



Composition of farmyard chicken, production practices and season effect on the reproductive parameters of local hens in the regions of Eastern Chad

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Abstract

This study was about the composition of the farmyard chicken, to evaluate the production practices and the reproduction performance of the hens of the Eastern Chad. The transversal retrospective survey covered 113 villages chosen at random in 12 Departments of three (3) regions (Wadi Fira, Ouaddai and Salamat). It was about 732 chicken farms with a total number of 18197 chickens. The average number per chicken farm was 25 ± 17 chickens. The females were 62% of the total number and the males 38%. The sex ratio was 4.7 in favor of the females. The henhouses with a roof were the majority (95%) among the ones with no roof (5%). Many producers (91%) distributed the cereal ban in some troughs for the chicks and 98% of the grains were thrown straight on the floor for the young chickens and the adult ones. The average total number of the hens clutch per year was 3.6 ± 0.7 and the average total number of eggs per hen clutch was 11.7 ± 1.7 . The yearly average production was 41 ± 9 eggs; the average hatching rate was 86.6% and the average survival rate when chicks were two months was 60%. According to the seasons, the low reproduction performances were noted during the dry hot season ($P < 0.05$). The loss was important after the weaning. Some practices aiming to reduce that loss would permit the numerical increase of the numbers. The characterization of the initial state of the hens production allows to evaluate the impact of the improvement and innovation practices which were introduced in the concerned regions.

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Introduction

The poultry, current in many breeding in Chad, are economically less considered whereas their numbers were recently estimated to be 47.8 million of heads (Mopate, 2010).

As far as the satisfaction of the animal protein and the first financial needs of the producers are concerned, the poultry play an important role (Provost and Boredon, 1968; Alamargot *et al.*, 1985; Grungler *et al.*, 1988; Rigaud, 1989; Aklobessi *et al.*, 1992). They have a significant place among the speculations and are worthy of an increased attention (IEMVT, 1978). Poultry are needed for sacrifices, play an important role in the reinforcing of the social relations and allow some peasants to create cattle breeding by capitalization (investment and the swap phenomenon) and to get some agricultural input (Prost, 1987; Aklobessi *et al.*, 1992; Mopate and Lony, 1999; Mopate *et al.*, 2010).

Seasons and environmental conditions, such as temperature and humidity as well as the offer in food resources, play an important role in the performance of traditional poultry production systems (Goromela *et al.*, 2006; Ercan *et al.*, 2013; Jesuyon and Salako, 2013).

There are no data about the reproduction in the family chicken farm in the regions of the Eastern Chad. Moreover, the interventions in favor of the animal production development must lay on the data proper to each intervention area. The aim of this study was the knowledge of the hen numbers, the forming of the farmyard animals, the production practices and the reproduction parameters in the regions of the Eastern Chad.

Materials and methods

The study zone

It is located between longitude 19° and 23° East and at latitude 9° and 16° North. It has the Central African Republic to the South and the Sudan to the East. Its total area is 150,782.56 km². The climate is the warm and dry continental type having a dry season and a rainy season. The rainfall levels are different from one region to another. The rainy season is from June to

October. The rainfall averages are 200 mm in the region of Wadi Fira, 200 mm to 300 mm in the region of Ouaddai and 600 mm to 700 mm in the region of Salamat. The dry season lasts between 8 to 9 months. The yearly average temperature is 28.8°C and the yearly relative average of humidity is around 58-61%.

The selection of samples and the methods of collecting data

The survey took place in the regions of the Eastern Chad, on a sample of 113 villages divided into 12 administrative departments and three (3) regions. The drawing lots of the villages in each of those departments were done with the aid of the software *Epi info* (DEAN *et al.*, 1990). In this way, 49 villages were reserved in the region of Wadi Fira ; 32 in Ouaddai and 32 in Salamat. The survey rates in each village were 20% when there were less than 50 families in the village; 10% when the families' number was between 50 and 100 and 10% over 100 families. In total 732 chicken farms had been done a survey, among them 273 in Wadi Fira, 226 in Ouaddai and 233 in Salamat.

The interview with the person who is responsible of the chicken farm took place in her courtyard. She was isolated from the other family members so that she would not be influenced by them. Aspects of interview with the producers concerned:

- The characteristics of the owners and the farmyard animals (numbers and components of the surveyed livestock in particular about the chicks from 0 to 2 months, the young chickens from 3 to 5 months and the adult chickens from 6 months and more year old);
- The production practices (poultry house, laying places, feeding and hen house equipments) were also the subjects of observation ;
- Parameters of the hen's reproduction (number of the laying per year, number of eggs per laying, number of hatched chicks and those which are still alive at 2 months).

The person who was surveyed was asked about the season effect. The seasons defined by the producers

were taken into account and the correspondences comparative to the Greek calendar month were established.

Data analysis

Key boarding of data was done with software Excel, descriptive and variation analysis with software SPSS (2009). The threshold signification retained on the differences of average was 5%. The variation analysis was done mainly according to the season factor defined by the producers. The average rate of hatching and survival were calculated. The rate of hatching is the relationship between the hatched chicks and the sat on eggs. The survival rate is the link between the chicks still alive at 2 months and those hatched.

Results

Characterization of poultry farmers

The men owners are majority (67%) than the women (20%) and the children (13%). The average age was 38±14 years old and many poultry farmers carried out (90%) some agro-pastoral activities. The average number of the family members was 4±2 members.

The majority had in average 13±10 years experience in the traditional poultry farming.

Numbers and components of surveyed livestock

18,197 chickens constituted the studied livestock. The average number per farmyard was 25±17chickens. On the whole, the males and the females from 3 to 5 months represented 28% and the chicks 40%. The cocks constituted 17% of the adult individuals and the hens 83%. The proportion of the chicks compared to the total number was 0.7 and the proportion of the young chicken compared to the adults was 0.9. The sex ratio was 4.7 in favor of the females (Table 1).

Production practices

Housing

The majority of the producers (95%) used some different types of henhouses with a roof against 5% of the producers who used sunroof henhouses types. Among the sunroof types, the straw huts were the majority (Table 2).

Table 1. Composition of the surveyed chicken's population in the regions of Eastern Chad.

Female			Male		
Sex and class age	Number	%	Sex and class age	Number	%
Chick (0 to 2 months)	3,633	20	Chick (0 to 2 months)	3,633	20
Pullet (3 to 5 months)	2,897	16	Cockerel (3 to 5 months)	2,272	12
Hen (6 months and more)	4,761	26	Cock (6 months and more)	1,001	6
Total	11,291	62	Total	6,906	38

We make the assumption of a sex-ratio equal for chickens of less than 02 months

Table 2. sharing out the different henhouses which had roof (95%) and those which had no roof (5%) in the regions of the Eastern Chad.

Type of house	Frequency (%)
<i>Covered</i>	
House in straw	62
House with walls in earth and roof in straw	12
House with walls and roof in earth	4
Earthenware jar	8
Hen coop	8
Packing crate	1
<i>Non covered</i>	
Below loft and shed, wall, tree, roof box, full air and enclosure	5
Total	100

The laying places were in the family huts for the majority (61.2%), in the henhouses (20.2%), under the

barns (9.7%) and in the piles of straw as for the rest (8.9%).

The henhouses were clean at least once a month (65%), at least once a week (23%), at least once a day (8%) and at least once a year (4%).

Feeding

According to the age categories, the cereal bran's was the main food given to the chicks and the cereal grains were given to the young and adult chickens (Table 3).

The food came from the harvest or was bought or was a gift. The daily food distribution was once (53.4%), twice (43.2%) or three times (3.4%).

The water sources for the farmyard animals were some traditional wells (76%), some cement wells (18.4%) and some drillings (5.6%). In addition to those water sources, the ponds were used during the rainy season.

Table 3. the types of food given to the chickens according to the age categories in the regions of the Eastern Chad.

Chick		Young and Adult	
Type of food	Frequency (%)	Type of food	Frequency (%)
Cereal bran	91	Cereal grain (sorghum, mil or corn)	98
Seed sesame	09	Seed (sesame, groundnut, squash, cowpea), insects and kitchen waste	02
Total	100		100

Breeding equipment

Troughs

A lack of troughs for the young and adult chickens was noted in almost all of the breedings (98%). Thus; the food was served straight on the floor. On the other hand, the chicks got in the big majority (97%) some troughs of different natures (horse boxes, mats, some old sacks and plates).

Watering places

The pieces of canaries used, as watering places, were the majority (88%), followed by the use of some pieces of calabashes (6%), the use of cups (4%) and some other salvage implements (2%).

Laying places

The places build especially for the hens laying and/or for the clutch were not observed, just like there were no perches in the henhouses. The hens had chosen themselves the places to lay and some are places altered by some breeders.

Reproduction parameters

In the study zone, the average number of the laying cycle per year was 3.6 ± 0.7 ; the number of the eggs per laying cycle was 11.7 ± 1.7 with an average of some yearly laid eggs of 41 ± 9 . The average rate of hatching was 86.6% and the average rate of the two-month chicks survival was 60%. According to the seasons, the low reproduction performances were noted during the dry hot season (Table 4).

Table 4. The average reproduction parameters of the hens according to the seasons in the regions of the Eastern Chad

Parameter	Cold season (Dec. – Fev.)	Dry hot season (march-may)	First rain june	Rainy season (juil. - sept.)	After rainy season (oct. - nov.)
Eggs per laying cycle	$11,7 \pm 2,2^a$	$10,2 \pm 2,3^b$	$11,2 \pm 2,2^a$	$12,1 \pm 2,2^a$	$12,5 \pm 1,9^a$
Hatching rate	$88,3 \pm 10,2^a$	$81,8 \pm 14,8^b$	$86,9 \pm 10,7^a$	$86,7 \pm 11,9^a$	$89,3 \pm 8,0^a$
Chicks alive in 2 month	$5,5 \pm 2,7^a$	$4,5 \pm 2,6^b$	$5,8 \pm 2,6^a$	$7,4 \pm 3,4^a$	$6,9 \pm 2,6^a$
Surviving rate in 2 month	$54,2 \pm 24,0^b$	$53,7 \pm 23,3^b$	$61,7 \pm 3,3^a$	$68,5 \pm 23,9^a$	$63,5 \pm 22,0^a$

Means in the same line with different superscripts are statistically different ($p < 0.05$).

Dec. = December; fev. = February; juil. = July; sept. = September; oct. = October; nov. = November

Discussion

The chickens production practices in these regions were all the same with the ones noted in other zones of Chad (Mopate and Maho, 2005; Mopate *et al.*, 2010; Issa *et al.*, 2013) and the practices were the same elsewhere in the sub-saharan Africa (Bell and Abdou, 1995; Mopate and Awa, 2010; Issaka *et al.*, 2013). The use of the sesame seeds, a highly proteinic and energizing food, was a distinctive feature. The ponderal growth of the chicks submitted to that food would be worthy to be studied in order to recommend its use in some food intakes in the rural environment. The improvement of the hens feeding in the rambling breeding system could increase the productivity (Goromella *et al.*, 2006; Kouadio *et al.*, 2010).

The chicks (40%) were less numerous compared to the 47% in Guera in the Central Chad (Mopate *et al.*, 2010) and the 51% in the rural area of NDjamena (Mopate and Lony, 1999). The losses were sometimes extensive due to some pathological outward signs and the predation. These reasons could explain the rate. Relationship between the chicks to the rest of the numbers is weak and explains the extensive loss; the one between the young chickens to the adult chickens shows a fewer number of young chickens. Saunders (1984) observed in Burkina Faso that the relationship between the young chickens to the adult chickens was 1.4 qualified to be low. Mopate *et al.* (2010) had observed a high relationship of 3.6 in Guera. The

proportions of the cocks compared to the adult chickens are near 14.5% in the rural area of NDjamena (Mopaté and Lony, 1999). They were not as high as those noted (28%) in Guera (Mopate *et al.*, 2010) and were higher than those reported by Brunet *et al.* (1984) which was 9.5% in the immune area. This forming emphasized the low number of the cockerels and the cocks put on sale or raised for the producers own consumption. The high number of hens was a keeping strategy to ensure the continued existence of the breeding.

Save the results in the region of Guera (Mopate *et al.*, 2010), the average number (25 heads) of the farmyard animals in the regions of the Eastern Chad is higher than those reported by the different sources and in some African countries. These differences about the number of the farmyard animals are linked to the socio-economic importance of the breeding. The regions of the Eastern Chad take part in the supplying of chickens in the town of NDjamena, the capital of Chad (Mopate, 2010). The sex-ratio of 4.7 in favor of the females in the East Chad was upper than those noted (Table 5) in the centre and the South of Chad (Mopaté and Maho, 2005; Mopate *et al.*, 2010; Issa *et al.*, 2013), in Nigeria (Sonaiya and Olori, 1989), in Niger (Bell and Abdou, 1995) and in Burkina Faso (Saunders, 1984) in the not immune area (Table 5). On the other hand, it is lower than those observed in the rural area of Ndjamena (Mopate and Lony, 1999) and in Senegal (Buldgen *et al.*, 1992).

Table 5. The comparison of the farmyard animals' composition and the reproduction performances with the different bibliographical sources.

author, Country	Average number	Sex-ratio	Young/adulte	Cock/adulte	Laying/year	Egg/Laying	Egg /year	Hatching rate	Survival rate
Results East of Chad	25	4,7	0,9	17	3,6	11,7	41	86,6	60
Aklobessi, 1990 Togo	21	-	-	-	-	-	-	-	-
Aklobessi <i>et al.</i> , 1992 Togo	-	-	-	-	4	-	-	65	-
Assane, 1990 Benin	-	-	-	-	-	-	50-100	-	-
Atteh, 1989 Nigeria	-	-	-	-	-	-	-	-	-
Bamba <i>et al.</i> , 1992 Côte Ivoire	-	-	-	-	-	10-15	70-80	75-85	-
Bell et Abdou, 1995 Niger	12	3,1	-	-	-	-	-	-	-
Brunet <i>et al.</i> , 1984 Burkina Faso	-	-	-	9,5	-	-	-	-	-
Buldgen <i>et al.</i> , 1992 Senegal	5-15	6-7	-	-	-	-	40-50	80	-
Emvt, 1994 Africa	10-20	-	-	-	--	-	-	-	-

Iemvt, 1978 Chad	-	-	-	-	-	-	70	-	-
Katule, 1992 Tanzania	-	-	-	-	3	12-13	36	-	-
Kounta, 1992 Mali	20-30	-	-	-	-	12-15	80-100	86,7	-
Mopaté et Lony 1999, NDjamena, Chad	16	6	-	14,5	3	10,5	32	79	55
Mopaté <i>et al.</i> , 2005, South Chad	12	4,2	1,3	-	3,4	13,7	47	86,2	64
Mopaté <i>et al.</i> , 2010 Centre Chad	27	2,5	3,6	28	3,8	11	42	87	60,6
Issa <i>et al.</i> , 2013, West Chad	17	2	-	-	3,6	12	43	87	74
Ngou Ngoupayou, 1990 Cameroon	10,3	-	-	-	-	-	50-80	82	-
Ndokia, 1990 Congo-Brazzaville	19	-	-	-	-	-	-	-	-
Prost, 1987 Niger	-	-	-	-	5	11	55	-	-
Rigaut, 1989 Mali	-	-	-	-	3-4	-	-	-	-
Saunders, 1984 Burkina Faso	-	3	1,4	-	-	-	-	-	-
Veluw, 1987 Ghana	-	-	-	-	2,5	-	20	72	-
Sonaiya et Olori, 1989 Nigeria	-	1,9	-	-	-	-	-	-	-
Wilson, 1979 Sudan Darfur	-	-	-	-	4,5	10,9	50	90	-
Wilson <i>et al.</i> , 1987 Central-Mali	-	-	-	-	2,1	8,8	35	69	-

These data show that the males are more sold, more used than the females. The females are kept in order to insure the reproducibility of the breeding. The advocated sex-ratio is 15 to 20 in the traditional breeding (Saunders, 1984) was rarely reached, taking into account epidemics, the predation and the running (Saunders, 1984). In Burkina Faso, in a well-immune area, Saunders (1984) observed a sex-ratio of 9.

Taking as a whole, the reproduction performances of the hens in the regions of the Eastern Chad are set on an average level, compared to the different bibliographical sources in Chad and in the sub-saharan Africa (Table 5). On the other hand, save the results of Wilson (1979) in the Darfur (Sudan) the hatching possibility of the local hens in our area is the best; it is comparable to those obtained in Guera and in Mali (Kounta, 1992). This good hatching rate is to establish a parallel between the laying places and / or the clutch places which are for the majority (91%) some familial huts and under the barns. Those places are favorable to the clutch management. Indeed, the temperature and the humidity are some factors which affect the eggs hatching (Crawford, 1984; Silversides and Scott, 2001; Melesse *et al.*, 2013). The average survival rate (60%) of the chicks after the weaning (at two months) is near 60.6% as reported in Guera

(Mopate *et al.*, 2010). On the other hand, this rate is higher than the one noted in the rural NDjamena which was 55% (Mopate and Lony, 1999) and it is lower than the observations done in the Southern Chad (Mopaté and Maho, 2005). Generally speaking, the average parameters observed in the Eastern Chad showed some significant differences which were linked to the seasons. During the dry hot season (March-May), the parameters obtained were lower if compared to the other seasons. The first rains (June), the rainy season (July-September), the period after the rainy season (October-November) and the cold season (December-February) are characterized by relative food abundance, some temperature and humidity favorable to the eggs production and to the clutch (Ercan *et al.*, 2013). Moreover, the lush vegetation during these seasons protect in some extend the chicks against the birds of prey (Mopate and Maho, 2005). Cereal harvests are between November and January. The substantial quantities of grains scattered in the yards contribute with those distributed by the producers, to increase the food availability of chickens. Best parameters obtained during these favorable periods suggest that it is in this way, possible to optimize the chickens' production of the traditional breeding during these seasons.

The reproduction parameters differences compared to the other results (Table 5) could be explained by some used practices in particular the behavior (accommodation and food). These practices are different according to the ethnic groups, the zones, the regions and the countries. Thus, the practices stay linked to the operator (Teissier, 1979) own experiences that he/she had got himself/herself through time or that got from his/her community (Landais, 1992; Pleine *et al.*, 1995).

Conclusion

This survey has brought some informations about the reproduction parameters of the chickens breeding in the Eastern Chad. Nevertheless, another complementary study in some breeding would allow not only to validate these results but also to clarify and to organize into a hierarchy some factors (except pathologies) which are responsible of some considerable loss of chicks. The control of the chicks loss will contribute without any doubt to a numerical increase where there will be a great chickens exploitation and the agro-breeders will get much more earnings. These results are, however, a basis to set some development actions in this area.

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