International
Journal
Of Advanced Research in Engineering& Management (IJAREM)
ISSN: 2456-2033 || PP. 77-88

Characteristics of the urban breeding of the local guinea fowl (*Numida meleagris*) and of local hens (*Gallus gallus*) in Lubumbashi (DRC)

Bilolwa B P[1], Ntemunyi N C[1], Kampemba M F[1], Mwangomb K D[2], Mukunto K I[3], Chinawej M M D[3], Ankwanda Y A[4], ManenaMY[1]

[1]*Department of Zootechnics, Faculty of Agricultural Sciences, University of Lubumbashi, BP 1825 DR Congo.*
[2]*Lubumbashi Food Research Center, BP 54 DR Congo.*
[3]*Department of Agro-Veterinary Sciences, Higher Pedagogical Institute of Lubumbashi, BP 1796 RD Congo*
[4]*Renewable Natural Resources Management Department, University of Lubumbashi, BP 1825 DR Congo*

Abstract: Local poultry farming at the national level seems to be unknown to all, in the sense that there are hardly any large farms and also publications. The objective of this study was to study the characteristics of local poultry farming, mainly hens and guinea fowl, and to establish a better knowledge of the behavior of guinea fowl and hens farming in Lubumbashi. A survey was conducted randomly in the city of Lubumbashi. Thus, 117 breeders in the various communes of Lubumbashi formed the basis of our investigation. The results revealed a large number of hens farmers (91%) compared to those of the guinea fowl (9%). Wandering remains the mode of rearing practiced for the two species where the food is mainly based on the waste of the hens. The major constraint remains the problem of diseases. The number of guinea fowl eggs and cubs is significantly higher than those of the hens ($p < 0.05$). The price of guinea fowl is higher than that of the hens with an average price of 14091 ± 3666 FC (the equivalent of 11.27 $) against 5769 ± 1974 FC (the equivalent of 4.61 $).Guineafowl is the livestock that pays more, but it is less practiced in the city in favor of the local hen which is a matter of all.

Keywords: Breeder, Lubumbashi, Guinea fowl (*Numidameleagris*), Local hen (*Gallus gallus*)

Introduction

Local poultry is a vital activity in rural areas for obtaining income through the sale of eggs and birds (Fotsa et al., 2010). In Nigeria (the country with the highest poultry population in Africa with 104 million people), 90% of the livestock is made up of local breeds (Baba, 2006). In Mali, village poultry accounts for 95% of the total population (Bengaly, 1997). In Morocco, traditional poultry production accounts for 25 to 40% of white meat and egg products (Benabdeljelil et al., 2005). For example, traditional hens account for about 80% of the total poultry population in Africa and contribute a sizeable proportion of meat production (25-70%) and eggs (12-36%) (Gueye, 1998). In Cameroon, for example, populations of low-productivity local hens represent 70% of the poultry population (Fotsa et al., 2007). In The Gambia, the number of local hens is 550000 (Benfoh et al., 1997). In Kenya, there are more than 21.77 million local hens in rural households (Njue, 2005). In Tunisia, this type of farming is composed of more than 4 million self-renewing individuals producing 6,000 tons of meat and 216 million eggs per year (Bessadok et al, 2003). In Egypt, hens of local breeds make up about 20% of all chickens produced in the country (Galal, 2006).And in recent years, the agribusiness (or guinea fowl breeding) is experiencing a particular boom in West Africa, where the guinea fowl is the object of considerable speculation because its meat is highly appreciated by the local populations (Dahouda, 2009) and it is an important activity in poultry farming, especially in the dry regions of Africa (Fao 1992, Dahouda et al, 2008). In Burkina Faso, this local poultry (*Numidameleagris*) ranks second in the preferred numerical classification of poultry species after the hen (*Gallus gallus*) (Savadogo 1995 and Dembélé et al., 1996, Sanfo et al., 2007). In Togo and Benin, the guinea fowl is well bred (Gnassimgbe, 1983 and Laurenson, 2002). However, in the DRC, a survey carried out in 2003 by the Tropical Agronomic and Veterinary Center of Kinshasa (CAVTK) on the poultry sector in Kinshasa showed that out of 253 households surveyed: 105 households practiced duck farming, is 41.5% of households questioned ; 94 households raise the chicken or 37.2%, 9 households practice pigeon breeding or 3.6%; 7 outbreaks raise guinea fowl, 2.8% of households; Only 2 households out of 253 raise the quail (0.8%) and 2 households also practice turkey rearing (0.8% of the total) (Huart et al., 2004).

These local poultry products contribute significantly to food security by providing protein directly to families. They are also central to many circumstances in social and cultural life (Moula et al., 2012). And according to Bessadok et al, (2003), this protein resource is easily renewable and accepted worldwide. And it is the world's food par excellence that is not the object of any cultural or religious prohibition over the centuries. Traditional poultry farming, with its extensive mode and rudimentary management, is widespread in all rural areas. This is evident in all rural families who, without any significant investment, manage to meet their poultry product needs and sometimes derive respectful benefits (Safalaoh, 1997). But, its importance has subsequently decreased from year to year, giving way to the industrial sector which has grown considerably and rapidly. This expansion is at the root of a fairly severe destruction of genetic resources of local chickens (Moula et al., 2012). Under the pressure of the rapid development of industrial poultry farming around the world, many local breeds of hens are currently on the verge of extinction. In the South, however, local breeds are an important tool for rural development and the fight against poverty. More generally, the loss of all biodiversity compromises our ability to meet future ecological and economic challenges (Moula et al., 2009).

In view of the foregoing, this study aims to study the characteristics of local poultry and guinea fowl finally to establish a better knowledge of the behavior of the guinea fowl and the local hen in Lubumbashi.

Material and method Field of study

The survey was carried out between April and September 2016 in the city of Lubumbashi, capital of copper, and capital of the mining province of Upper Katanga. Lubumbashi is located southeast of R. D. Congo at 11 ° 40 'S, 27 ° 29', and 1200-1300 m (Figure 1). The climate is of the Cw6 type of the Koppën classification (FAO 2005, Kasongo et al., 2013, Kidinda et al., 2015); it is characterized by the alternation of a rainy season of 185 days (November to May) and a dry season of 118 days (May to September) with October and April as the transition months, July and August being dry (Malaisse 1998 Mujinya et al, 2010, Kasongo et al, 2013, Kidinda et al, 2015).

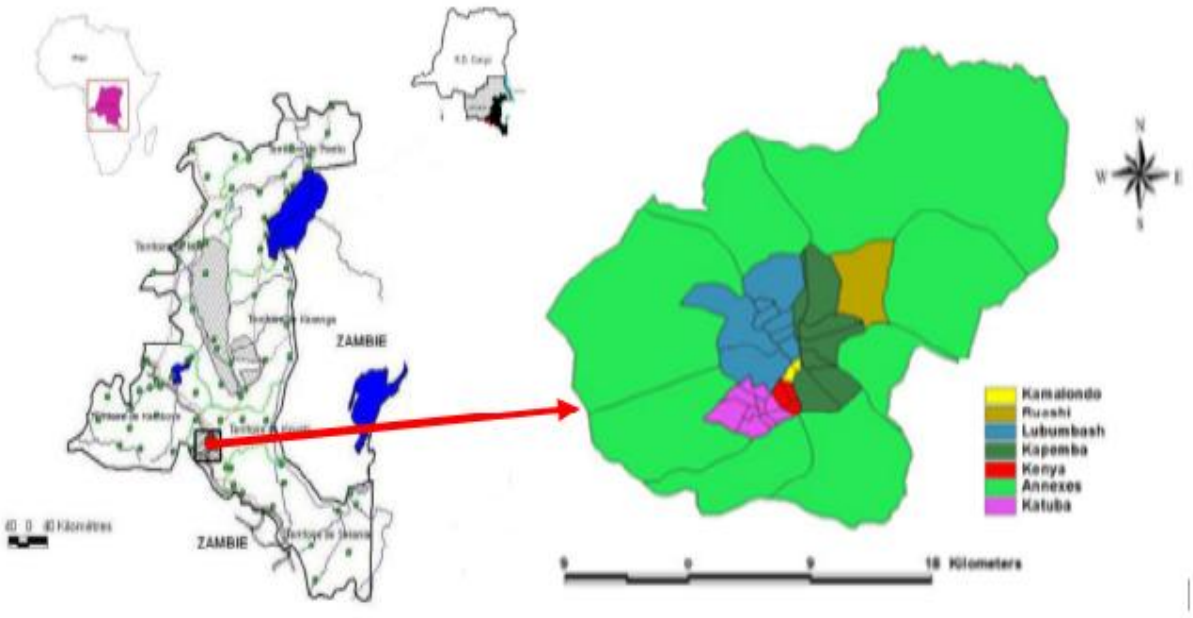

Figure 1: Localization of the study environment

Method

Sampling strategy

To carry out this study, a survey was conducted to identify the breeders holding guinea fowl and chickens. This is a study based on interviews and direct questioning near the breeders of guinea fowl and hens. Sampling was random. A total of 117 breeders were surveyed in the different communes of Lubumbashi. This total number of farmers was dictated by access to households. The information was collected by means of a

formal questionnaire developed for this purpose and it was related to the data concerning the livestock breeders, the breeding system, the zootechnical data (driving of the housing, of food, reproduction and sanitary management), the marketing of livestock products and major constraints.

Statistical treatment

Of data Data collected and saved using Excel software. The descriptive analysis was performed from which the qualitative variables were described as numbers and percentages and the quantitative as averages and extremes (minimum and maximum). The one-way analysis of the variance (ANOVA) was used to compare the averages. These statistical analyzes were performed using the R software (Version 2.15.0.).

Results

Characteristics of the breeders

Table 1 shows the different characteristics of guinea fowl and hen farmers in the different communes of Lubumbashi. This table shows that hen farmers (91%) outnumber guinea fowl (9%), while guinea fowl is the highest by females (5.10%), while hen is higher by females than females (9%). men (50.40%). Half of the breeders in the hens had a secondary level of education (50.4%) while for the guinea fowl, the primary and secondary levels were equal (3.4% each). The breeders of these birds are mostly married 74.4% for the chicken and 7.7% for the guinea fowl. As a main activity the majority of breeders of these two species are official 49.6% and 3.5% respectively for the hen and the guinea fowl. All guinea fowl farmers reported that this poultry improved diet (9.4%) and income (9.4%). While 78.6% and 83.8% respectively admitted the importance of the chicken in food and income improvement (Table 2).

Table 1: Characteristics of guinea fowl and hen farmers in the different communes of Lubumbashi

Parameters	Species	Number of breeders	(%)
Number of breeders	hen	106	91
	guineafowl	11	9
Sex			
Female	hen	47	40,2
	guineafowl	6	5,1
Man	hen	59	50,4
	guineafowl	5	4,3
Level of study			
Illiterate	guineafowl	1	0,9
	hen	3	2,6
Primary	guineafowl	4	3,4
	hen	25	21,4
Secondary	guineafowl	4	3,4
	hen	59	50,4
Academic	guineafowl	2	1,7
	hen	19	16,2
Civil status			
Married	guineafowl	9	7,7
	hen	87	74,4
Single	guineafowl	2	1,7
	hen	7	6,0
Widower	guineafowl	0	0,0

	hen	12	10,3
Main activities			
Agriculture	guineafowl	0	0,0
	hen	4	1,5
Breeding	guineafowl	3	2,6
	hen	6	5,1
Trade	guineafowl	1	0,9
	hen	15	12,8
Official	guineafowl	4	3,5
	hen	59	49,6
Without jobs	guineafowl	3	2,6
	hen	22	21,4

Table 2: Motivation and profit from guinea fowl breeders and hens

Motivation	Breeder of the Guineafowl	Breeder of the Hen
Improvement of the family diet		
Yes	11 (9.4%)	92 (78.6%)
No	0 (0.0%)	14 (12.04%)
Improvement of family income		
Yes	11 (9.4%)	83.8 (68 %)
No	0 (0%)	9.4 (38%)

Livestock management

The results in Table 3 illustrate that most herders are wandering (80.3%) for the hen and (6.8%) for the guinea fowl. These birds are raised in the same soil (82.7%) for the chicken and (7.7%) for the guinea fowl. The results in this table show that a large number of breeders use broodstock from their flocks (88.0%) and this also applies to guinea fowl breeders (8.5%). For reproduction, the results show that the breeders of the hen prepare nest boxes for their animals (86.3%), unlike the guinea fowl breeders (4.3%).

Table 3: Cultivation of guinea fowl and hen

Breedingmethod	Breeder of the Guinea fowl	Breeder of the Hen
Claustration	3 (2,6%)	12 (10,3%)
Sliding	8 (6,8%)	94 (80,3%)
Breeding place		
Tree	1 (0,9%)	1 (0,9%)
Homeless	0 (0,0%)	1 (0,9%)
On Chip	1 (0,9%)	7 (6,0%)
Similarly Sol	9 (7,7%)	97 (82,7%)
Reproduction of animals		

Origin of the parents		
Purchase	1 (0,9%)	1 (0,9%)
Livestock	10 (8,5%)	103 (88,0%)
Heritage	00 (0,0%)	2 (1,7%)
Preparing the nest		
No	6 (5,1%)	5 (4,3%)
Yes	5 (4,3%)	101 (86,3%)

Driving the food

Table 4 illustrates the feeding behavior of guinea fowl and henfarmers in Lubumbashi. The results show that 72.6% of chicken farmers distribute feed to their hens against 7.7% for guinea fowl. Kitchen waste is donated by guinea fowl breeders (9.4%) and hen breeders (89.7%). These are mainly kitchen peels and crushed corn kernels. Breeders of chickens and guinea fowl rarely give their animals commercial feed (1.7%) compared to (8.5%). Poultry watering is provided for the guinea fowl (9.4%) and for the hen (67.4%), although some breeders do not give the water (23.1%).

Table 4: Feeding behavior in guinea fowl and hen farming

Food distribution	Breeder of the Guineafowl	Breeder of the Hen
No	2 (1.7%)	21 (17.9%)
Yes	9 (7.7%)	85 (72.6%)
Type of fooddistributed		
Wastefromkitchens		
Yes	11 (9.4%)	105 (89.7%)
No	0 (0.0%)	1 (0.9%)
Commercial foods		
Yes	2 (1,7%)	10 (8,5%)
No	9 (7,7%)	96 (82,1%)
Safewatering		
Yes	11 (9,4%)	79 (67,4%)
None	0 (0.0%)	27 (23,1%)

Characterization of sanitation and constraints

The state of the poultry sanitary management presented in Table 5 shows the hygiene for both species within the farms is well ensured (9.4% for the guinea fowl and 82.9% for the hen), but generally once a week. The majority of breeders in the hens (87.2%) have disease problems, unlike the guinea fowl breeders (1.7%). The results show that a large number of breeders do not provide disease prevention for both poultry.

Table 5: Sanitaryoperation

Hygiene practice	Breeder of the Guinea fowl	Breeder of the Hen
Yes	11 (9,4%)	105(82,9%)
No	0 (0,0%)	1 (7,7%)
Building cleaning per week		
Once	11(9%)	106(91%)
Twice	0(0%)	0(0%)
four times	0(0%)	0(0%)
Seven times	0(0%)	0(0%)
Presence of diseases		
Yes	2 (1,7%)	102 (87,2)
No	9 (7,7%)	4 (3,4)
Diseaseprevention		
Non	11(9,4%)	97 (82,9%)
Yes	0 (0,0%)	9 (7,7%)

Types of diseases and drugs used to treat diseases

Table 6 presents the diseases encountered and the drugs used to treat these diseases. This table shows that breeders in chickens experience diarrhea and drowsiness at (22.2%) respectively, and for guinea fowl a low rate of diarrhea and drowsiness (0.9%) was recorded by the breeders. To treat the diseases most breeders of hens used tetracycline (19.7%) followed by traditional medicines (14.5%) and for 1.7% of the diseases observed the breeder makes use of traditional medicines.

Table 6: Diseases and drugs used Diseases

experienced	Breeder of the Guineafowl	Breeder of the Hen
Diarrhea	1 (0,9%)	26 (22,2%)
Avian plague	0 (0,0%)	7 (6,9%)
Drowsiness	1 (0,9%)	26 (22,2%)
Diarrhea and cough	0 (0,0%)	2 (4,3%)
Paralysis of all members	0 (0,0%)	3 (2,6%)
Paralysis and diarrhea	0 (0,0%)	1 (0,9%)
Cough	0 (0,0%)	17 (14,5%)
No disease	9 (7,7%)	20 (17,1%)
Drugs used		
Aspirin	0 (0,0%)	6 (5,1%)
Bactrime	0 (0,0%)	1 (0,9%)
Clamoxylin	0 (0,0%)	4 (3,4%)

Indocide	0 (0,0%)	3 (2,6%)
Tetracycline	0 (0,0%)	23 (19,7%)
Traditional	1 (1,7%)	15 (14,5%)
None	9 (7,7%)	1 (0,9%)

Other constraints

Table 7 indicates that guinea fowl breeders encounter predation difficulties and theft of animals (8.5%) and hen (49.6%). They all have a problem of lack of space, hands of works and supervision by the services of the state or non-governmental organizations.

Table 7: Other constraints faced by farmers.

Difficulties encountered	Breeder of the Guineafowl	Breeder of the Hen
Predation and theft of animals		
Yes	10 (8,5%)	48 (41,0%)
No	1 (0,9%)	58 (49,6%)
Insufficient space		
Yes	11 (9,4%)	105 (86,3%)
No	0 (0,0%)	1(4,3%)
Lack of hands of works		
Yes	11 (9.4%)	(105)89.7
Non	0 (0.0%)	(1) 0.9
Lack of framing services		
Yes	11 (9.4%)	105 (89.7%)
No	0 (0.0%)	1 (0.9%)

Production performance

To evaluate the production performance in relation to these two species we examined the number of eggs laid and the number of pups. Thus, the results in Table 8 illustrate that guinea fowl lay significantly more eggs than hen ($p < 0.05$). This is reflected in the significantly smaller number of small guinea fowl compared to the hen ($p < 0.05$).

Table 8: Number of eggs laid and cubs per spawning period by spawning period

Species	Number of eggs per spawning period	Number of pups per spawning period
Guineafowl	89,09 ± 40,85 a	12,636 ± 7,460a
Hen	10,56 ± 2,11 b	9,528 ± 2,067b
P	0.000	0.001

Marketing

Table 9 shows that the guinea fowl's sales price is higher than that of the hen with an average price of 14091 ± 3666 FC (equivalent of $ 10) compared to 5769 ± 1974 FC (equivalent of $ 4.5). and the animals are sold in the different markets of the city of Lubumbashi.

Table 9: Marketing Margin for Guinea Fowl and Hen

Species	Maximum	Mean ± Standard Deviation	Minimum
Guineafowl (FC)	20000	14091 ± 3666	7500
Hen (FC)	15000	5769 ± 1974	4000

Variation of the selling price according to the species

The results in Table 10 show a significant difference between guinea fowl and chicken prices ($p < 0.05$).

Table 10: Price Margin by Species.

Species of poultry	Sales price depending on the species
Sales price depending on the species	14091 ± 3666a
Hen	5769 ± 1974b
P	0,000

Discussion

The results obtained showed a large number of breeders of the 106 breeders breed, that is to say 91% against 11 breeders of guinea fowl or 9%. These corroborative results obtained by (Huart and Nkidiaka, 2004) in Kinshasa where he had recorded a large number of hen farmers compared to those of guinea fowl. Similar results were found in Bourkinafaso where guinea fowl came after the hen in terms of numbers (Savadogo, 1995 and Dembélé et al, 1996). This is justified by the fact that guinea fowl meat is not yet part of Congolese food habits, while the hen is very well consumed.

The majority of herders had secondary education for the hen (50.4%) and guinea fowl (3.4%). These results are similar to those obtained by Sanfo et al., (2007) demonstrating that guinea fowl breeders do not have a higher level of education that allows them to conduct breeding successfully. The guinea fowl is higher by the women whereas the hen is higher by the men. This observation is similar to that of Dahouda (2003) and Boko et al, (2012) who showed that the management of guinea fowl farming is carried out by the women of the households, but officially, it is the men who are the owners of the animals. These results contradict those found by (Sanfo et al, 2007) in central Burkina Faso where this activity is practiced largely by men as a result of cultural requirements. This is all the more true as the study areas are differentiated on the cultural, social and religious points. They are mostly married. As a main activity, the majority of breeders of these two species are official 49.6% for the hen and 3.5% for guinea fowl. These observations corroborate those made by Moula et al., (2012) where they found a number of poultry officials in the province of Lower Congo in the Democratic Republic of Congo. These small farms help officials to beg for their wages that do not adequately meet the needs of the family.

The results indicate that most breeders of hens and guinea fowl are wandering. These results are similar to those obtained by (Boko et al., 2012) in sub-Saharan Africa, which found that chickens and guinea fowl are higher in wandering. This mode of farming is more widespread and is traditionally integrated with agricultural systems. pastoral activities as a secondary activity. The breeding is practiced in total freedom around the concessions, without distinction of age or species (chickens, guinea fowl), and according to the techniques of rudimentary breeding. Thus, herd size is generally small and ranges between 9 and 18 adults on average (Laurenson, 2002). The results also indicate that hen farmers raise more on the ground (82.7%) and guinea fowl (7.7%). These results corroborate those obtained by Sanfo et al., (2007) explaining that hen farmers and guinea fowl prefer high on the soil. With regard to food, the results show that 72.6% of the breeders of the hen distribute food to their hens against 7.7% of breeders of the guinea fowl. These results confirm those obtained by Dahouda et al. (2007). In this system of free-range farming, breeders generally give a few handfuls of food to the chicken and guinea fowl (millet, sorghum, maize and or rice, and fragments of termite mounds). By this practice, the breeder also aims to conquer the confidence of his livestock by seeking to create a habit through rapprochement. Kitchen waste is more given by breeders for both species. These results are similar to those observed by Kabatange and Katule, 1990; Pandey, 1992; Dahouda et al., 2007; Moussa et al., 2010). Birds wander about the houses during the day when they find their food mainly from the remains of cooking insects and seeds. The results showed that hen farmers do not give commercial feed 82.1% followed by guinea fowl 7.7%. These results are similar to those obtained by (Dahouda et al., 2007). This would explain according to some breeders bythehighcostofcommercialfeedforalowprofit.

A large number of breeders use broodstock from their flocks and this is also valid for guinea fowl breeders. These results contradict those of Savadogo (1995) who found that breeders bought the broodstock they used in farms in Burkina Faso. The breeders of the hen prepare nest boxes for their animals unlike the breeders of the guinea fowl. These results relate to those found by Obun (2004). According to these same researchers, this is explained by the poor performance of the incubator and the guinea fowl leader; this means that the eggs are collected by the breeders as soon as they are laid and then given to the hens who incubate them. Hygiene for both species is assured. These results contrast those of (Bengaly, 1997) revealing that at the level of poultry farms in Burkina Faso hygiene was almost non-existent. The majority of hen breeders encounter disease problems, unlike guinea fowl breeders. Our results support those of Saina (2005) who also found that stray hens are permanently exposed by their feeding and watering to infections and infestations. This same author agrees that the guinea fowl display a rusticity unlike the chicken following their semi wild character. In terms of prevention, breeders do not do anything to prevent diseases for both poultry. These results corroborate Sonaiya and Swan (2004) who found that non-compliance with zootechnical standards and disease prevention leads to low numerical productivity in guinea fowl and guinea fowl. Breeders of hens are diagnosed with diarrhea and drowsiness (22.2% respectively) and in proportion to guinea fowl with a low disease rate of 0.9% diarrhea. These results confirm those of Moula et al (2012) who found that disease problems were more frequent in poultry farming in Bas - Congo (92.2% of households) and Sanfo et al (2007) support these results by demonstrating that in Burkina-Faso, the pathologies involved are mainly diarrhea and pseudopackage in young and adult poultry, but the grower producers nevertheless recognize the great tolerance of the adult guinea fowl to ordinary avian diseases. To treat diseases most breeders of hens used tetracycline (19.7%) accompanied by traditional medicines (14.5%) and on the part of the guinea fowl no drug is used except a breeder (1, 7%) that treats guinea fowl diseases with traditional medicines. These results align with those of Moula et al (2012) demonstrating that a small proportion of chicken farmers use veterinary drugs (7.79%) generally received free of charge from ngos(AGRISUD and CRAFOD) and treatments using traditional pharmacopoeia including hemp, ash, peppers and coffee leaves. The guinea fowl breeders (8.5%) prove the difficulties of predation and theft of animals, unlike those of the chicken (49.6%). They all have a problem of lack of space, hands of works and supervision by the services of the state or non-governmental organizations. These same constraints have been reported previously in many studies, Safalaoh (1997) in Malawi, Khieu (1999) in Tanzania, Kugonza et al (2008) in Uganda and Bett et al (2012) in Kenya. Thus, theft and predators are the factors that discourage poultry farmers, as these farms played an important role for the middle classes both socio-culturally and economically in developing countries.

Analysis of the variance revealed a significant difference between the number of eggs for both species. It turns out that the guinea fowl lays more eggs than the hen. These results support those of Sanfo et al., (2007) who found in the evaluation of reproductive parameters that guinea fowl lay a lot of eggs compared to hens. Thus, mother hens are used as natural brooders with 25 to 30 eggs per clutch (Ayorinde et al., 1986) .However, the analysis of the variance showed a significant difference between the number of guinea fowl and the number of guinea fowl. of the hen. These results are similar to those reported by Ayorinde et al. (1986) and Hien et al. (2002) indicating a numerical productivity twice as high for guinea fowl as that of the local hen. The selling price of the guinea fowl is significantly higher than that of the hen with an average price of 14091 ± 3666 FC (equivalent $ 10) against 5769 ± 1974 FC (equivalent $ 5) and the animals are sold in the different markets of the city of Lubumbashi. The results reveal that the analysis of the variance showed a difference between the price of guinea fowl and that of the hen. These price results compared to the hen contradict those found by Moula et al., 2012 in Bas - Congo finds that the average prices of the hens were of the order of 3409 ± 750 FC.

Conclusion

The aim of this study was to study the characteristics of local poultry farming, mainly henand guinea fowl. The results obtained show that:

- Family-based poultry farming in Lubumbashi is ongoing and represents a significant source of meat for urban families, trying to support the family's needs for meat, as well as financial support. Thus, the breeding of the guinea fowl is less practiced unlike that of the hen.
- The breeders of the hen were numerous compared to those of the guinea fowl. In addition, the farming method practiced for these species is the rambling where kitchen waste is used. The breeders get the parents in their own flocks. Breeders of chickens have recorded diseases unlike those of guinea fowl, although hygiene is assured.

- The guinea fowl shows good production performance with a significantly high number of eggs laid per spawning period and a high numerical productivity of pup numbers relative to the hen. The guinea fowl has a selling price twice the size of the hen. And it stands out from the hen by its production factors in view of the number of eggs, small give by spawning period and it is less susceptible to disease compared to the hen.

The breeding practiced in the city of Lubumbashi, is essentially based on breeding survival, this character would be explained by the low launch cost and the lack of knowledge of essential concepts. In addition, the guinea fowl is less elevated following its wild seedling traits and culture in the lives of Congolese in general. Finally, it is necessary to make the phenotypic and genetic characterization of these local scrapes, with the aim of improvement.

Thanks

We would like to express our sincere thanks to all the breeders of the hen and guinea fowl of the city of Lubumbashi who made this publication possible through access to the data.

Bibliographical references

[1]. **Ayorinde K L, etAyeni J S O, 1986**The reproductive performance of indigenous and exotic varieties of the Guinea fowl (*Numidameleagris*) during different seasons in Nigeria. J. Anim. Prod. Res. 6(2): 127-140.

[2]. **Baba S S 2006** Influenza aviaire et aviculture familiale au Nigeria : potentialités pour une propagation rapide et une présence continue de la maladie, Rapport de R&D N°. 1, Bulletin RIDAF Vol. 16, N°. 1

[3]. **Benabdeljelil K, Johnston P, Arfaoui T and Karari E 2005** Avantages et inconvénients d'une approche durable visant à accroitre les revenus de l'aviculture rurale. Bulletin RIDAF, Janvier-Juin 2005, Vol.15 N°.1, 21 22.

[4]. **Benfoh B, Ankers P, Pfister K, Pangui L J and Toguebay B S 1997** Répertoire de quelques Contraintes de l'Aviculture Villageoise en Gambie et propositions pour son amélioration. Proceeding INFPD Workshop, M'BOUR, Sénégal, DEC. 9-13.

[5]. **Bengaly K 1997** Amélioration de l'Aviculture Villageoise : Cas de la Zone Mali-Sud. Proceedings INFPD Workshop, M'BOUR, Sénégal, DEC. 9-13.

[6]. **Bessadok A, Khochilef I et El Gazzah M 2003** Etat des ressources génétiques de la population locale du poulet en Tunisie. Tropicultura, 21 (4): 167-172.

[7]. **Bett H K; Bett R C; Peters K. J, Kahi A K and Bokelmann W, 2012** Linking Utilisation and Conservation of Indigenous Chicken Genetic Resources to Value Chains. Journal of Animal Science Advances, 2(1) : 33-51.

[8]. **Boko K C, Kpodekon T M, Dahouda M, Marlier D, Mainil J G, 2012** Contraintes techniques et sanitaires de la production traditionnelle de pintade en Afrique subsaharienne. Ann. Méd. Vét., **156**, 25-36

[9]. **Dahouda 2009** Contribution à l'étude de l'alimentation de la pintade locale au Bénin, et perspectives d'améliorations à l'aide de ressources non conventionnelles. Thèse, Université de Liège

[10]. **Dahouda M 2003** Elevage de la pintade locale dans le Département du Borgou au Bénin: comparaison des caractéristiques de production en station et en milieu rural. Mémoire de DEA, Faculté de Médecine Vétérinaire de Liège, Belgique, 35 p.

[11]. **Dahouda M, Senou M, Toléba S S, Boko C K, Adandédjan J C et Hornick J L 2008** Comparaison des caractéristiques de production de la pintade locale (*Meleagrisnumida*) en station et dans le milieu villageois en zone soudanoguinéenne du Bénin. LivestockResearch for Rural Development, 20 (12)

[12]. **Dahouda, M., S.S. Toleba, A.K.I. Youssao, S. BaniKogui, S. YacoubouAboubakari, J.-L. Hornick, 2007** Guinea fowl rearing constraints and flock composition under traditional management in Borgou Department, Benin. Family Poult., 17: 3-14.

[13]. **Fao1992** Atelier Régional sur le développement de l'Élevage de la pintade en régions sèches africaines, tenu à Ouagadougou (1992), volumes 1 et 2. Rome, Italie, 125 p

[14]. **Fao 2005** New LocClim: Local Climate Estimator. FAO Environment and Natural Resources Working Paper, N° 20.

[15]. **Fotsa JC, Rognon X, Tixier-Boichard M, Coquerelle G, PonéKamdem D, NgouNgoupayou J D, Manjel Y and Bordas A 2010** Caractérisation phénotypique des populations de poules locales

(*GallusGallus*) de la zone forestière dense humide à pluviométrie bimodale du Cameroun. Animal GeneticResources, 46, 49–59.

[16]. **Fotsa, JC, Bordas A, Rognon X, TixierBoichard M, PonéKamdem D et Manjeli Y 2007** Caractérisation des élevages et des poules locales et comparaison en station de leurs performances à celles d'une souche commerciale de type label au Cameroun. Journées de la Recherche Avicole. (Tours), pp. 414–417.

[17]. **Galal S 2006** Protéger les ressources génétiques de poulets locaux dans une situation pandémique d'influenza aviaire en Egypte. Note de Communication N°. 2, Bulletin RIDAF Vol. 16, N°. 1.

[18]. **Gnassimgbe C N 1983** contribution à l'étude de l'élevage de la pintade au Togo. Thèse, Université de Dakar

[19]. **Gueye E F 1998** Village egg and fowl meat production in Africa - Regional Report World's. Poultry Science Journal, 54: 73-86.

[20]. **Hien, O C, Boly H, Brillard J P, Diarra B et Sawadogo L, 2002** Effets des mesures prophylactiques sur la productivité de la pintade locale (*Numidameleagris*) en zone sub-humide du Burkina Faso. Tropicultura20: 23-28.

[21]. **Huart A et Nkidiaka L O, 2004** La situation de l'élevage de volaille en RDC et à Kinshasa. Troupeaux et Cultures des Tropiques. Revue nationale sur l'élevage, Centre Agronomique et Vétérinaire Tropical de Kinshasa(CVTK).

[22]. **Kabatange M A, Katule A M 1990** Rural poultry production systems in Tanzania. In: Sonaiya,E.B. (ed.), Proceedings of an International Workshop on Rural Poultry Developmentin Africa, Ile-Ife, 171-176.

[23]. **Kasongo L E, Mwamba M T, Mukalay M J, Useni S Y, Mazinga K M, Nyembo K L, 2013** Réponse de la culture de soja (Glycine max L. (Merril) à l'apport des biomasses vertes de *Titiniadiffersifolia* (Hemls) comme fumure organique sur le ferrasol à Lubumbashi, RD Congo. Journal of Applied Biosciences 63:4727-4737

[24]. **Khieu B 1999** Chicken Production, Food Security and Renovative Extension Methodology in the SPFS Cambodia. In: Poultry as a Tool in Poverty Eradication and Promotion of Gender Equality. In: Proceedings of a Workshop, Tune Landboskole Denmark. Editors: FrandsDolberg and Poul Henning Petersen. Denmark.

[25]. **Kidinda L K, Tshibuyi K B, Banza M J, Kilumba K M, Ntemunyi N C, Muganguzi N T, Tshipama T D and Nyembo K L, 2015** Impact of Chicken Manure Integration with Mineral Fertilizer on Soil Nutriments Balance and Maize (*Zea mays*) Yield: A Case Study on Degraded Soil of Lubumbashi (DR Congo). American Journal of Plant Nutrition and Fertilization Technology 5 (3): 71-78,

[26]. **Kugonza D R, Kyarisiima C C and Iisa A 2008** Indigenous chicken flocks of Eastern Uganda: I. Productivity, management and strategies for better performance. LivestockResearch for Rural Development, Volume 20, Article #137. Retrieved July 23, 2011,

[27]. **Laurenson P 2002** Détermination des paramètres zootechniques de la pintade locale dans la région du Borgou (Bénin). Mémoire d'Ingénieur agronome, Faculté Universitaire des Sciences Agronomiques de Gembloux : Gembloux, Belgique, 81 p

[28]. **Malaisse, F 1998**Se nourrir en forêt claire Africaine. Approche écologique et nutritionnelle. Centre technique de coopération Agricole et Rurale. (CTA). Postus 380-NI- 6700 AJ Wageningin (Pays bas) ISBN 2-87016-045-3, 384p.

[29]. **Moula N, Antoine-Moussiaux N, Farnir F, Detilleux J and Leroy P 2009** Réhabilitation socioéconomique d'une poule locale en voie d'extinction : la poule Kabyle (Thayazitlekvayel). Annales de Médecine Vétérinaire. 153 :178-186.

[30]. **Moula N, Detiffe N, Farnir F, Antoine-Moussiaux N et Leroy P 2012** Aviculture familiale au Bas-Congo, République Démocratique du Congo (RDC) LivestockResearch for Rural Development 24 (5).

[31]. **Moussa A B, Idi A, Benabdeljelil K 2010**Aviculture familiale rurale au Niger : alimentation et performances zootechniques. Bull. RIDAF, 19, 3-10

[32]. **Mujinya BB, VanRanst E, Verdoodt A, Ngongo L M 2010** termite bioturbation effects on electro-chemical properties of ferrasols in the upper Katanga (DR Congo). Geoderma158,233-241

[33]. **Njue S W 2005** Rentabilité différents systèmes de productions avicoles sous les conditions Kenyanes. Bulletin RIDAF, Vol.15 N°.1, 20.

[34]. **Obun C O 2004** Hatching and brooding of Guinea fowl (*Numidameleagris*) egg
[35]. **Pandey V S 1992** Epidemiology and economics of village poultry production in Africa: overview. In: Pandey V.S., Demey F. (eds), Proceedings of an International Workshop on Village Poultry Production in Africa, Rabat, 7(**11**) 5, 124-128
[36]. **Reddy C V 1997** Support for rural poultry. Poultry International, March 1997. Pp. 38-44
[37]. **Safalaoh A C L, 1997** Characteristics of indigenous chickens of Malawi. Animal Genetic Resources Information, 22, 61-69.
[38]. **Sanfo R, Boly H, Sawadogo L et Ogle B 2007** Burkina Faso- Characteristics- *Numida meleagris*- Rural breeding. Tropicultura, 25, 1, 31-36
[39]. **Savadogo A 1995**Contribution à l'amélioration de l'élevage de la pintade (*Numida meleagris*) au Burkina Faso. Mémoire de fin d'études d'IDR. Option : Élevage. Université d'Ouagadougou. 102 p
[40]. **Sonaiya E B, Swan S E, 2004** Production en Aviculture familiale. Organisation Des Nations Unies pour l'Alimentation et l'Agriculture : Rome, 140 p.