



## Phenotypic characteristics of local poultry (hen and guinea fowl) in Niger

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### Abstract

*The present study was initiated to characterise local chicken and guinea fowl populations of Niger in order to provide necessary information to better valorise their breeding. For this purpose, a survey is carried out on a sample of 200 poultry farmers of all species and the characterisation work concerned 400 adult poultry. Thus, a total of 20 villages, spread over 18 communes in the Regis-ER project area, were covered. Several morpho-biometric and qualitative characteristics were assessed in both the local hen and guinea fowl, including the type of plumage, crest, polydactyly, feather distribution, colour of the plumage, tarsus, legs, barbels, skin, earlobe, beak, eggshell and eyes. It emerged from the analysis of results that, majority of the respondents were aged between 30 and 50 years (64%). Their main activity was agriculture (73%). Poultry farming is practiced majority by married women. A total of seven local varieties of chicken were encountered, including Dourgou, Goggori, Gouzou-gouzou, Kollonto, Métis, Populaire and Tchiagara. With the exception of wing length and barb length, the Kolonto variety has the highest average values. The Dourgou variety has much smaller mean values for tarsal length, wing length and wingspan. Five local guinea fowl varieties were observed, namely Angoulou, Hwaraa, Jaa, Koural fataké and Zabako. The Angoulou variety had the highest average values. The lowest live weight values were obtained in Hwaraa (1027.85 g) and Jaa (1057.50 g). In addition, molecular analysis will allow a better assessment of the genome diversity of the local hen and guinea fowl population.*

**Keywords:** Niger, local chicken and guinea fowl, Phenotypic, characteristics]

## I. INTRODUCTION

Generally, in Africa, family poultry farming is practiced by more than 80% of the population concentrated mainly in rural areas. It plays an important role in the rural, urban, and peri-urban areas economies [1]. Its importance for producers is linked to the fact that it requires low levels of inputs, contributes significantly to food security, fight against poverty, permits healthy conservation of biological resources, and offers employment to disadvantaged groups [2], [3].

In Niger, poultry farming is dominated by family poultry farming, which concerns about 96% of all local species combined against 3% for modern farming. This activity

contributes, to the food security of populations, particularly in rural areas where it is the main source of animal protein [4], and contributes to reducing poverty in rural and peri-urban areas by providing a substantial income to producers [5]. Local chicken and guinea fowl represent 55% and 26% respectively of the species reared in family poultry farming in Niger [5].

However, their characteristics are not well known. This lack of information could constitute an obstacle to a possible development program for the breeding of these species. Indeed, the Food and Agriculture Organization of the United Nations has mentioned that knowledge of the phenotypic and zootechnical characteristics of local populations of hens and guinea fowl constitutes a preliminary step in the choice of suitable genotypes, to be valued at regional, national scales, and especially to the improvement of the productivity of these species [6].

In view of their numerical importance and their undeniable socio-cultural and economic roles, the zootechnical production performance of local breeds of hens and guinea fowl in Niger are little known and appear to be weak.

Thus, the present study was initiated to characterize the local populations of hens and guinea fowl in Niger in order to provide the information needed to better promote their breeding. More specifically, it was about: make the typology of the breeders of the local hen and guinea fowl; identify the different varieties of local hens and their phenotypic characteristics; establish the genetic diversity of the local guinea fowl on the basis of phenotypic traits.

## II. MATERIALS AND METHODS

### 2.1 Study period and area

The study was conducted from March to May 2019 in Niger in the intervention area of the Resilience and Economic Growth in the Sahel - Enhanced Resilience (REGIS - ER) project funded by the United States Agency for International Development (USAID). It covers the regions of Tillabéri and Maradi, with 15 townships in Tillabéri and 3 townships in Maradi (figure 1). In those communities, REGIS-ER has made interventions in family poultry farming, the objective was to gather massive support of producers.

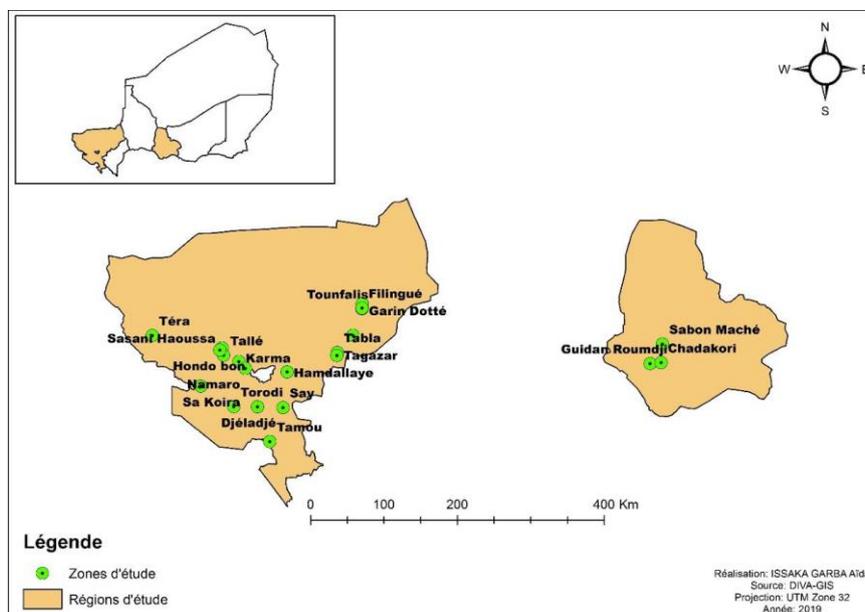


Figure 1: Study area

Tillabéri (or Tillabéry) region is located in the southwest of Niger. It covers an area of 97,251 km<sup>2</sup> (7.7% of the country area). It is bordered to the North by Mali Republic, to the east by Tahoua and Dosso regions, to the South by Benin Republic, and to the West by Burkina Faso Republic. Niamey, Niger capital is circumscribed within Tillabéri Region. The region is crossed by the Niger River.

The relief is a plateau of around 250 m altitude, cut by temporary (Gorouol, Sirba) or permanent (Mékrou, Tapoa) rivers. To the east, in Filingué department, Tillabéri region extends over part of the Dallol Bosso valley and is imprinted by the fossil stream of Azawak. The National W Park is located in the extreme south of the region and extends over Burkina Faso and Benin. The North-eastern part of the region (Ouallam and Filingué departments) is a savannah region.

Climate is Sahelian type, hot and relatively humid with 540 mm of rainfall in Niamey. However, Tillabéri does not receive a drop of rain for more than 4 months a year. The region was populated by 2,572,125 inhabitants in 2012 [7]. The population is composed mainly of Djermas (63.6%), Fulanis (12.6%), Tuaregs (11.1%), and Hausas (10.5%) [8].

Maradi region is located in the eastern center of Niger. It is bordered at the East by Zinder region, at the West by Tahoua region, at the North by Tahoua and Agadez regions, and at the South by the Federal Republic of Nigeria with which it shares approximately 150 km of border. Maradi region has 41,796 km<sup>2</sup> of area (3.30% of the Niger country). According to the latest demographic projections, Maradi region remains the most populous in Niger with a population estimated in 2012 [7] at 3,117,810 inhabitants, or 20.20% of Niger population. Its density is estimated at 74.59 inhabitants / km<sup>2</sup> against 12.42 inhabitants / km<sup>2</sup> for the country [8]. Maradi region has two types of climates. At the North, the Sahelian-type climate is characterized by average annual precipitation of between 200 and 300 mm, and the Sahelo-Sudanese climate in the south, characterized by an average annual rainfall of between 500 and 600 mm. Animal breeding is the second activity after agriculture, it is practiced by more than 90% of the population for the generation of income, the satisfaction of socio-religious needs, and protection against food crises.

## 2.2 Sampling

The sampling consisted of determining the representative numbers of persons being investigated and of adult poultry being characterized. Therefore, the following proportion formula was used:

$$n = (Z / e)^2 \times p (1 - p).$$

- "n" is the size of the sample;
- "Z" is the confidence level, in general, Z = 1.96 at a 95% confidence interval;
- "P" is the initial level of the indicators;
- "e" is the margin of error.

In the villages, the study population consists of poultry farmers. The choice of respondents depends on their availability to collaborate. From each respondent who gave their agreement, two subjects (chickens or guinea fowl) were isolated for the measurements. Because of this technical inking, the initial level of indicators (p-value) chosen for the survey sample was p = 80% and the considered margin of error was "e" = 5%. Thus, the size of the calculated survey sample was:

$$n = (1.96 / 0.05)^2 \times 0.8 \times 0.2 = 245$$

Due to the realities in rural areas, the surveys focused on a sample of 200 poultry breeders of all species, and the characterization work concerned 400 heads of adult poultry. Thus, a total of 20 villages, spread over 18 municipalities in the intervention area of the Regis-ER project, were involved in the study. In each village, 10 local hen or guinea fowl producers are chosen and for each hen or guinea fowl producer, two adult subjects are

isolated at random (without distinction of sex) for phenotypic characterization. Table 1 shows the distribution of samples by region.

*Table 1: Sampling of breeders and poultry by locality*

Regions	N Municipalities	N surveyed	N chickens	N guinea fowl
Tillabéri	15	154	237	82
Maradi	3	46	63	18
Total	18	200	300	100

## 2.3 Data collection

Two categories of data were collected, those for the socioeconomic characterization of poultry farmers and those for the phenotypic characterization of local breeds of chickens and guinea fowl. For the latter, the characterized parameters are:

- Qualitative characters: type and colors of plumage, colors of legs, beak, eyes, eggshell, barbel, earlobe, tarsus, skin and mumps, type of crest, existence or not of a 5<sup>th</sup> finger (polydactyly), and distribution of feathers;
- Quantitative characters: length of the tarsus (distance between the articulation of the fingers and that of the thigh), length of the body (distance between the tip of the upper mandible and that of the tail without feathers), thoracic perimeter (circumference of the chest taken below the wings and at the level of the protruding region of the keel), the circumference of the tarsus (circumference of the tarsus), length of the wing (length of the wing extended from the junction of the humerus to the spine Until the end of the wing without feathers), barbel length, beak length (distance between the tip of the upper mandible and the commissure of both mandibles), wingspan, the height of the crest (guinea fowl) and live weight.

The qualitative parameters were assessed by simple observation. However, the morphometric characters were determined from the body measurements of the subjects, carried out using a measuring tape graduated to the millimeter, and the live weight was determined using an electronic weighing scale of 5 kg. and precision of 1 gram. The description of the qualitative characteristics and the body and weight measurements were carried out according to the recommendations of the [6]. In the end, a picture of the poultry is taken to achieve a more precise description.

## 2.4. Data processing and analysis

The data collected was entered using SPSS software and analyzed using R software (version 2.14.2). The descriptive analysis was conducted to calculate and present the data in the form of numbers, frequencies, means and standard deviations. The figures and tables were produced using an Excel spreadsheet.

# III. RESULTS AND DISCUSSION

## 3.1. Socioeconomic characteristics of the farmers surveyed

Six variables were retained to assess the socioeconomic characteristics of the breeders. Table 2 presents the frequencies of the modalities of these variables.

**Table 2: Frequencies of modalities of socio-demographic variables of the farmers surveyed**

of socio-demographic variables	Modalities	Number	Percentages
Gender	Women	117	58.50%
	Men	83	41.50%
age range	30-50 years	128	64%
	50-70 years	72	36%
Rank in family	Householder	97	48.50%
	Wife	102	51%
	Girl	1	0.50%
Marital status	Married	186	94.50%
	Single	4	2%
	Widower	7	3.50%
Resident status	Native	142	71%
	Allochthonous	58	29%
Activities	Agriculture	146	73%
	Other	54	27%

It appears from Table 2 that poultry farming is practiced by both men and women with the dominance of women (58.5% vs. 41.5%). Most of these respondents are between 30 and 50 years old (64%). The majority of respondents are married (94.5%), native (71%), and are either wives (51%) or head of the family (48.5%) or daughter (0.5%). Their main activity is Agriculture (73%).

### 3.2. Morpho-biometric traits of local chicken and guinea fowl

#### 3.2.1. Qualitative morpho-biometric traits of the local chicken

A total of seven local races were found, among which we have *Dourgou*, *Goggori*, *Gouzou-gouzou*, *Kollonto*, *Métis*, *Populaire* and *Tchiagara*. Table 3 shows the number of subjects encountered by local breed / race per region.

**Table 3: Number of subjects (hens) characterized by race and by Region**

racess		<i>Dou</i>	<i>Gog</i>	<i>Gouz</i>	<i>Kol</i>	<i>Pop</i>	<i>Tcha</i>	<i>Metis</i>	<i>Eff</i>	(%)
Number		5	1	1	12	177	93	11	300	100
Region	Tillabéri	2	0	1	6	135	7	86	237	79
	Maradi	3	1	0	6	42	4	7	63	21
Gender	Female	3	1	0	6	139	2	82	233	77,7
	Male	2	0	1	6	38	9	11	67	22,3

*Dou = Dourgou ; Gog = Goggori ; Gouz = Gouzou-gouzou ; Kol = Kolonto ; Pop = Populaire ; Tcha = Tchagara ; Eff = Effectif.*

##### 3.2.1.1. Plumage types, ridge type, polydactyly, and feather distribution

Two types of plumage were observed including smooth plumage (99.66%) and curly plumage (0.33%). The peak is simple in 99.33% of subjects and pink in 0.66%. Polydactyly is 100% absent. The regular (normal) distribution of feathers on the body is mainly observed (95.33% of subjects), the hoopoe is present in 4.66%.

##### 3.2.1.2. Colors of local chicken plumage

A great diversity of plumage color (eleven colors) was observed in the hens (Table 4 and Figure 2).

**Table 4: Colors of local chicken plumage**

Varieties	White	mottled	Silver Coucou	Tawny	Froment	Ermine color	Thousand flowers	Black	Partridge	Red	Salmon
<b>Gog</b>										1	
<b>Gouz</b>	1										
<b>Dou</b>			2	1				2			1
<b>Kol</b>	3		1	1		1	4		1	1	
<b>Métis</b>	4		2			3	2				
<b>Tcha</b>	7	8	5	18	2	14	3	11	16	7	1
<b>Pop</b>	29	13	19	20	10	26	5	10	30	13	2
<b>Eff</b>	44	21	29	40	12	44	14	23	47	22	4
<b>%</b>	14.7	7	9.6	13.3	4	14.7	4.7	7.7	15.7	7.3	1.3

It appears from Table 4 that 15.7% have partridge plumage; 14.7% have white, same frequency observed for ermine color plumage and 13.3% have tawny plumage. All colors were observed in the Popular and *Tchagara* races / varieties.



### 3.2.1.3 Color of tarsi and legs

The chicken legs can be white (57%), gray (33.33%), yellow (4.86%) or black (4.86%) as shown in Table 5. The same colors are found in the tarsi with 58.13%

respectively; 31.83%; 5.19% and 4.84% of frequencies (Table 5). The white coloring of the tarsi and legs concerns all varieties.

**Table 5: Color frequencies of tarsi and legs in different varieties of local chicken**

Varieties	Tarsi				legs			
	White	Gray	Yellow	Black	White	Gray	Yellow	Black
Gog	0,60				0,61			
Gouz	0,60				0,61			
Dou	2,38	1,09			2,44	1,04		
Kol	4,17	3,26	13,33		4,88	3,13	7,14	
Métis	3,57	1,09	26,67		4,27		28,57	
Tcha	25,60	40,22	13,33		26,22	38,54	14,29	
Pop	63,10	54,35	46,67	100	60,98	57,29	50	100
% relatif	58.13	31.83	5.19	4.84	56.94	33.33	4.86	4.86

### 3.2.1.4. Beak color

The color of the beak in local varieties of chicken in Niger is predominantly white (51.7%). This coloring is observed in all varieties. It is followed by the black coloration (28.7%) (Table 6).

**Table 6: Frequencies of beak color in the different varieties of local chicken in Niger**

Varieties	White	Black	Brown	Yellow	Red	Gray
Dou	1.9	2.3				
Gog	0.6					
Gouz	0.6					
Kol	5.2	1.2	13.6			
Métis	3.9	2.3	4.5	8.0	75.0	
Pop	56.8	59.3	63.6	68.0		50.0
Tcha	31.0	34.9	18.2	24.0	25.0	50.0
FR	51.7	28.7	7.3	8.3	1.3	2.7

### 3.2.1.5. Eye colour

The overwhelming majority of subjects (91.3%) all varieties combined have an orange coloring of the eyes (Table 7).

**Table 7: Frequencies of eye color**

Varieties	Orange	Yellow	Red	Brown
Populaire	162	12	3	
Tchagara	83	7		3
Dourgou	5			
Gogori	1			
Gouzou-Gouzou	1			
Kolonto	12			
Métisse	10		1	
Total	274	19	4	3
Fr	91.3	6.3	1.3	1.0

### 3.2.1.6. Eggshell color

A total of 65.33% of females were laying eggs at the time of the survey. All varieties except *Gouzou-Gouzou* were represented. Two colors were observed for the eggshell, in

particular the white (82.14%) observed in all the varieties encountered in laying, and the brown (17.86%) observed in the *Tchagara* and *Popular* varieties. The color of the eggshell is white in *Kolonto*, *Dourgou* and *Métis* and white and brown in *Populaire* and *Tchagara* (Table 8).

**Table VIII: Eggshell color according to the variety**

Varieties	White	Brown
<i>Dourgou</i>	2	
<i>Goggori</i>	1	
<i>Kolonto</i>	5	
<i>Métis</i>	3	
<i>Populaire</i>	94	22
<i>Tchagara</i>	56	13
Total	161	35
Fr	82.1	17.9

### 3.2.1.7. Mumps color

People with white mumps are the most common (48%). They concern all varieties encountered exception of *Gogori* and *Gouzou - Gouzou*. Red mumps are observed in all varieties and represent 30.7% of the population. Gray and black colored mumps were observed only in the *Popular* and *Tchagara* varieties (Table 9).

**Table 9: Mumps color frequencies**

Varieties	White	Gray	Black	Red and White	Red
Dou	1,4				3,3
Gog					1,1
Gouz					1,1
Kol	2,1			5	7,6
Métis	0,7			7,5	7,6
Pop	60,4	50	50	65	54,3
Tcha	35,4	50	50	22,5	25
FR	48	1,3	1,3	13,3	30,7

### 3.2.1.8 Barbel color

The color of the Barbel is mainly red (93.7% of the subjects studied). This coloring of the barbels is observed in all the local varieties of chicken from Niger. However, subjects with white and black colored barbel are observed in the *Popular* and *Tchagara* varieties (Table 10).

**Table 10: Barbel color frequencies according to chicken varieties**

Varieties	Red	Red & black	Black	White	Red & White
<i>Dourgou</i>	5				
<i>Goggori</i>	1				
<i>Gouzou-gouzou</i>	1				
<i>Kolonto</i>	12				
<i>Métis</i>	11				
<i>Tchagara</i>	169	5	3	3	

<i>Populaire</i>	82	2	2	2	2
Total	281	7	5	5	2
Fr	93.7	2.3	1.7	1.7	0.7

### 3.2.1.9 Skin and earlobe color

The skin is white in most subjects (98.3%). However, the black color was observed in the varieties *Dourgou* (0.3%), *Populaire* (0.3%) and *Tchagara* (1%). Earlobe's color is predominantly white (98.7%) for all varieties. However, subjects with a gray (0.3%), black (0.3%) and red-white earlobe are found respectively in the *Popular*, *Tchagara*, *Dourgou* and *Populaire* varieties.

### 3.2.2 Quantitative morpho-biometric characters of local chicken

Table 11 presents the mean and standard deviation of the quantitative morpho-biometric variables measured in local chickens. Average values of 1179.8 g; 8.19 cm; 35.54 cm; 27.47 cm; 3.76 cm; 17.65 cm; 2.33 cm; 2.99 cm and 39.77 cm were obtained respectively for the live weight (W), the length of the tarsus (LT), the length of the body (LB), the thoracic perimeter (TP), the tarsus circumference (TC), wing length (LW), barbel length (LBa), beak length (Lb) and wing span (WS). With exception of LW and Lb, *Kolonto* variety is the one with the highest mean values of all parameters, followed by the *Métis* and the *Popular* varieties. The *Dourgou* variety exhibits much smaller mean values for LT, LW and WS.

*Table 11: Quantitative characteristics of local chickens according to the varieties*

Paramètres	<i>Dourgou</i>	<i>Goggori</i>	<i>gouzou-gouzou</i>	<i>Kolonto</i>	<i>Metis</i>	<i>Populaire</i>	<i>Tchagara</i>	Moyenne
W (g)	990 ± 140,35	1058 ± 1058	1255 ± 1255	1494,41 ± 465,43	1378,63 ± 495,09	1147,40 ± 258,65	935,20 ± 191,89	1179,8 ± 552,02
LT (cm)	5,68 ± 0,75	8,5 ± 8,5	9 ± 9	9,61 ± 1,41	9,35 ± 1,34	7,46 ± 0,99	7,77 ± 7,10	8,19 ± 4,15
LB (cm)	33,10 ± 1,81	34 ± 34	34 ± 34	39,27 ± 5,38	38,66 ± 4,70	35,19 ± 3,81	34,60 ± 4,44	35,54 ± 12,59
TP (cm)	26,30 ± 3,56	28,5 ± 28,5	28,5 ± 28,5	29,23 ± 3,85	28,07 ± 5,25	26,56 ± 3,91	25,18 ± 2,65	27,47 ± 10,88
TC (cm)	3,68 ± 0,57	3,6 ± 3,6	3,8 ± 3,8	4,15 ± 0,50	4,01 ± 0,57	3,81 ± 2,97	3,33 ± 0,52	3,76 ± 1,79
LW (cm)	14,50 ± 1,96	19 ± 19	19 ± 19	19,04 ± 1,78	19,59 ± 1,93	16,57 ± 2,58	15,91 ± 1,69	17,65 ± 6,84
LBa (cm)	1,70 ± 0,34	1,5 ± 1,5	4 ± 4	3,59 ± 3,22	2,93 ± 1,38	1,65 ± 1,06	0,94 ± 0,74	2,33 ± 1,74
Lb (cm)	2,68 ± 0,70	3,3 ± 3,3	3,3 ± 3,3	3,15 ± 0,49	3,20 ± 0,45	2,79 ± 1,11	2,56 ± 0,51	2,99 ± 1,4
WS (cm)	34,90 ± 2,70	43 ± 43	35,5 ± 35,5	44,08 ± 7,15	43,58 ± 3,07	39,48 ± 3,93	37,85 ± 3,76	39,77 ± 14,15

*NB: W = Live weight; LT= Length of the tarsus; LB= Body length; TP= Thoracic perimeter; TC= tarsus circumference; LW= Wing length; Lba= Length of the barbel; Lb= Length of the beak; WS= Wing span.*

### 3.3 Morpho-biometric characteristics of the local guinea fowl

Five local varieties of guinea fowl were observed, including *Angoulou*, *Hwaraa*, *Jaa*, *Koural fataké* and *Zabako*. Figure 3 illustrates these different varieties.



*Angoulou (Black color)*



*Hwaraa (White color)*



*Jaa (Red color)*



*Koural Fataké (ash to light gray)*



*Zabako (Gray color)*

*Figure 3: genetic diversity of the local guinea fowl*

### 3.3.1. Plumage color

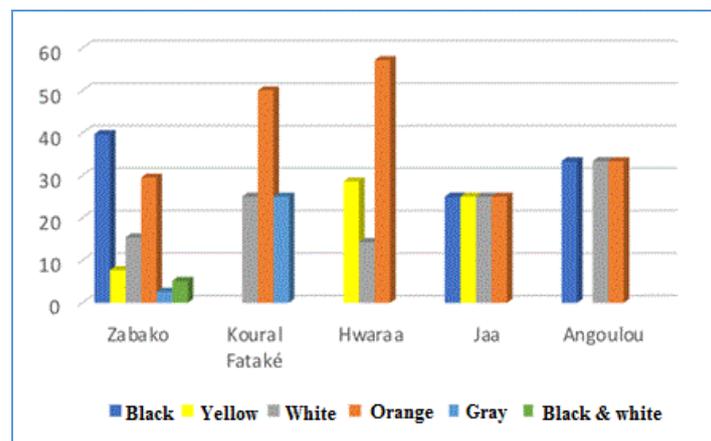
In local guinea fowl, subjects with gray plumage are the most represented 78%, then those whose feather color is ash 8% and finally those with a white color 7% (Table 12).

*Table 12: Plumage color frequencies of Niger guinea fowl*

Plumage color	Vareties	Frequency (%)
White	Hwarra	7
Ash	<i>Koural fataké</i>	8
Gray	<i>Zabako</i>	78
Marron	<i>Jaa</i>	4
Black	<i>Angoulou</i>	3

### 3.3.2. Leg color

Different coloring of the legs was observed in the local guinea fowl of Niger. As shown in Figure 4, it is in particular white, gray, yellow, black, black-white or orange.



*Figure 4: Leg color in guinea fowl in Niger*

The leg color is white, black or orange in the *Angoulou* variety (33% each color). It is predominantly orange in the *Hwaraa* and *Koural fataké* varieties and black or orange in the *Zabako* variety. However, in the *Jaa* variety, the legs can be white, yellow, black or orange.

### 3.3.3. Beak color

The beak color is red in the *Hwaraa*, *Jaa* and *Zabako* varieties. This color also dominates in the *Angoulou* and *Koural fataké* varieties where it is possible to observe subject with black beak (33% and 12.5% respectively).

### 3.3.4. Eye colour

The eye colors of guinea fowl *Jaa* and *Angoulou* is uniformly brown (100%). For the remains an intra-breed diversity of eye color is observed. Thus, the eyes are mainly brown 62.5%, 85.9% and 51.1% for respectively *Koural fataké*, *Zabako*, and *Hwaraa* varieties; they can be orange (12.5%) or pearl (25%) in the *Koural fataké* variety; orange (2.6%) or pearl (11.5%) in the *Zabako* variety, pearl (42.9%) in the *Hwaraa* guinea fowl.

### 3.3.5. Eggshell color

All the varieties present a brown coloration for the eggshell (100%) except the *Hwaraa* variety which has in addition to brown (57.1%), a white shell (42.9%).

### 3.3.6. Mumps color

The red-white color was uniformly present in all varieties and (100%) with the exception of the *Zabako* variety which also has a white color (1.3%).

### 3.3.7. Barbel color

The red-white color is present in all the varieties with different proportions namely 85.7% of the *Hwaraa*, 75% of the *Jaa*, 100% of the *Angoulou*, 62.8% of the *zaboko* and 62.5% of the *Koural fataké* varieties. And among those with a red color, the *Koural Fataké* variety is the most represented with a proportion of 37.5%. However, the *Zabako* variety additionally exhibits a red-white-blue coloration 5.1% (Figure 5).

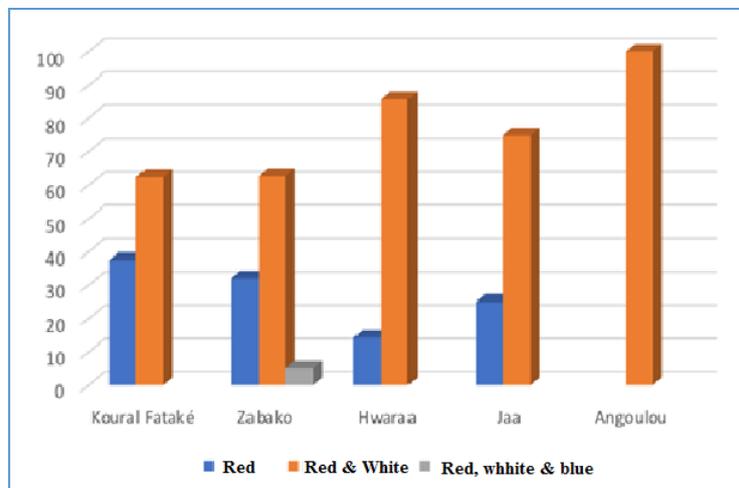


Figure 5: Barbell color in Niger guinea fowl

### 3.3.8. Ear lobe color

For guinea fowl, as in chickens, all varieties have a white earlobe coloration, moreover, the black color is only observed in the *Angoulou* variety representing 33.3% and the gray color in the *Zabako* variety representing 11, 5%.

### 3.3.9. Tarsus color

All the tarsal color diversity is observed in the variety *zaboko* with a predominance of black. In the *Koural Fataké* and *Angoulou* varieties, the colors yellow respectively black are not observed. However, In *Hwaraa* guinea fowl, black and gray tarsi colorations were not observed (Figure 6).

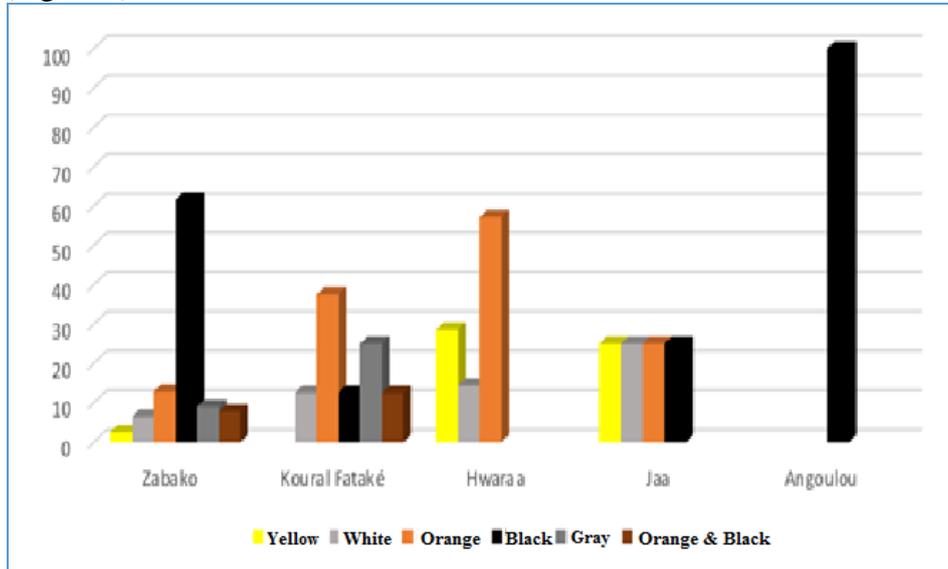


Figure 6: Tarsal color in Niger guinea fowl

### 3.3.10. Skin color

All varieties have a white color of the skin, however *Zaboko* variety also exhibits gray, yellow and black colorings.

### 3.3.11. Quantitative morpho-biometric parameters of the local guinea fowl

Table XIII presents the means and standard deviations of the quantitative morpho-biometric variables measured in local guinea fowl. Means values of 1137.69 g; 6.99 g; 40.71 g; 29.07 g; 3.58 g; 17.52 g; 1.9 g; 2.5 g; 41.38 g and 1.2 g were obtained respectively for W, LT, LB, TP, TC, LW, LBa, Lb, WS and RH. For all these parameters studied, *Angoulou* variety exhibited the highest average values with the exception of TT and HC. The lowest live weight values were obtained in guinea fowl *Hwaraa* (1027.85 g) and *Jaa* (1057.50 g).

Table XIII: Means and standard deviations of the values of the quantitative parameters of the local guinea fowl in Niger

Paramètres	Angoulou	Hwaraa	Jaa	Koural fataké	Zabako	Moyenne
W (g)	1261,66 ± 301,7	1027,9 ± 175,9	1057,5 ± 198,1	1103,12 ± 221,29	1238,3 ± 409,8	1137,7 ± 261,4
LT (cm)	7,73 ± 0,25	6,94 ± 0,66	6,72 ± 1,00	6,67 ± 0,49	6,93 ± 1,18	6,99 ± 3,58
LB (cm)	43,60 ± 2,42	41,10 ± 3,92	39,62 ± 1,79	38,43 ± 3,23	40,81 ± 4,28	40,71 ± 3,12
TP (cm)	30,73 ± 3,26	28,82 ± 2,55	27 ± 2,04	30,32 ± 3,68	28,48 ± 5,34	29,07 ± 3,37
TC (cm)	3,63 ± 0,32	3,57 ± 0,37	3,72 ± 0,17	3,28 ± 0,21	3,74 ± 0,64	3,58 ± 0,34
LW (cm)	19,33 ± 0,57	17,37 ± 0,83	16,62 ± 3,81	16,36 ± 2,51	17,96 ± 2,48	17,52 ± 2,04
LBa (cm)	2,60 ± 0,60	1,90 ± 0,59	1,20 ± 0,14	1,73 ± 0,55	2,07 ± 1,98	1,9 ± 0,77
Lb (cm)	2,63 ± 0,15	2,54 ± 0,19	2,42 ± 0,28	2,46 ± 0,23	2,46 ± 0,37	2,5 ± 0,24
WS (cm)	46,13 ± 1,50	41,52 ± 2,10	38,12 ± 7,19	38,81 ± 2,89	42,33 ± 5,14	41,38 ± 3,76
RH (cm)	1 ± 1	0,95 ± 0,67	1,27 ± 0,22	1,42 ± 0,51	1,39 ± 0,46	1,2 ± 0,57

*NB: W = Live weight; LT= Length of the tarsus; LB= Body length; TP= Thoracic perimeter; TC= tarsus circumference; LW= Wing length; Lba= Length of the barbel; Lb= Length of the beak; WS= Wing span; RH = Ridge Height*

### 3.4 Discussion

#### 3.4.1. Typology of breeders of local chicken and guinea fowl

The present study has shown that raising local chickens is a predominantly female activity. This is reported in the literature from sub-Saharan Africa [9], [10], [11]. This result is in contradiction with that obtained in India [12] and Togo [13], where traditional chicken breeding is a man's business. The predominance of women observed in our survey is linked to the fact that raising local chickens is a traditionally female activity in most African countries. To fight against poverty which generally affects women and children, institutional support for local chicken farming coupled with raising the female school attendance rate in rural areas would be essential.

#### 3.4.2. Morpho-biometric characteristics of the local hen

The phenotypic characterization, shows a diversity of races, this probably indicates the existence of genetic variability. Indeed, according to [14], this phenotype variability characterizes local chickens and indicates the presence of several morphological mutations that result from domestication and random reproduction. However, the light colors, notably the white plumage and the barred or cuckoo present at about 20% in the total population, may suggest a relatively high level of dilution of local genes through the introduction of the strains.

Two types of plumage (smooth and curly) are observed in local breeds of chicken in Niger. This result corroborates that of [15] in Senegal. However, [16] in Benin and [17] in Côte d'Ivoire observed three types of hen plumage. Regarding the coloring of the plumage, several colors can be distinguished, but the most frequent is the partridge in accordance with the results obtained by [18] and [13] in Togo. This result differs from those obtained on local breeds of chicken in Benin [16], Cameroon [10] and [19] and Senegal where the most

frequent colors are black and fawn respectively. The normal distribution of feathers on the body was observed with high frequencies in accordance with those obtained by [20] in Niger. However, our results are restrictive of those described by [13] and [19], who observed two other phenotypes that were not encountered in our study, notably the naked neck and feathery tarsi phenotypes. The normal distribution of the widely represented feathers would probably be the consequence of a relative homogeneity of climatic conditions in Niger. The legs and tarsi are mostly white. Our observations are in agreement with those of [21], [10], [19], [22] and [20]. This result differs from those obtained on chickens from Nigeria by [23] where the most frequent are hens with black tarsi. Hens with green or steel blue tarsi reported in Cameroon [10] and [19] were not observed in this study. The presence of the yellow coloration of the tarsi and legs could reflect the degree of penetration of exotic genes in the local hen population. Unlike the results obtained by [19] in Cameroon, who report a predominance of horn bill (48.7%), our study shows that 51.7% of hens in Niger have a white bill color. Regarding eye color, our study revealed that the majority of chickens in Niger have orange eyes (91.3%). This percentage is distant from 58.2% and 86% observed respectively by [19] in Cameroon and [20] in Niger. The same is true for [1] in Cameroon where the orange-red color is dominant. According to the latter this color corresponds to the wild type. Which means that crossbreeding probably did not have major effects on the genes controlling eye color. The color of the mumps is varied (white, red, red-white, gray and black), but, the most encountered is the color white as in the majority of studies carried out in West Africa [21], [17]. Nevertheless, a predominance of the red-white color is observed by [13] in Togo. There is a predominance of the red color of the barbels (93.7%). The same observation was made by [19] who reports that 87.8% of chickens in Cameroon have red barbels. White skin color is observed in 98.3% of chickens according to observations by [21], [19] and [13] with 93.4% 39.4% and 76% respectively.

The weight obtained is higher than that observed in Senegal [21] but lower than the observations of [19] in the western highlands of Cameroon. The polymorphism exhibited by the different phenotypic types of chickens from Niger is consistent with that observed by most authors from West Africa. Indeed, this diversity justifies the preference of rural breeders for the heavier types when it comes to producing meat and for the lighter types for egg production. The biometric characteristics of the local chicken studied, vary with the morphological type. There are differences between varieties for all the characteristics considered. We also note that, like the weight, all the other quantified characters are lower in the *Dourgou*, and significantly higher in the *Kolonto*. This great diversity can be used as a basis for the establishment of hardy and more performing strains through crosses and selections. A concomitant improvement in breeding conditions should make it possible to increase the productivity of the local chicken to make them, particularly in traditional environments, a less expensive source of quality proteins. However, the still insufficient information on the degree of similarity of the different phenotypes encountered still poses a problem in the choice of samples for improvement and preservation.

### **3.4.3. Morpho-biometric characteristics of the local guinea fowl**

Five colors of plumage were observed in our study, in accordance with the observations of [24] and [25] in Niger. They are black, white, brown, ash to light gray and gray which correspond respectively to the varieties *Angoulou*, *Hwaraa*, *Jaa* or red guinea fowl, *Koural fataké* and *Zabako*. The gray color of the plumage in other words the *Zabako* variety predominates (78%). The five plumage colors encountered are part of 9 plumage colors (Brown, White, Lavender or Ash, Pearl Gray, Coral Blue, Brown Pied, Pearl Gray Pied Pied, Bronze Pied and Bronze) observed in 3 regions of Ghana [26]. The red, white-red,

red-white-blue colors of the barbels are comparable to the red, red-white and blue colors reported by [25] and [27]. Our results are comparable to the eleven (11) tarsi colors (white-yellow, white-brown, black-ash, black-white, orange, black, orange-white, light orange, orange-black, red-white, red-black) reported by [25]. Since color plays a role in the absorption and reflection of ultraviolet radiation, birds with black phenotypic characteristics may be more sensitive to heat stress under intense sunlight. Birds with white plumage characteristics, on the other hand, may be more tolerant of the same conditions. For the peasants, this variation in the colors of the plumage has certain advantages: for example, due to the lack of labeling means, the breeders use certain traits, such as the color and patterns of the feathers, to distinguish their guinea fowl from one author to another [28].

The *Hwaraa* variety is the lightest variety and the heaviest *Zabako*. The same observation was made by [29] who describes *Hwaraa* as the variety with the smallest size and with the lightest carcass. Unlike the results of [25], who announces that there is no significant difference between the five (5) varieties of local guinea fowl, our study shows a big difference between these varieties. Indeed, the *Hwaraa* and the *Jaa* are the lightest compared to the *Zabako* and *Angoulou* which are the heaviest. The mean value of the PT (29.07cm) was close to that of [30] and that of [31] which were 30.15 cm, on the other hand the mean value of the LA obtained (17.52 cm) remains lower than the 23.02 cm and 21.50 cm obtained by these same authors. [32] obtained an average PT value greater (35.37cm) than ours. The average wingspan (41.38) is close to that of 42.77 cm reported by [25] but less than the 45.2 cm obtained by [31]. The mean LC (40.71 cm) was lower than the results of [30], [31] and [27] who obtained 41.75 cm, 42.28 cm and 44.04 cm respectively. Guinea fowls from Niger presented LT (6.99 cm) comparable to those (6.54 cm) reported by [31], shorter compared to those reported by some authors: 8.94 cm [30]; 7.73 cm [32] and 9.68 cm [27]. All the characteristics studied varied according to the countries and the authors. This could be explained by the age of the subjects used which differed from one author to another. In addition, the variety or strain, the environmental conditions in which the subjects live and the method of measurements would help to explain this difference. It should be noted that the measurements in the context of this study were made according to the recommendations described by [6].

#### IV CONCLUSION

At the end of the work, it emerged that poultry farming is primarily the domain of women (58.5%), people aged 30 to 50 (64%) and married (94.5%). The hen and the guinea fowl of Niger present a great diversity which is explained by the absence of directional selection, by the diversity of the environmental conditions in which these animals live, but perhaps also by the existence of uncontrolled introductions to from commercial strains. Seven varieties of local hens are thus encountered, including *Dourgou*, *Goggori*, *Gouzou-gouzou*, *Kollonto*, *Métis*, *Populaire* and *Tchiagara*, respectively; and five varieties of local guinea fowl including *Angoulou*, *Hwaraa*, *Jaa*, *Koural fataké* and *Zabako*. A great diversity of color was found for the studied characters, it is about the type of plumage, colors of plumage, legs, beak, eyes, shell of the eggs, barbel, earlobe, tarsus, skin and mumps, type of ridge, existence or not of a 5th finger (polydactyly) and distribution of feathers. The varieties of local guinea fowl are mainly distinguished by the color of the plumage. The average weight of the local hen is around 1.179 kg and that of the guinea fowl is 1.137 kg. The different morphological measurements obtained confirm the idea of genetic variability within the population of local hens and guinea fowl. These different variabilities observed constitute an opportunity to improve the productivity of these varieties by selection. The study of the phenotypic diversity of other local populations in the country should be carried out to supplement the information on the overall diversity of this species at the national level and to study the effect of different

climatic conditions on the frequency of certain phenotypes. A molecular analysis will make it possible to better assess the diversity at the genome level of the population of local hens and guinea fowl.

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