

Original Research Article

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Types of Litter Used and Possible Impact on Poultry Farming in Abidjan District

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ABSTRACT

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The litter soiled, is a source of proliferation of potentially pathogenic germs that are responsible for many diseases. The aim of this study is to know the types of litter used and their impact on poultry farming in Abidjan District. Five areas of Abidjan targeted were visited in the period from 02 May to 24 October 2019. The questionnaire included a series of questions related to information on litter and symptoms of contracted diseases. The results revealed that on a total of 361 farms surveyed, 100% use shavings as the only type of bedding. 98.61% use 1 bag of shavings of 50 Kg per m². 51.25% treat it before the arrival of day-old chicks and 32.69% before and during breeding. In order not to contaminate the broilers and especially for their well-being, they change obligatory the shavings 2 (19.16%) to 3 (18.02%) times during a breeding band. 38.44% mentioned without justification that litter is responsible of the diseases encountered in poultry farming. The mortality rates most expressed are 3.05-7.00%. The diseases encountered in poultry farming are essentially related to the degradation of the shavings by the contribution of humidity within the building during the breeding. The use of shavings has an impact on poultry production in Abidjan.

Introduction

Poultry litter can be defined as a bed of straw or other plant material, flexible, insulating and absorbent, which is spread out in livestock buildings to serve as a layer for the animals (Larousse, 2024). Indeed, litter plays an important role in the development of poultry farming. A good litter must be able to absorb and return moisture to the environment as quickly as possible (Garcès *et al.*,

2013). It is an important element of poultry production that can influence animal welfare, flock health, food safety, environmental impact and production efficiency (Dunlop *et al.*, 2016).

In general, bedding is chosen according to its absorption capacity, comfort, cost and availability in different parts of the world (Hafeez *et al.*, 2009; Greenacre *et al.*, 2014; Irfan *et al.*, 2017).

However, this litter is facing many problems in the poultry industry. In addition to difficulties with litter supply the condition of birds on soiled litter on farms is very problematic (Rousset *et al.*, 2014). Indeed, at the beginning of the breeding, the litter is characterized by a very high dry matter content, a high carbon concentration and a low nitrogen content. But this data is reversed as moisture is added to the building. Moisture can be caused by air, water ingress and animal waste. It soils the litter as it evolves (Pal *et al.*, 2021). Soiled litter is a source of proliferation of potentially pathogenic germs that are fatal for chickens (Zhao *et al.*, 2005; Lawrence *et al.*, 2017; Ostović *et al.*, 2021; Rogovski *et al.*, 2021; Dunn *et al.*, 2022).

On a varied microbial population, such as that of litter contaminated with faecal matter, temperature will act by selecting species according to their thermal optimum, accelerating or slowing down overall development (Guerrin, 2017). These germs are responsible for many diseases including Gumboro and Newcastle disease, salmonellosis, colibacillosis, aspergillosis and avian coccidiosis which are responsible for enormous economic losses for the breeder (M'bra, 2000; Brou *et al.*, 2018).

To control these pathologies, farmers treat the litter mechanically, chemically, and microbiologically to improve the sanitary quality of the poultry farm (Guinebert and Penaud, 2005; Rousset *et al.*, 2014). Litter is becoming increasingly important in poultry farming in the District of Abidjan in Côte d'Ivoire. However, during breeding, does poorly treated or poorly monitored litter not have an impact on the District's poultry industry? However, in Côte d'Ivoire, no data on the impact of litter during its evolution has been carried out in poultry farming. Thus, the general objective of this study is to know the different types of litter used and their possible impact on poultry farming in Abidjan District.

Materials and Methods

Study Area and Criteria for Selecting Communities

The study was carried out from May 02 to October 24, 2019 and it consisted to visit the farms in the localities of each target zone in the District of Abidjan. See figure 1. The communes of Bingerville, Yopougon, Songon, Port-Bouet and Anyama were chosen primarily because of the

particular development of poultry farming, which results in a multiplicity of poultry farms. Indeed, Abidjan encompasses more than 80% of the country's modern poultry farms (Essoh, 2006). The second reason is that the District of Abidjan is the main outlet for poultry products marketed in Côte d'Ivoire, with more than 54 markets for poultry from several countries and even from border countries through the Abidjan-Ouagadougou railway network (Kallo, 2007). The city is located on the Atlantic Ocean (Gulf of Guinea) between 5°00' and 5°30' North latitude and between 3°50' and 4°10' West longitude. It is the most populous city in Francophone West Africa with a population of 6,321,017 in 2024 (Worldometer, 2024).

Questionnaire design and farm selection

The questionnaire included a series of questions related to litter information (Nature, place of purchase and supply of litter, Quantity of litter / m² and Treatment of litter before and during rearing, Frequency of litter change and Origin of diseases encountered in poultry farming) and symptoms of contracted diseases, bird mortality and products used for sanitary prophylaxis. The questions were constructed based on the epidemiology of common chicken diseases in Côte d'Ivoire. The survey based on the formulated questionnaire was conducted by face-to-face interview between the re-searchers and the farmers, as well as personal observations by the researcher. Only farms with at least 100 head of chickens were selected for the survey.

Data processing

The data analysis corresponded to the exploitation of the survey questionnaire by finding a code for each word. First all the data obtained were entered using the Microsoft Office Excel table, then processed with the IBM.SPSS Statistics software and finally the results were evaluated using the Microsoft Office Excel table.

Results and Discussion

General characteristics of poultry farming on the farms visited

A total of 455 farms were visited in the 5 selected areas during this survey. Of these farms, 86 were in Anyama, 92 in Bingerville, 92 in Port Bouet, 94 in Songon and 91 in Yopougon. Generally, in all the farms visited, the number of animals ranged from 150 to 35,000 head. On

the other hand, the breeding of broilers 80.22% of the farms visited is more developed than that of laying hens, hybrids, cockerels, quails, guinea fowls and others with respectively (9.45%; 5.93%; 1.76%; 1.54%; 0.44% and 0.66%). Among all the localities visited (22), there are more farms in Benogosso (Port-Bouet), Songon-Agban (Songon), Boukinouso (Yopougon), Anan (Bingerville), Songon-Té (Songon) and Km17 (Adiopodoumé).

Of the 455 farms, 94 were unable to respond to the survey questionnaire, while the remaining 361 farms were able to cooperate. Figure 2 show the chicks on the wood shavings in a farm.

Use conditions of the litter in Abidjan District

Nature of bedding

In the different farms visited, all farmers use shavings as the only type of bedding (100%) and take it from sawmills (100%). Moreover, those who find the supply of wood chips difficult (63.36%) are more numerous than those who can get it easily (36.64%).

Amount of litter / m² and treatment of litter before and during breeding

Among all the farms surveyed, 98.61% of the farmers use 1 bag of shavings of 50 Kg per m². The rest use 0.5, 1.5, 2 and 3 bags of 50 Kg by m² (figure 3). 51.25% of the farmers process the shaving before the arrival of the day-old chicks. In addition, 32.69% of the farmers treat the bedding before and during breeding. However, 13.02% of the farmers simply use the bedding without any treatment. The rest of the people do not have information on the treatment of the shaving during the breeding process (figure 4).

Frequency of litter change

This is the number of times a litter installed in a barn is changed from start to finish (band). As for the farms visited, the frequency of change that is repeated more is 2 (19.16%) to 3 (18.02%) times by band. In addition, the least frequent changes are 1 (8.07%), 4 (4.16%), 5 (1.89%) and 6-8 (1.39%) times by band and at the end of the band (4.66%).

However, 1.39% of the farmers also change the litter 1-2 times a week, when it is in bad condition (wet, dirty,

damp). There are some who remove the wet parts only (0.5%). There were farmers who have no information on the number of times the litter is changed (28.86%) (figure 5).

Origin and symptoms of avian diseases

Origin of the diseases, supposedly encountered in poultry farming

Most of the farmers met in the breeding areas mentioned without justification that the litter is responsible for the diseases encountered in poultry farming (38.44%). Similarly, there are farmers who justified that the litter causes diseases when it is in poor condition (wet 3.28%, wet 6.05% and dirty 28.48%). They continue with other justifications (18.53%) such as: its duration, powdery, male treated, untreated, its origin, smell of wood, the release of gas, heat... However, 3.91% of the farmers said that the diseases they encountered did not come from the litter (figure 6).

Symptoms of contracted diseases and mortality of subjects

In the surveyed farms, the numbers of symptoms most revealed by the farmers are 4 (31.64%), 3 (20.54%) and 5 (16.89%). In addition, the numbers such as 1 (3.02%), 2 (8.82%), 6 (7.81%), 7 (5.29%) and 8 (2.27%) are also identified by the rest of the farmers. However, 2.77% of them have no information about the symptoms (figure 7). The different symptoms encountered in the farms visited are: diarrhea, leg scabies, feather scabies, eye discharge, neck torsion, lack of appetite, growth retardation, difficult breathing, eye swelling, gumboro, plague, stress...

During these surveys in the 5 zones, the different mortality rates most expressed are 3.05-4.00%, 4.05-5.00% and 5.05-7.00%. Similarly, mortality rates such as 1.05-2.00%, 2.05-3.00%, 7.05-9.00%, 9.05-11.00%, 11.05-15.00%, 15.05-20% and 20.05-40.00%. However, some farmers still have no information on the mortality rate (figure 8).

Products used for sanitary prophylaxis

To avoid possible contaminations and diseases, the farmers make the sanitary emptying of the buildings at the end of each batch, using more OMO and bleach

(54.83%). On the other hand, they use more one product (32.64%) than 2 (7.81%) and 3 (1.39%) products for cleaning the farm. On the other hand, 3.66% of the people surveyed recognized that the sanitary vacuum is carried out at the end of the season without specifying the products used (figure 9).

The different products used for sanitary prophylaxis are: virinet, cresyl, lime, formaldehyde, vickyl, D6, costic soda, virosept, vapofofor, protectall, tripuricide, bleach. However, virinet, bleach and cresyl are the products most applied in the cleaning of buildings.

Concerning the survey, it took place in two phases; the preparatory phase which is made with the support of the previous works and the inhabitants (Bitty, 2013). This phase involved locating and visiting the farms. And the actual survey consisted of visiting the farms in the 5 selected areas and interviewing the farmers there. The number of farms, which varies from 86 to 94 by zone, shows that the population is still interested in raising chickens. In all farms visited the number of chickens ranged from 150 to 35,000. This number is higher than the one found (150 to 2000 heads) in their study on the practices of biosecurity measures and their consequences on poultry farms in Abidjan District (Goualié *et al.*, 2020).

The large presence of farms in these localities could be explained by the fact that farmers left the center of the city and preferred to farm on the outskirts of the city because of the city's evolution. The most common type of farming in the different farms visited was broiler chicken (80.22%). This high rate could be explained by the fact that these chickens are raised for only 27 to 35 days. They are the most consumed in public places, ceremonies, homes and parties. View, the influence of this activity on the market, it encourages people to give more of themselves to it. A total of 361 farms were surveyed. This is higher than the number of farms surveyed (91) by other authors in the same autonomous District of Abidjan (Goualié *et al.*, 2020).

Regarding the information on bedding, in the different farms visited, wood shavings are the only type of bedding used by the breeders with a rate of 100% and take it all in sawmills with some difficulties in supply (63.43%). This could be explained by the fact that it is the most available and cheapest type of litter, but the high demand makes it difficult to supply. One of the criteria of the choice of the place of supply is the cost

which varies from 200 to 300 FCFA by bag of 50 Kg and the quality of the wood shaving. Of course, there are many other criteria. Moreover, there is no such thing as the perfect litter. Indeed, they all have their advantages and disadvantages. However, wood shavings have a number of interesting qualities as bedding. Wood shavings form a healthy, insulating and edible bedding. Moreover, the maintenance of this litter is rather simple and the shavings being non-dusty, they can of course be used for the animals which suffer from respiratory problems (ADMIN1548, 2020).

In addition, the most commonly used types of products are virinet, virkon, cresyl and bleach (grains), however the least used are: vickyl, copper sulfate, virosept, lime, vitassyl, protectall, omnicide, vigosin, antitic. All these products are directed against potentially pathogenic microorganisms or parasites found in the litter.

The quantity of litter/ m² used in the livestock buildings according to 98.61% of farmers surveyed is 1 bag of shavings of 50 Kg. These results are not consistent with those found in their study where they say, apart from buckwheat hulls, which require more mulch, the average quantity of litter used is around 1 kg/m² (Dezat and Gohier, 2020).

In these surveys, 51.25% of the farmers treated the shavings before the arrival of the day-old chicks and 32.69% did so before and during rearing, while 13.02% of the farmers used the litter without any treatment.

The most commonly used types of products are virinet, virkon, cresyl and bleach (grains). The treatment of the bedding is very important in the breeding. In fact, the aerobic spore flora, lower than 10⁴ in untreated litter, is always above 10⁵ CFU/g in treated litter. The treated bedding reduces the number of pathogens and the physicochemical parameters are also modified (Guinebert and Penaud, 2005).

The frequency of change that repeats more is 2 (19.16%) to 3 (18.02%) times by band. This frequency shows that farmers find it difficult to replace litter when it is dirty. Regarding the symptoms of contracted diseases, the numbers of symptoms most revealed by the breeders are 4 (31.64%), 3 (20.54%) and 5 (16.89%). The different symptoms encountered in the farms visited are: diarrhea, leg scabies, feather scabies, eye discharge, neck torsion, lack of appetite, growth retardation, difficult breathing, eye swelling.

Figure.1 Survey Areas in the Autonomous District of Abidjan

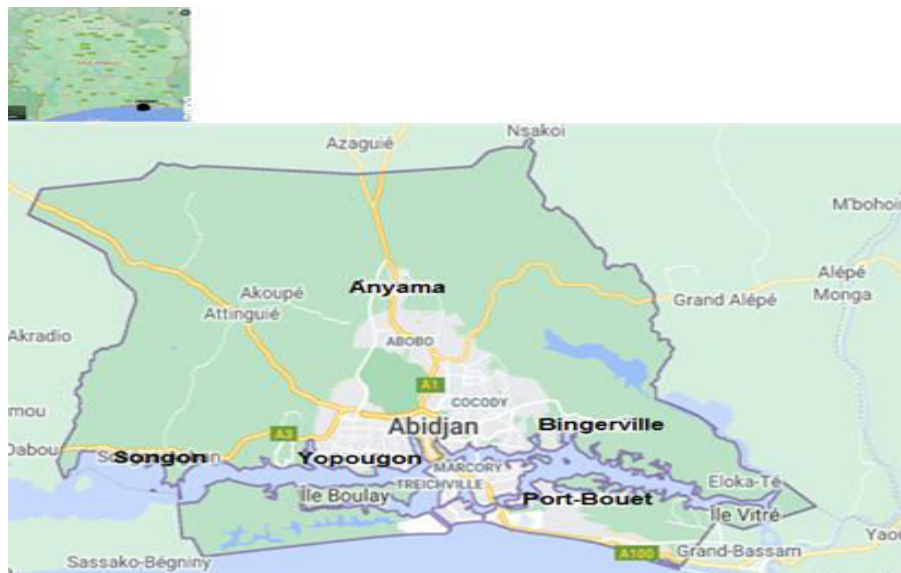


Figure.2 Chicks on wood shavings in a farm of Anyama



Figure.3 Amount of bedding by m²

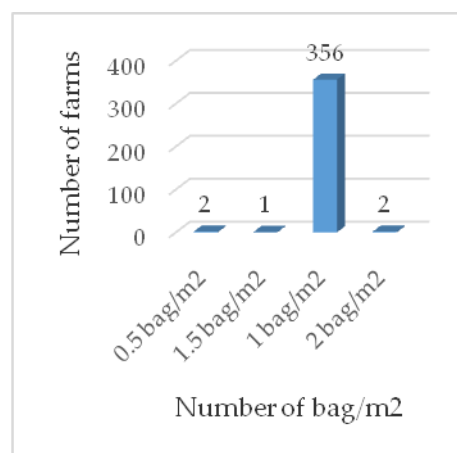
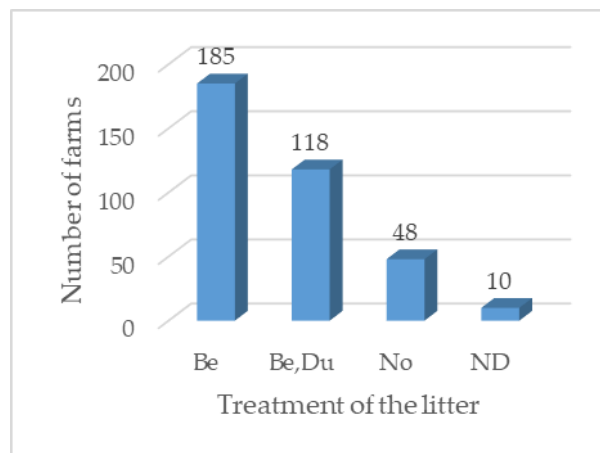


Figure.4 Litter treatment before and during breeding



Be: Before, Du: During, ND: Not Determined

Figure.5 Frequency of bedding change

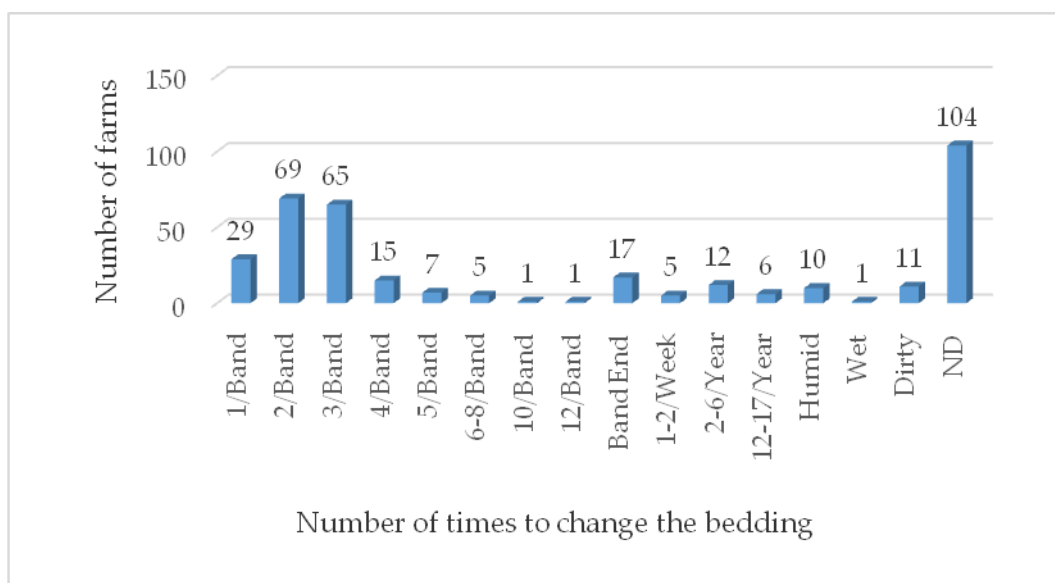


Figure.6 Supposed origins of the diseases encountered in the farms visited

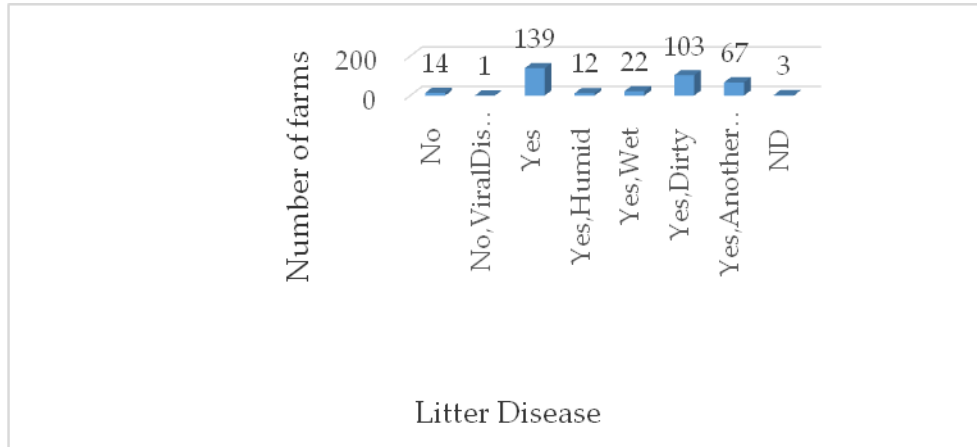
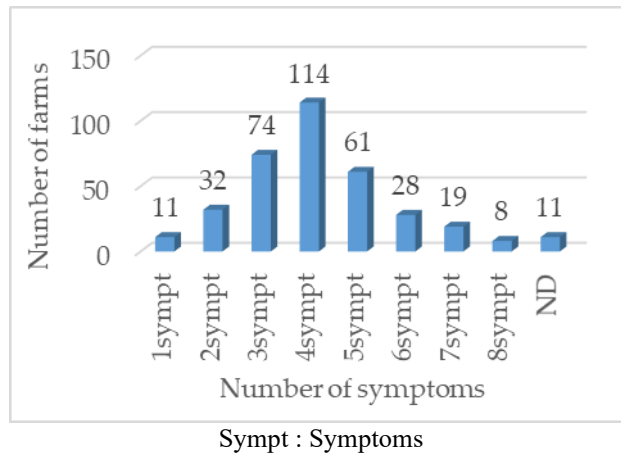


Figure.7 Symptoms of contracted diseases



Sympt : Symptoms

Figure.8 Mortality rate in the farms visited

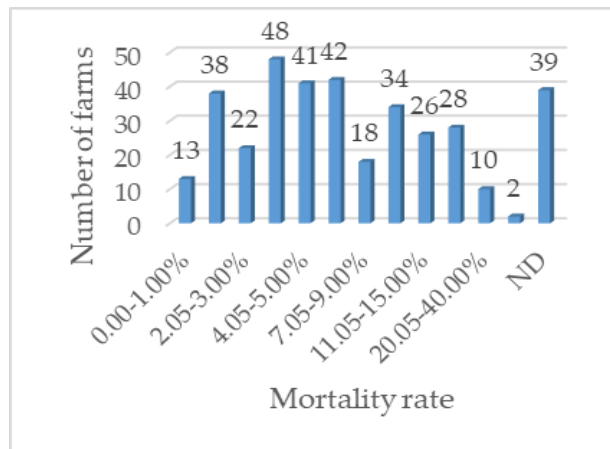
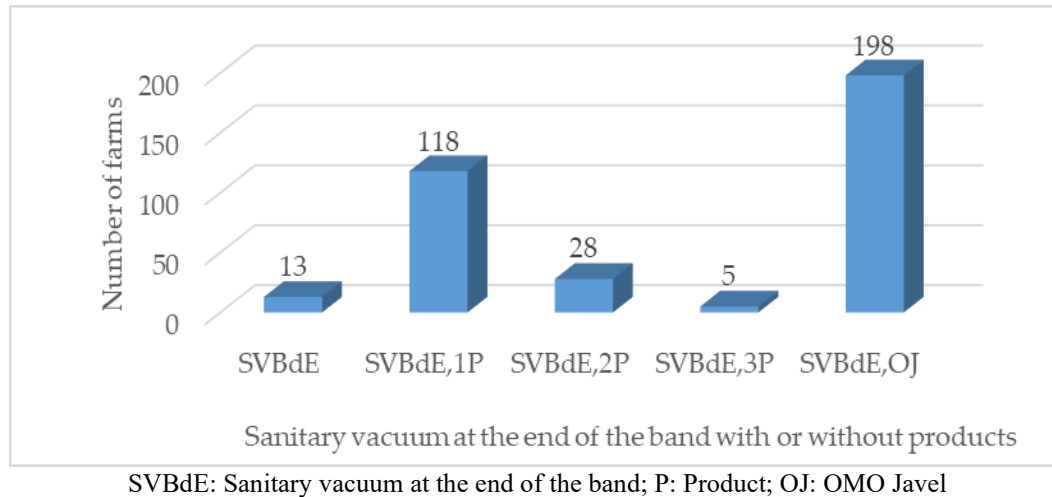


Figure.9 Number of products used for sanitary prophylaxis



These symptoms could be due to poor bedding quality. The onset of symptoms is highly dependent on environmental conditions. It is most often sporadic (a bird found suddenly dead without other animals being affected) and causes respiratory infections or even septicemia that is rapidly fatal (FRAB Midi-Pyrénées, 2012).

Of the 5 areas, the different mortality rates most expressed are 3.05-4.00%, 4.05-5.00% and 5.05-7.00%. These rates are higher than those expressed in its work on the effects of a calcined attapulgit based litter on the growth performance of broilers, where the overall mortality rate is 3.67% (Sanni, 2014), which is lower than the standard rate of 5% (Parent *et al.*, 1989).

In the surveys 60.37% of the farmers emphasized that the reason for mortality is due to disease. The others (19.66% and 13.86%) mentioned mixed disease-accident and disease-predator as the reasons for mortality respectively.

To avoid possible contaminations, diseases and mortality, the farmers make the sanitary emptying of the buildings at the end of each batch using main products.

Finally, in all the farms surveyed in the five target zones, wood shavings are the only type of bedding used, at a cost of 300 FCFA per 50 kg bag, and its treatment is done more with virinet and cresyl.

In order not to contaminate the animals and especially for their wellbeing, the farmers are obliged to change the

shavings 2-3 times during the breeding season. 31.64% of the farmers pointed out that 4 symptoms can occur during breeding. Most of the diseases encountered in poultry farming are essentially related to the degradation of the litter by the contribution of moisture in the building during breeding. The use of wood shavings has an impact on poultry farming in Abidjan District.

As a recommendation, we would like the breeders to use the good practices of the rules of hygiene, that they make a good follow-up from the starting to the finishing, that they have some notion in poultry farming before launching in the activity.

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Author Contributions

Lamine Samagaci: Visualization, Writing - Review & Editing, Validation, Resources and Funding Acquisition; Patrick-Roch Kevin N'depo: Conceptualization, Methodology, Software, Formal Analysis, Investigation, Data Curation, Writing - Original Draft Preparation; Essoh Eric Apka: Visualization, Supervision, Validation and Project Administration; Bernadette Goualie: Investigation and Writing - Original Draft Preparation; Christelle Djoman: Investigation; Comoé Koffi Donatien Benie: Conceptualization, Methodology, Formal Analysis.

Data Availability

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

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent to Publish Not applicable.

Conflict of Interest The authors declare no competing interests.

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