3 respectively show the percentage distribution of quail farmers by nationality and gender in the Autonomous District of Abidjan. It is evident that quail farming is practiced by over 90% of nationals ($p < 0.01$). In terms of gender, the proportion of male quail farmers (89.8%) is ten times higher than that of female quail farmers.

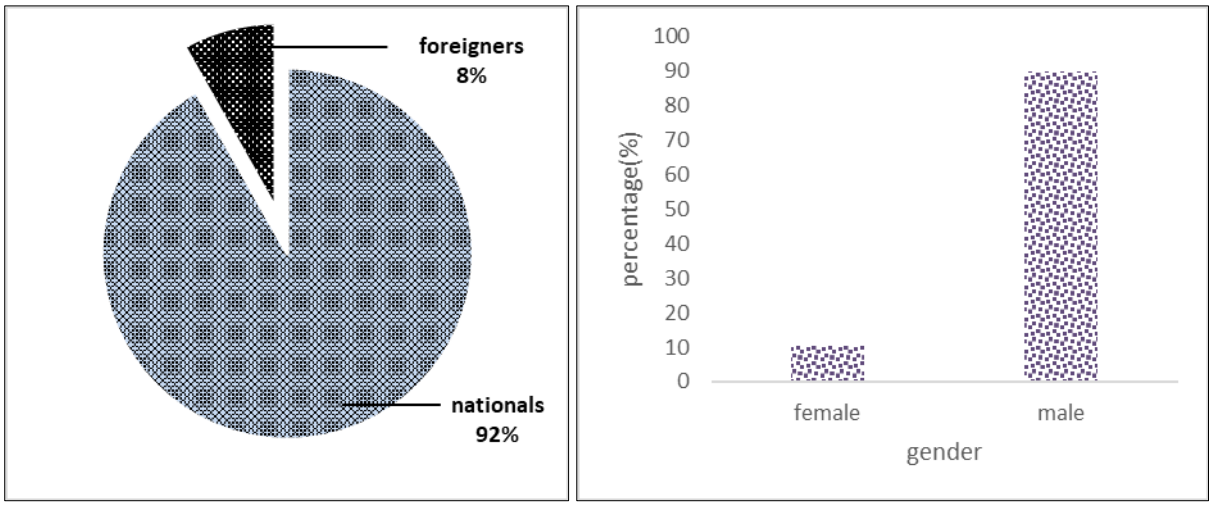

Figure 2 and 3 Distribution by nationality and gender of quail farmers in the Autonomous District of Abidjan.

3.3. Age groups of quail farmers in the Autonomous District of Abidjan.

The age of the quail farmers varies, and the activity is significantly ($p < 0.01$) dominated by those aged between 30 to 45 years, accounting for over 65% (Figure 4). Individuals under the age of 20 are less represented, with a proportion of 6.12%.

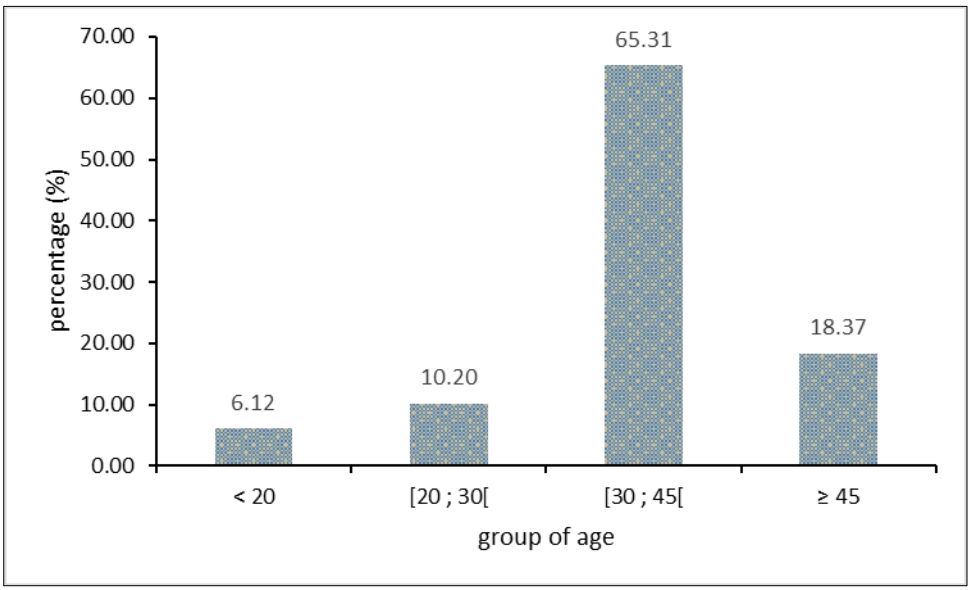

Figure 4 Distribution by age group of quail farmers in the Autonomous District of Abidjan

3.4. Educational levels of quail farmers in the Autonomous District of Abidjan

This study has shown that the actors involved in quail farming in the Autonomous District of Abidjan include both educated and non-educated individuals (Figure 6), with a clear dominance of educated farmers ($p < 0.001$). Approximately 98% of all quail farmers are educated. However, when comparing the different proportions of quail farmers based on their educational levels, there is a significant difference between these proportions. The proportion of farmers with a higher education level is 1.3 times higher than those with a secondary education level and 4.8 times

higher than those with a primary education level. The latter group is 3.8 times smaller than their counterparts with a secondary education level.

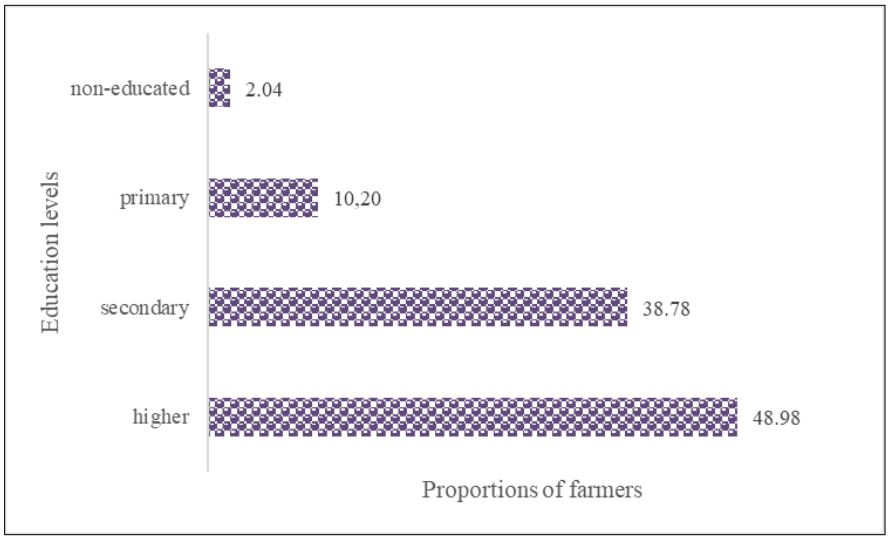

Figure 5 Distribution of quail farmers according to their educational levels

Figure 6 presents distribution of the main activities of quail farming participants in the Autonomous District of Abidjan. Among the three categories of participants, the farmers' category is statistically the most dominant ($p < 0.001$), accounting for 55% of all quail farming participants. Furthermore, the proportion of farmers is 1.67 times higher than that of government employees and 4.59 times higher than that of entrepreneurs. Additionally, the proportion of government employees engaged in quail farming is significantly higher ($p < 0.01$), being more than 2.75 times that of entrepreneurial quail farmers.

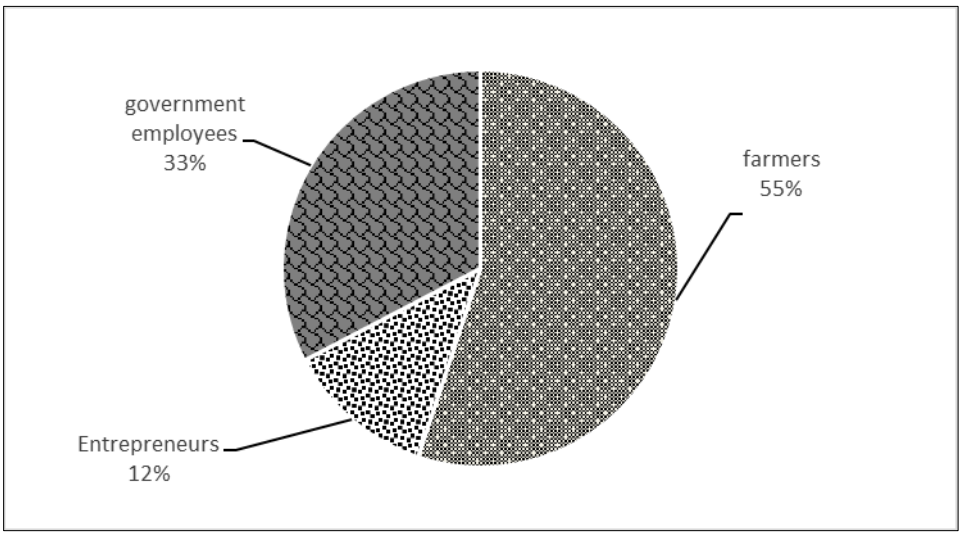

Figure 6 Main activities of quail farmers in the Autonomous District of Abidjan

3.5. Years of experience of quail farmers in quail farming activity in the Autonomous District of Abidjan.

The figure 7 shows the three categories of quail farmers in the Autonomous District of Abidjan based on the number of years of experience in this activity. The majority of quail farmers (2/3 of them) have been engaged in quail farming for less than three years.

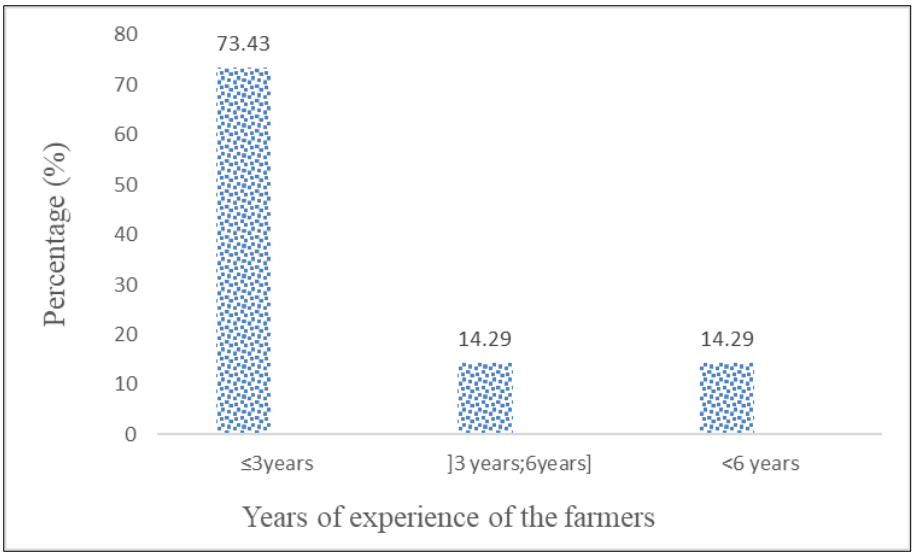

Figure 7 Percentage distribution of quail farmers based on the number of years of experience in the activity in the Autonomous District of Abidjan.

3.6. Age of quail farms in the Autonomous District of Abidjan

Quail farming has been established in the Autonomous District of Abidjan for over six (6) years (Figure 8). More than 3/4 of quail farms, accounting for 78%, are aged three (3) years or less. This proportion is significantly higher than those of farms aged between three and six years and over six years, being 6.5 times and 7.8 times higher, respectively.

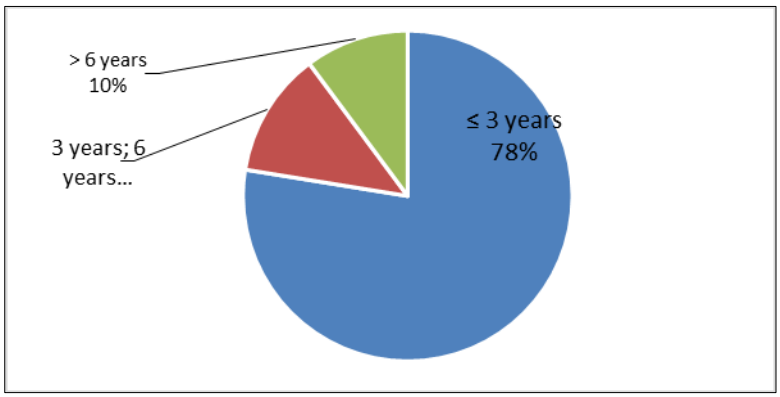

Figure 8 Distribution of quail farms in the Autonomous District of Abidjan.

3.7. Characteristics of quail farms in the Autonomous District of Abidjan

Table 1 presents the characteristics of quail farms in the Autonomous District of Abidjan. It was found that 85.71% of quail farmers associate at least one other type of farming with quail farming. Only 14.29% of quail farmers practice quail farming as their sole activity. Regarding housing, nearly three-quarters of farmers, accounting for 72.45%, house the quails in cages, while 27.55% opt for floor housing. As for the origin of the animals, 91.84% of farmers procure them from suppliers, which is 11.25 times higher than those who obtain their animals from their own hatchery. For the majority of surveyed farms (85.71%), the preferred method of management is single flock housing, approximately six times higher than those practicing multiple flock housing. Additionally, the results showed that 97.96% of farmers engage in quail farming for egg production, while only 2.04% practice it for meat production.

Table 2 provides information on the feed and water characteristics in quail farms in the Autonomous District of Abidjan. Two types of feed are used for quail feeding: industrial feed and local feed, which is prepared by the farmers themselves and referred to as "quail feed." The industrial feed used includes broiler feed and layer feed. However, a preference for using industrial feed is recorded among more than 72% of farmers, which is over 2.6 times higher than the proportion of farmers using local feed. Among the two types of industrial feed, the majority of farmers (41.8%) prefer layer feed. The feeds are available in three forms: crumbs, pellets, and powder. The use of crumb feed is significantly higher

(61.2%) compared to other forms of feed ($p < 0.001$). Furthermore, the proportion of farmers using crumb feed is 2.14 times and 6 times higher than those using powder and pellet feed, respectively.

Table 1 Characteristics of quail farms in the Autonomous District of Abidjan

Parameters	**Designation**	**Proportions**	**P-value**
Types of farming	Exclusive quail farming	14.29	*< 0.001*
	Mixed farming	85.71	
Housing mode	Cage	72.45	*< 0.001*
	Floor housing	27.55	
Origin of quails	Hatchery	8.16	*< 0.001*
	Purchase of chicks	91.84	
Management mode	Single flock housing	85.71	*< 0.001*
	Multiple flock housing	14.29	
Farms	Egg production	97.96	*< 0.001*
	Meat production	2.04	

In the Autonomous District of Abidjan, 67.3% of farmers feed their quails twice a day. This proportion is significantly higher ($p < 0.001$) than the proportion of farmers who feed their quails once a day or three times a day, which is 2.8 times and 8.2 times higher, respectively. Moreover, 95.9% of farmers provide rationed feeding to the quails, while only 4.1% offer *ad-libitum* feeding. In terms of water supply, the majority of farmers (44.9%) use tap water from SODECI, which is significantly higher than the proportion of farmers using well water (24.5%) or borehole water (30.6%).

Table 2 Characteristics of Feed

Characteristics of Consumables	**Designation**		**Proportions**	**p-value**
Feed sources	Local feed	quail	27.6^{b}	*< 0.001*
	Industrial feed	broiler	30.6^{b}	
		layer	41.8^{a}	
Feed presentations	Pellet		10.2^{a}	*< 0.001*
	Crumble		61.2^{b}	
	Flour		28.6^{c}	
Feeding frequencies	Once a day		24.5^{a}	*< 0.001*
	Twice a day		67.3^{b}	
	Three times a day		8.2^{c}	
Feeding methods	*Ad-libitum*		4.1	*< 0.001*
	Rationing		95.9	
Water sources	Borehole		24.5^{a}	*< 0.001*
	Well		30.6^{b}	
	Tap water		44.9^{c}	

The table 3 presents quail mortality in the Autonomous District of Abidjan during different phases of rearing. For all rearing phases, farmers recorded mortality rates of up to 10%. During the survey period, 47% of farmers reported mortality during the startup phase. Among these farmers, 20% recorded mortality rates ranging from 1% to 5%, while the remaining 27% recorded mortality rates from 5% to 10%. However, statistical analyses showed a similarity ($p>0.05$) in the proportions of farmers reporting mortality rates in these two ranges during this phase.

During the growth phase, 37% of farmers recorded mortality rates ranging from 1% to 5%. Only 3% of farmers reported mortality rates of 5% to 10% during this phase. Regarding the laying phase, 17% of farmers recorded mortality rates ranging from 1% to 5%, while only 3% of farmers reported mortality rates from 5% to 10%.

Table 3 Quail mortality in the Autonomous District of Abidjan during the study period

Growth Phases	Mortality Rate	Proportion of Breeders	p-value
Starter (1 to 15 days)	1-5%	20.0	*< 0.001*
	5-10%	27.0	
Growth (16 to 30 days)	1-5%	37.0	*< 0.001*
	5-10%	3.0	
Laying (> 30 days)	1-5%	17.0	*< 0.001*
	5-10%	3.0	

4. Discussion

This study revealed that quail farming (coturniculture) is practiced in almost all the localities of the Autonomous District of Abidjan, with the highest concentrations of quail farms in the localities of Bingerville and Port-Bouët. The widespread presence of quail farms in the district indicates the growing interest of the population in this activity. Quail farming is considered less costly compared to poultry farming and requires less space for implementation (Diallo *et al.*, 1994; Sarabmeet *et al.*, 2015). As a result, diversifying avicultural activities allows farmers to offer consumers new taste choices and contribute to meat production in response to the increasing demand for animal protein (Ukashatu *et al.*, 2014).

The strong presence of quail farms in the localities of Bingerville and Port-Bouët could be explained by the fact that these areas were originally known for their intense farming activities. Therefore, farmers in these localities already have available space for farming and choose to include quail farming to increase their income (Kouatcho, 2015). Moreover, Bingerville and Port-Bouët have been endemic areas for viral diseases (such as Gumboro, Newcastle, and avian influenza) in recent decades. These diseases caused significant poultry mortalities, resulting in substantial economic losses for poultry farmers. As a result, many farmers shifted to raising quails and "hybrid" chickens, which are more resistant species (FAO, 2019). Similar studies in Cameroon by Katchouang *et al.* (2015) also observed similar patterns with nationals dominating quail farming.

The study also showed that quail farming is dominated by individuals between the ages of 30 and 45. The high presence of this age group could be partly due to their search for financial stability to meet family needs. Most individuals in this age group are married or in a relationship, and regardless of whether they are unemployed, entrepreneurs, or civil servants, they seek to create Small and Medium Enterprises (SMEs) and diversify their income. As they approach this age group, some graduates, unable to secure stable jobs in both the private and public sectors, turn to SMEs, including quail farming. This explains the high presence of quail farmers with secondary or higher education levels. However, Katchouang *et al.* (2015) found in their study that quail farming in Cameroon is dominated by individuals over the age of 55.

Most quail farms in the Autonomous District of Abidjan are less than three years old, reflecting the relatively recent adoption of quail farming in Côte d'Ivoire. Quail farming is an innovative species in livestock farming in the country, appealing to both farmers and consumers. However, the typology of quail farms, including housing type, management mode, quail origin, and production marketing, shows that this activity is still in the artisanal stage. Since quail farming is relatively new in Côte d'Ivoire, farmers use either layer feed or broiler feed (Ayssiwede, 2013) as there is currently no specialized quail feed available. Lack of scientific input to provide farmers with specialized quail feed forces them to

use feed intended for other species (Farhat, 2019; N'guessan *et al.*, 2020). The high mortality rates observed in the visited farms may be attributed to the lack of knowledge in proper quail farming techniques (Katchouang *et al.*, 2015).

5. Conclusion

Quail farming is a relatively recent activity in Côte d'Ivoire, with higher concentration in Bingerville and interest from males and young individuals aged between 30 and 45. Many of the farmers engaged in quail farming are not originally farmers; some are civil servants or entrepreneurs, and all have received formal education but lack professional training in the field. This lack of training could be one of the main reasons for the high mortality rates in their farms. Therefore, implementing technical training programs to improve the technical performance of these farmers and organizing the quail farming sector would be beneficial for the further development of quail farming in Côte d'Ivoire.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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