Factors impacting guinea fowl (numida meleagris) production in Ivory Coast

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Factors Impacting Guinea Fowl (*Numida meleagris*) Production in Ivory Coast

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Primary Audience: Ivorian Authorities in Charge of Animal Production

SUMMARY

Guinea fowl production is very important for some countries from a socioeconomic and nutritional perspective. Guinea fowl production is low in the Ivory Coast, even if the demand is high. In order to improve understanding of the factors impacting guinea fowl production, a survey was conducted in 2017 in 8 regions (97 farmers) out of a total of 31 regions in Ivory Coast. The aims were 1) to establish a global typology of farmers; 2) to assess the goal of their enterprise (sale or home consumption), and 3) to classify the farmers on their socioeconomic profile and guinea fowl farming system. The sampling was conducted following a snowball type design (chain referral sampling method), a non-probabilistic method where farmers were selected not from a sampling framework but from a friendship network of the farmers already part of the sample. Guinea fowl production was undertaken by persons from all social levels without distinctions due to education level. The majority of farmers were men with no formal education. They had less than 20 guinea fowl (31% of interviewed farmers) and practiced extensive farming. The majority (66%) of farmers of the survey focused on home consumption of egg and meat with sale of surplus. One of the major challenges for farmers is to control the mortality of young guinea fowl, which can be very high. The development of this breeding activity could contribute to food self-sufficiency in animal protein and contribute to the fight against poverty in Ivorian rural areas

Key words: live guinea fowl, egg, *Numida meleagris,* survey, Ivory Coast

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DESCRIPTION OF PROBLEM

In the Ivory Coast, poultry farming including chicken, guinea fowl (**GF**), ducks, turkeys, and pigeons is an essential part of animal production according to the FAO [1] and indeed, poultry meat represents 44% of Ivorian meat production [2]. Guinea fowl originated from Africa; these birds are indigenous, adapted to the environment, and resistant to many pathologies present in the Ivory Coast. Nevertheless, in the Ivory Coast, GF are considered as expensive luxury poultry although their farming can play an important role in increasing self-sufficiency in animal proteins (eggs and meat). Guinea fowl production provides one of the best opportunities for small farmers and the rural population to access meat and eggs as well

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as potential for poverty reduction by revenue generation through sales of live GF and eggs.

The Ivory Coast is an agricultural country where more than 70% of poultry farming is traditional [1]. The cultural context plays an important role in the development of GF farming. We speculate that the poor productivity of GF in Africa is due to constraints faced by farmers in raising the birds, as well as lack of knowledge on how to address the challenges. For example, we can assume that illiterate farmers are unable to improve their GF farming, and to improve their skills because they cannot have access to information or training. For literate farmers, their level of education can also have consequences on their farming skills and farming knowledge.

However, despite the importance of GF farming for the Ivory Coast, research has never been undertaken on this species locally. In 2017, a survey was conducted in 8 regions (97 farmers) from a total of 31 regions in the Ivory Coast. The aim was 1) to establish a typology of GF farmers, 2) to assess their objective (sale or sale and home consumption), and 3) to classify GF farmers on their socioeconomic profile and GF farming system.

MATERIALS AND METHODS

Location of the Survey

Ivory Coast is a West African country with a surface area of about 322,500 km^2 and, in 2014 a population estimate of 22,671,331 persons. Eight regions were randomly selected for survey from the Ivorian 31 regions; in the North West the regions were Folon and Kabadougou, in the North East Bounkani, in the South East Indenié-Djuablin, in the South West Nawa and San Pedro, in the South GrandsPonts and in the West Tonkpi. The validity of the questionnaire was determined using a pilot survey with GF farmers from the suburbs of Yamoussoukro and Bouaflé.

Methodology of the Survey

The study was a transversal survey combined with a retrospective survey. The survey was conducted in 8 regions of the Ivory Coast, with only one visit to each of the 97 producers of GF eggs and meat. It was carried out in 2017, on the basis of face-to-face interviews.

Farming Systems

According to [1], there are 3 poultry farming systems in Ivory Coast.

- *The extensive system*: the animals are never confined and must scavenge for feed. They are not fed or can receive a very low quantity of grains.
- *The semi-intensive system*: the animals can have hand-made houses, especially for the night, they are fed a homemade mixture or scavenge for feed; there is sometimes a health control program.
- *The intensive farming*: the birds have modern housing, they only receive commercial feed and there is a standard and regular health program.

Sampling

The sampling was conducted following a snowball type design (chain referral sampling method), a non-probabilistic method where GF producers were selected not from a sampling framework but from a friendship network of the farmers already part of the sample [3]. The first farmers interviewed give information on other GF producers who in turn will also provide information on others they know [4]. The survey proceeded until the farmer being interviewed could not identify additional producers for interview [4]. With the not probabilistic method that we used, all the GF producers who were met were interviewed [5].

Statistical Analysis

The questionnaire consisted of responses to qualitative and quantitative variables. The socioeconomic profile of the GF farmers was determined by a descriptive analysis. The analysis of the objective of the GF farmers used the classification and regression tree (**CART**) method on socioeconomic data [5]. The CART is obtained by a binary recursive partitioning. The process is binary because parent nodes are always divided

into 2 descendant nodes and recursive because the process is repeated by considering each node as a parent node [5].

The typology of the producers of GF was identified through a multiple correspondence analysis (**MCA**) of the raw data. This method is often used to describe, explore, summarize, and visualize information contained within questionnaire data [6]. Multiple correspondence analysis was followed by an ascending hierarchical classification (**AHC**) with standard settings (Euclidean distance, Ward's method, automatic truncation). The inputs of the AHC were the coordinates of the weighted percentages of inertia axes, reduced off-center. The type of farming system was then linked with socioeconomic data to produce a comprehensive typing of farmers by using MCA and AHC.

A problem tree, relational analysis tool, was used to analyze the current situation of GF farming. This tree is used to identify a central problem and its causes and effects. Statistical analysis was assessed by using the software R [7].

RESULTS AND DISCUSSION

Socio-Economic Data

The final sample was composed of 97 GF farmers. Guinea fowl farming was mainly a male activity, with a minority (4.1%) of women. The majority (90.7%) of producers were between 18 and 59 yr old (Table 1). These results concurred with those from an earlier study which found that in Benin GF farming was overwhelmingly a male activity [8]. More than half the farmers were illiterate (54.6%), approximately 20% had primary education and a smaller proportion secondary (10%) or high school level (15.5%) education. This is slightly different than previous results which reported that in Ghana, 33% of GF farmers were literate with only 3% having a high school level education [9]. In the present study, flock size varied with 42.3% being less than 20 GF. The results suggested that GF production was still largely dominated by farmers with no formal education.

The majority (66%) of farmers focused on home consumption of eggs and meat with sale of surplus, while 34% focused on selling products (slaughtered or live animals and collected eggs). The proportion of farmers who only sold eggs and animals was lower than in Burkina Faso [10]. The majority (92.8%) of the farmers self-financed their activity and a majority (68%) sold their eggs at a price of 0.15 to 0.30 euros (the highest price being observed in towns and the lowest price being observed in rural areas) (Table 1). This price was higher than the egg price in Zimbabwe (0.09 euros) [11]. The majority of the farmers sold live animals at a price of 4 to 10 euros, which was in the range of prices observed in Zimbabwe (6.4 euros in average) [11]. This high variability of the price is due to the color of the animals, white GF are much more expensive than grey ones, since they are preferred for sacrifices and witchcraft. Eggs and live birds were sold on site or at local markets or sometimes sold in town.

Descriptive Analysis of Some Characteristics of GF Breeding

The information collected from the farmers gave an indication of the rate of reproduction of the birds. Approximately 14.4% of the birds originated in France and laid before 6 mo of age, but most of the GF were from indigenous breeds and laid between 6 and 7 mo of age. The majority (88.7%) of the birds laid during the rainy period (May to November) with the number of eggs per female and per year averaging 100 (range of 50–150). The same result was observed in Burkina Faso [12] and in Ghana. [9] However, in Botswana, it seems that GF lay during the dry season (September to April) [13]. However, GF can lay all year, if they are fed an adequate diet and receive water ad libitum [14]. Extensive farming was the major farming system and the majority of producers (70.1%) fed their GF (Table 1). But they only give the birds a few handfuls of sorghum or corn with the main aim of attracting them to return home. The majority of the farmers (74.2%) had started their production by buying eggs from other farmers, and then hatching and rearing their own GF from the fertilized eggs.

In our survey, for 95% of farmers GF eggs were brooded by chicken hens because GF are poor brooders and they are not interested in protecting their young after hatching. Hatching rate was on average 70% and was similar to

Table 1. Socioeconomic Characteristics of Guinea Fowl Producers in Ivory Coast.

Variables	Modalities	Number	Proportion (%)
Sex	1. Male	93	95.9
	2. Female	4	4.1
Age (years)	1. 18 to 59	88	90.7
	2. Over 59	9	9.3
School level	1. Illiterate	53	54.6
	2. Primary school	19	19.6
	3. At least high school	15	15.5
	4. Secondary school	10	10.3
Marital status	1. Married	82	84.5
	2. Single	15	15.5
Farming system	1. Extensive	61	62.8
	2. Intensive	18	18.6
	3. Semi-intensive	18	18.6
Number of guinea fowl	1. Less than 20 birds	41	42.3
	2. 20 to 50 birds	33	34.0
	3. More than 50 birds	23	23.7
Feeding	1. Fed	68	70.1
	2. Not fed	29	29.9
Producer objective	1. Sale and consumption	64	66.0
	2. Sale	33	34,0
Nationality	1. Ivoirian	51	52.6
	2. Other	46	47.4
Financing	1. Self-financing	90	92.8
	2. External financing	7	7.2
Egg price (euros)	1. 0.15 to 0.30	66	68.0
	2. Over 0.30	5	5.2
	3. Less than 0.15	26	26.8
Live guinea fowl (euros)	4. 4 to 10	70	72.2
	5. Over 10	3	3.1
	6. Less than 4	24	24.7
Egg/guinea fowl/year	1. 100	47	48.5
	2. More than 100	26	26.8
	3. Less than 100	24	24.7

the rate observed in Benin [15] but higher than that observed in Zimbabwe (63.8%) [16] or that observed in Mali (44%) [17]. The average brooding duration was 27 to 28 d, which is also the case in Iran [18] and Bangladesh [19].

The majority (95%) of farmers declared that the high mortality of young GF was a critical factor. However, it was not possible during this survey to get firm data on early mortality; the farmers just declared that it was high. This situation of high early mortality is similar in other African Countries. In Mali, 49% of young birds were lost at 1 mo of age [17], and related an early mortality in the range of 10 to 40% in Zimbabwe [16] and in Burkina Faso [20] described a high early mortality (27%). This mortality was mainly due to predators like snakes and eagles (until 33.3% of early mortality in Zimbabwe, according to [16]), and diseases and parasites.

Main Determinants of GF Production by the Classification Analysis

The analysis of the classification tree with the "GF production objective" as dependent variable is presented in Figure 1. The terminal node 1 included 18 farmers who practiced intensive farming and predominantly (88.9%) only sold their eggs and live animals. The terminal node 2 included 79 farmer producers with semi-intensive

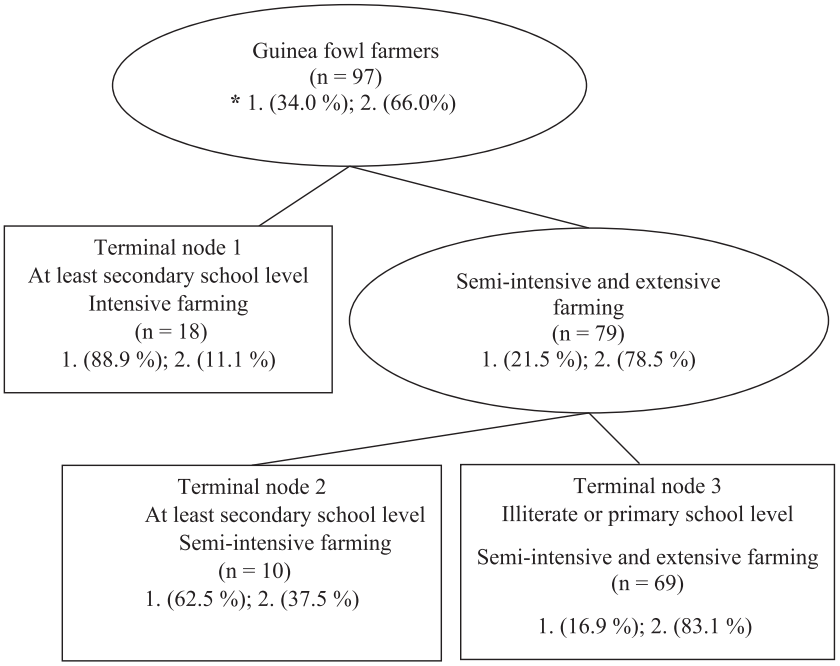

Figure 1. Classification tree with «objective of farmers» as target variable. *: 1 = Eggs and live animals sale; 2 = Eggs and live animals sale and consumption.

or extensive farming practice. Among these 79 farmers, the majority (78.5%) sold the eggs and live GF, 10 had at least secondary school level education and the majority of the other 69 farmers had at most primary school level education, and both consumed and sold the eggs and live GF. So, the conclusion is that farmers with the highest level of education are self-employed and have the sale of GF products (eggs and live birds) as their principal enterprise.

Global Typology of GF Producers

Multiple correspondence analyses resulted in a dispersion of farmers in 6 factorial axes. This graphic display explained 79% of the total variability. The hierarchical clustering on the basis of characteristics of individuals showed that 3 groups of farmers could be distinguished (Figure 2). The division into 3 groups related to the education level, the poultry farming system (extensive, intensive, and semi intensive), the number of animals, GF production (eggs and live GF), and whether the GF were or were not fed. In group 1, most producers farmed extensively (91%), were illiterate (79%), had less than 20 GF (61.2%), the majority (91.4%) of which were of indigenous breeds. Birds were fed by 58% of the producers although 93% of flocks had an egg production less than or equal to 100 per bird yearly. The farmers both home consumed and sold eggs and live GF. In group 2, most producers (90%) practiced intensive farming, 75% had a good level of education, and all the farmers had more than 50 GF with only 55% being of indigenous breeds, just 5% of producers did not feed their birds and 95% had a yearly egg production greater than 100 per bird, and the sale of the eggs and live animals was their primary source of income. In group 3, all producers farmed semi-intensively, 60% had a primary school level education, and 70% had between 20 and 50 GF of indigenous breeds. All the farmers fed their GF, had a yearly egg production greater than 100 per bird, and sold eggs and live GF.

This typology confirmed that, in Ivory Coast, the productivity of local GF was improved in semi-intensive system in comparison with extensive farming [2]. In this system, the birds are fed by the farmer, but they can also forage outside for additional food to meet their nutritional

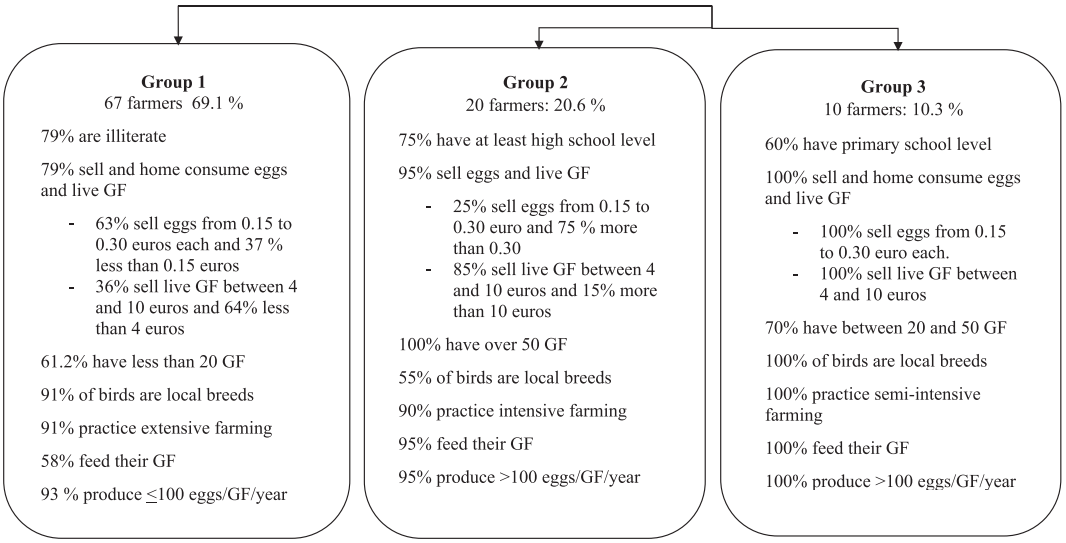

Figure 2. Classification of guinea fowl (GF) producers according to GF production.

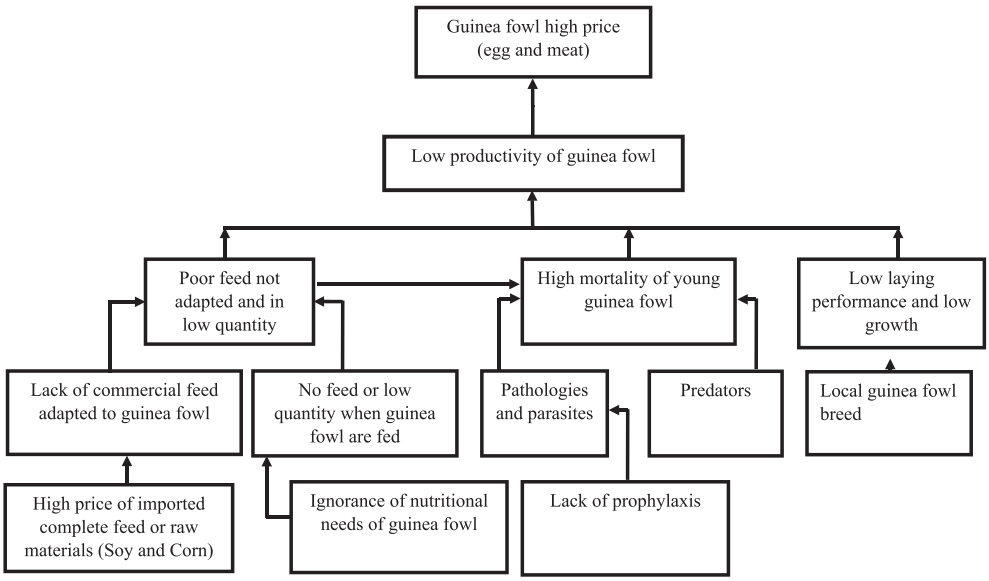

Figure 3. Constraints of guinea fowl production.

needs. According to [20], the improvement of nutritional conditions has positive effects on prolonging the laying performance of the GF over a long period.

Constraints of GF Production in Ivory Coast

Several factors said to be constraints to optimal production are presented in Figure 3. The lack of health management, the poor management of young GF, reduced the survival rate of birds. The inconsistent feeding system could also be a major contributor of undernutrition and malnutrition leading to unhealthy young GF and their early death, and leading to poor productivity of GF. The situation is similar in sub-Saharian African countries such as Zimbabwe [16], Mali [17], and Burkina Faso [20].

CONCLUSIONS AND APPLICATIONS

1. GF farmers were mostly men (96%) aged between 18 and 58 yr, and a majority of them (53%) had no formal education.
2. The majority of GF farmers kept an average flock size of less than 20 GF, and the most common type of farming was extensive.
3. The majority (66%) of farmers focused on home consumption of eggs and live GF with sale of surplus.
4. The most important training need for the farmers was in young GF mortality control.
5. The development of this breeding activity could then contribute to food self-sufficiency in animal protein and contribute to the fight against poverty in Ivorian rural areas.

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