World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

Check for updates

Characterization of the production and of the parameters of breeding ducks in the area of peri-urban N'Djamena

AHAMAT ABDOULAYE MAHAMAT *, CHERIF LAMADINE AMINE *, MOHAMMAD ATTAHIR HADJARO and KHADIDJA HASSABALLAH

Department of Biology, Faculty of Exact and Applied Sciences of Farcha, University of N'djamena (Chad).

World Journal of Advanced Research and Reviews, 2026, 29(01), 1633-1645

Publication history: Received on 14 December 2025; revised on 25 January 2026; accepted on 27 January 2026

Article DOI: https://doi.org/10.30574/wjarr.2026.29.1.0194

Abstract

The study aimed to characterize duck production and identify reproductive parameter in the peri-urban area of n'djamena, chad. A cross-sectional and retrospective survey was conducted during the months of January and February 2022 among 212 producers selected at random from the 19 villages in the study area. The results showed that this breeding is mainly in the hands of men (70%). These breeders are married (86%), aged on average 42 ± 0.96 years and educated for the most part (75.48). They have practiced duck farming for an average of 11.08 ± 0.52 years and are mainly farmers (61.32%). The duck is the highest poultry species (99%) in this area with an average number of 16.11 ± 1.04 heads. The free-range farming method is adopted by almost all breeders (97%). The objective of breeding is dirty and self-consumption (88.21%). The ducks' diet is based on cereals, kitchen residues and cereal bran (66.5%). The ducklings are weaned at 2.08 ± 0.045 months and are bred at 6.6 ± 0.09 months. The ducks have an average of 2.40 ± 0.39 laying cycles per year with an average of 13.05 ± 0.13 eggs per clutch. The average hatching rate is 84.59 ± 0.60. The main constraints mentioned by 86.32% of breeders are diseases, food and lack of attention. The diseases that plague livestock have various symptoms with only one appearance per year (81.34%), leaving the majority of producers defenseless, of whom only 14% practice medical prophylaxis. In view of the constraints to its breeding mentioned by the breeders and sti still traditional practice, this production records acceptable parameters of reproduction which could be improved by supervisory actions for better productivity for the benefit of the breeders.

Keywords: Peri-Urban Area of N'djamena; Duck Production; Constraints; Opportunities

1. Introduction

In developing countries, village poultry or traditional dominates and practice in rural, peri-urban and urban (Fotsa, 2008), because it requires low levels of inputs, contributes significantly to food security, the fight against poverty, the ecological management of healthy natural resources and represents a source of employment for disadvantaged groups (Gueye, 1998 ; Khan, 2004). Poultry farming local is an important activity in several african and asian countries where it is an important source of animal protein and income (Zaman *et al*., 2004). The breeding of waterfowls including the duck has experienced strong growth in recent decades worldwide (Faostat, 2018). The development of the production of ducks is likely to impact and improve the conditions in the human diet. Although on a global scale, the biggest part of the poultry meat and eggs come from the Gallus species, some parts of the world use significantly more ducks for this type of production (Pingel *et al*., 2012).

In Africa, the production of ducks has increased 6-fold from 1961 to 2010 (Yakubu, 2013). The ducks have a number of advantages compared to other poultry species, in particular because of their resistance to diseases. They are robust, they are very good marauders, and are easy to gather. One of the drawbacks of the ducks, when they are reared in

* Corresponding author: AHAMAT ABDOULAYE MAHAMAT and CHERIF LAMADINE AMINE

Copyright © 2026 Author(s) retain the copyright of this article. This article is published under the terms of the Creative Commons Attribution License 4.0.

confinement and fed with balanced rations, due to the fact that they waste a lot of food because of the shape of their beak. This makes the use of animal food, less effective, and this also explains why their meat and their eggs are more expensive than those of chickens (FAO, 2021). Breeding ducks breed local (Caïrina moschata) is an important source of income for farmers (Fasina *et al*., 2007) and is one of the rare opportunities for savings and investment (Sharmar, 2007).

In Chad, According to the Ministry of Livestock and Animal Production, livestock chad is estimated to be 93.8 million livestock units which 34.6 million heads of poultry. Poultry, it is dominated by the farming of chicken with 26.6 million head, or 77% of the total workforce. Other poultry are made up of ducks, geese, guinea fowls and pigeons (MEPA, 2018). The breeding of monogastrics (pigs, poultry) is increasing due to the increase in demand linked to population growth (Mopaté, 2002). In regard to the rearing of ducks, there is no recent study on the breeding duck local Chad namely the duck of Barbarism. However, data have been produced in 1999 this species to N'djamena in particular, its culture and its productivity.

2. Materials and methods

2.1. Material

2.1.1. Environment and period of study

The study on the characterization of the production and reproductive parameters of the ducks was carried out during the period of January to February 2022 in 19 villages of the peri-urban area of the city of N'djamena. This study area has a semi-arid climate, dry and hot with two seasons, a dry season and a wet season. The precipitation in this area is highly variable. The villages are divided into 3 provinces namely the Chari Baguirmi, the Hadjer Lamis and the province of N'djamena. Most of the selected villages are located on the banks of the Chari river, or Logone and bringing together a significant number of producers of duck, local (Canard de Barbarie *: Caïrina moschata)* (Figure 1).

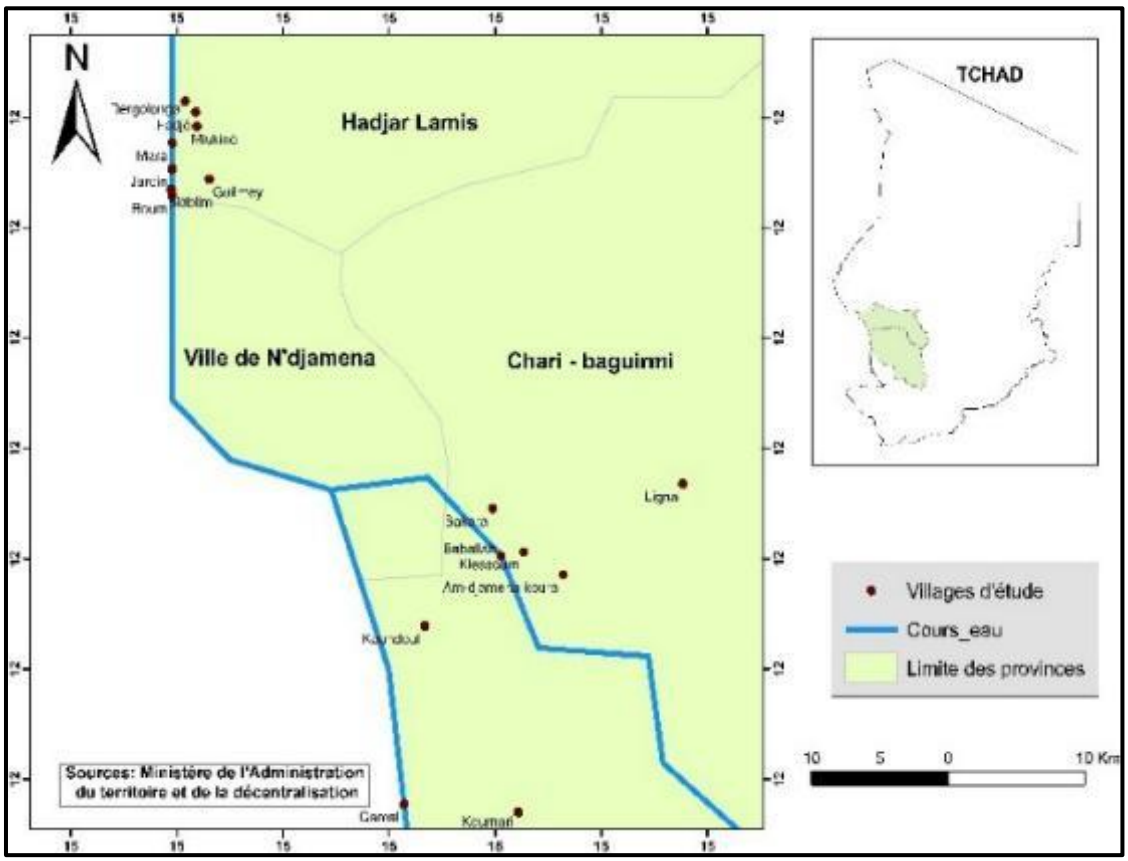

Figure 1 Distribution of villages in the study

2.1.2. Study material

It consists of an interview guide and questionnaires. Animal material affected is the duck. The questionnaires included information about the study environment, the characterization of the breeder (name and surname, age, sex, religion, ethnicity, marital status, occupation, and experience farming, husbandry (housing, food, driving, health and the different modes of production), reproductive parameters, the constraints and opportunities of the production of ducks.

2.2. Method of investigation

The methodology used in this study was a cross-sectional survey and retrospective by direct interviews with the operator. She has appealed to the memory of the breeders, while retracing the different stages of breeding ducks. In the study area, 212 producers of duck have been identified, and the choice was based on the criteria of accessibility and availability of information. Each of 212 breeders has been subjected to a direct conversation for the collection of the data that has been effective in the farms during the study period.

3. Results

3.1. Socio-professional profile of the breeders

The age of the farmers (Table II) indicates that they are relatively young, with practical breeding of about eleven years on average.

Table 1 Distribution of farmers according to the age and experience

Parameters	Minimum	Average ± standard Deviation	Maximum
Age	15.00	42.00 ± 0.96	75.00
Number of years of breeding	1.00	11.08 ± 0.52	50.00

Other settings and functions of the breeders are grouped in table III

Table 2 Parameters and functions of the breeders of ducks in the area surveyed

Settings	Features	Headcount	%
Sex :	M	149	70.28
	F	63	29.72
	Married	183	86.32
Marital Status	Single	20	9.43 A
	Widow	9	4.25
	Christian	135	63.68
Religion	Muslim	76	35.85
	Animist	1	0.47
ethnic Groups*	Sudanian Zone	162	76.42
	sahelian Zone	50	23.58
	Illiterate	50	23.58
Level of Study	Primary	68	32.07
	Secondary	73	34.43
	University	21	9.91
	Agriculture	130	61.32

	Trade	23	10.85
	Official	22	10.38
Main Activity	Resourceful	20	9.43
	Student and students	11	5.19
	Fishing	4	1.89
	Breeding	2	0.94
	Breeding	178	83.96
	Agriculture-Breeding	21	9.91
Secondary Activity	Livestock-Fisheries	6	2.83
	Trade-Livestock Farming	5	2.36 In
	Agriculture	2	0.94

(*) In terms of ethnic groups in Chad, diversity has been observed, of which the most numerous of which are from the sudanian zone (76,42%) compared to those of the sahelian zone (23,58%).

3.2. Poultry species and other animals in the household

The majority of breeders (60,38%) raise the duck in association with the chickens only. Those who only practice the breeding ducks only constitute about 23%, while the association of several other species of poultry breeding ducks is observed (Table III).

Table 3 Type of poultry raised in the lower courts

Type of poultry	**Effective**	**%**
Ducks	48	22.64
Canards_Poules	128	60.38
Canards_Pintades	2	0.94
Canards_Poules_Pigeons	21	9.91
Canards_Poules_Pintades	6	2.83
Canards_Poules_Dindons_Oies	1	0.47
Canards_Poules_Pigeons_Pintades	1	0.47
Canards_Poules_Pintades_Dindons	1	0.47

On the other animals in the lower course, the farmers have also associated to other animal species for breeding ducks. The recorded species were goats, pigs, cattle, sheep, and rabbits (Table V).

Table 4 Other animal species observed in breeders of ducks surveyed

The farms with other animals	**the Effective**	**%**
Goats	59	50
Sheep	7	5.93
Pigs	5	4.24
Rabbits	2	1.69
Cattle	1	0.85
Ovins_Caprins	25	21.19

Caprins_Porcins	4	3.39
Bovins_Ovins	2	1.69
Bovins_Ovins_Caprins	11	9.32
Ovins_Caprins_Porcins	2	1.69

3.3. IIIBreed of ducks, mode of husbandry and production goals

Almost all farmers (99%) raise the duck race Barbarism called Duck Pear *(Caïrina moschata).*

For the mode of breeding, almost all of the breeders livestock in freedom (97%). A very small minority (3%) cattle in confinement. The monitored farms are made most often by the whole family (76%) than by breeders only (24%).

Figure 2 reveals that the main objective of the livestock production in the study area was home consumption and sale of the ducks.

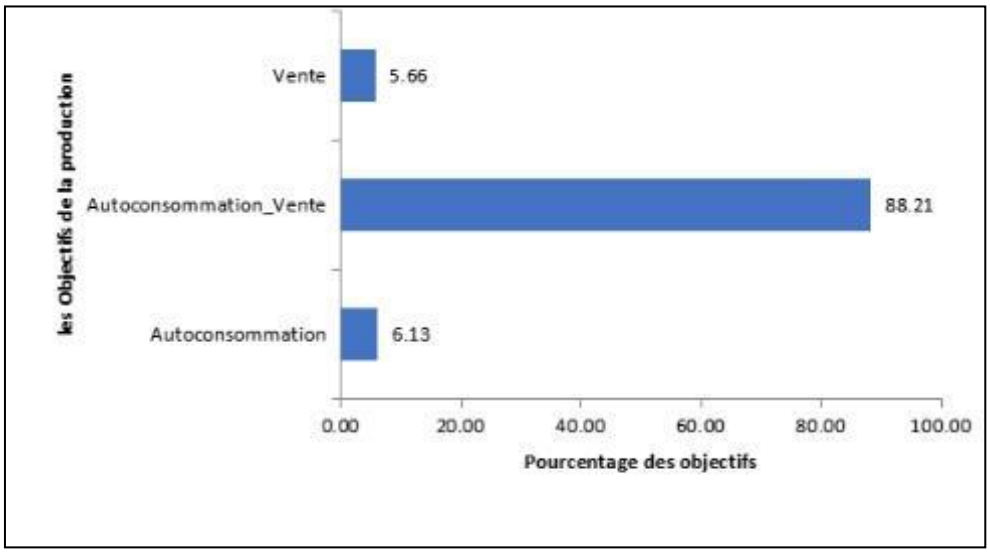

Figure 2 Objectives of the breeding of ducks reported by farmers in the study area.

3.4. Characteristics and hygiene of housing/Canardières

It can be seen from Table V that the canardières type of wall, roof and floor of beaten earth have been dominant and that almost all of The breeders will have cleaned and disinfected these accommodation with a frequency of one to two times per month.

Table 5 Characteristics and hygiene of housing of ducks in the area of investigation

Parameters	**Characteristics**	**Frequency (%)**	**Total**
Wall	of rammed Earth	64.42	
	Baked Bricks	Of 35.1	100
	Block	0.48	
Roof	clay	62.98	
	Plate	Of 35.1	100
	Wood	1.44	
	Straw	0.48	
Floor	of beaten Earth	97.59	

	Cement	1.92	100
	Pad	0.49	
Practice of cleaning	Yes	99	100
	Non -	1	
Frequency of cleaning	once/month	42	
	Two times/month	55	100
	Two or more times/month	3	
Practice of disinfection	Yes	51	100
	No	49	
Frequency of disinfection	once/month	20	
	Two times/month	63	100
	Two or more times/month	17	

The disinfectants used are the modern, most used insecticides (), products, or traditional and a combination of both (Table V).

Table 6 The products of disinfection used by breeders ducks on the farm

Product of disinfection	**Effective**	**%**
Insecticides	72	67.29
Ash	14	13.08
Cendre_Feu	10	9.34
Insecticides_Cendre	4	3.74
Insecticides_Cendre_Feu	3	2.8
Cendre_Plantes	1	0.93
Smoke	1	0.93
Insecticides_Plantes	1	0.93
Plants	1	0.93

3.5. Feeding the ducks

3.5.1. Equipment (water drinkers and feeders) and feed the ducks

The presence of the trough, and their nature : almost all of The farmers (98%) have a source of water in their farms, against (2%) who do not have it. They use for the majority (74%) of drinkers of the traditional type (half bottle, half barrel, kitchen utensils, song of the canary). By contrast, 26% use of water drinkers modern type.

The presence and types of feeders and nature : The majority of farmers (81%) have feeders and the rest (19%) do not. These feeders are used by almost all the farmers (99%) were of the traditional kind (sheet, plate, mat, half bottle, cookware, half barrel).

For the food distributed, the breeders are several kinds of food to the ducks, including the association of cereal food waste and sounds of grain was the prevailing practice (Table VI).

Table 7 *T*he Type of food served to the ducks in the farms surveyed

Types of food that are served	Actual	%
Grains, Residues of kitchens and Sounds	141	66.5
Grains, Residues of kitchens, Sounds and Draft	31	14.62
Cereals and Residues of kitchens	30	14.15
Grains, Residues of kitchens and Draft	3	1.42
Grains, Residues of kitchens, Sounds and Concentrates	3	1.42
Residues kitchens and Sounds	2	0.94
Concentrated	1	0.47 In
Cereals and Sounds	1	0.47

3.6. Characterization of the reproduction

III.1.5.1. The Structures and compositions of farms (Number)

The structures and compositions of the holdings of the ducks in the study area are grouped in Table ***VIII***.

Table 8 The Structures and composition of low-courses in the area of investigation

Settings	Features	Actual	Minimum,	Average and standard Deviation	Maximum
Composition of farms	Males	432	1.00	2.47 ± 0.1	10.00
	Female	1106	1.00	5.22 ± 0.3	33.00
	Young	1069	1.00	8.42 ± 0.64	38.00
Age of puberty (months)	Male	-	4.00	6.98 ± 0.12	12.00
	Female	-	4.00	6.60 ± 0.09	12.00
Number of breeding	Males	373	1.00	2.07 ± 0.10	10.00
	Female	1085	1.00	5.12 ± 0.31	33.00

3.6.1. Origin and criteria of choice of duck breeding

The ducks breeding were in their vast majority chosen in the same farmyard (Figure 3).

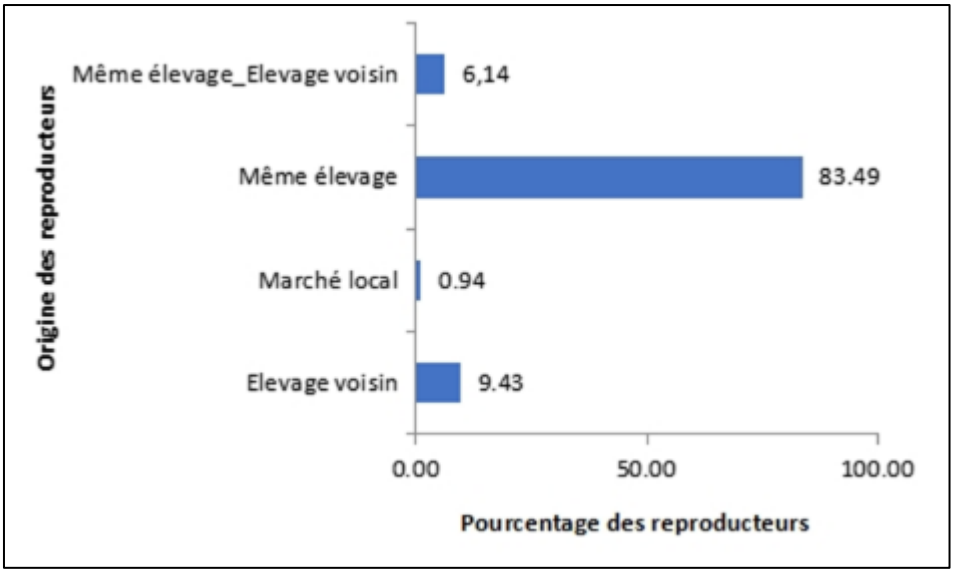

Figure 3 Origin of ducks breeding

For the selection criteria, the majority of the producers in the study area, choose the ducks breeding based mainly on the morphology of the other criteria (Figure 4).

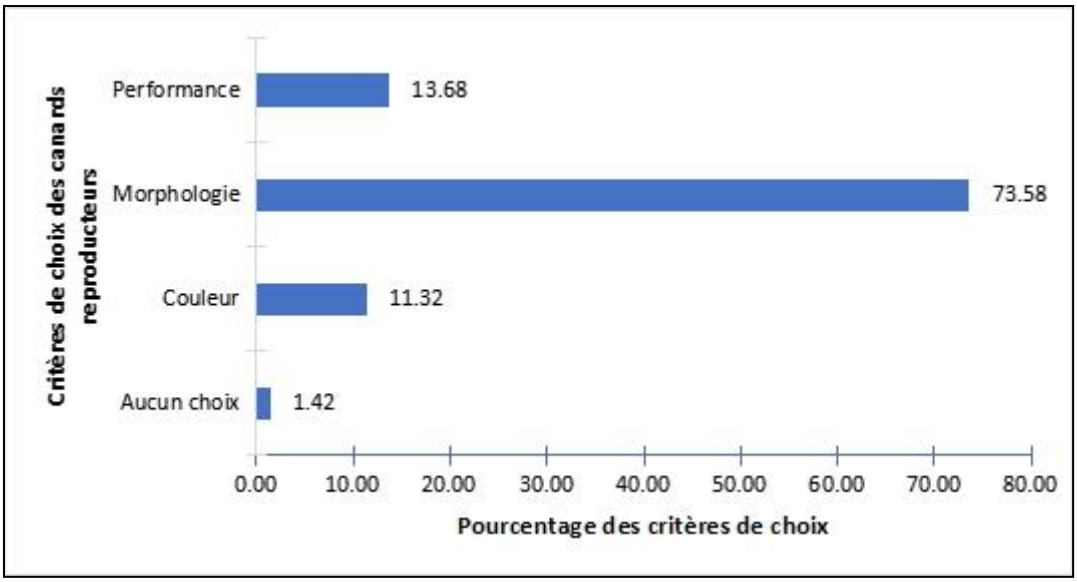

Figure 4 Criteria for the selection of ducks breeding in the survey area

3.6.2. Origin and the selection criteria for breeding

The ducks are breeding were mostly from the same farm (97%). But there are also those that are purchased on the local market (2%) and farming neighbours (1%).

The criteria for the choice of the canes have been primarily based on the performance of laying track for the proper conduct of the ducklings (Figure 5).

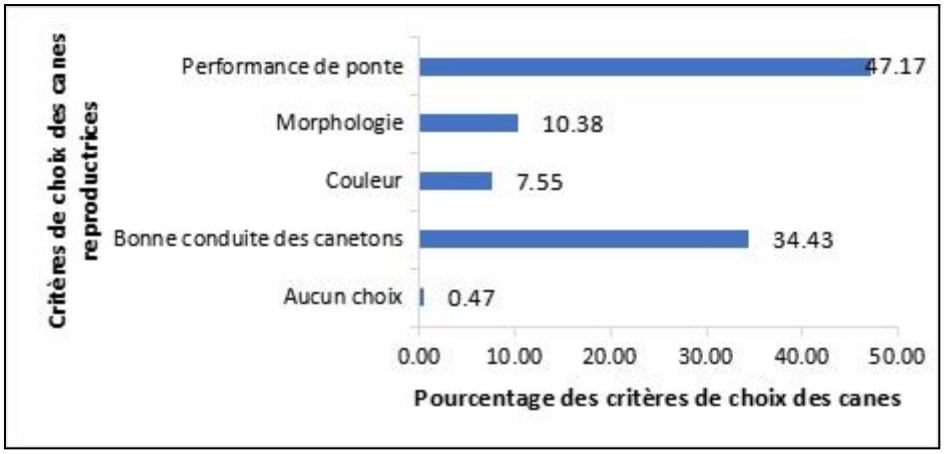

Figure 5 Criteria for the selection of ducks breeding in the farms surveyed

3.6.3. Fashion and reproductive parameters

The farmers of the study area surveyed say that they use in their operations that the mode of reproduction is not controlled.

It can be seen from table IX, the parameters of breeding ducks in the study area

Table 9 The reproductive parameters of the canes in the survey area

Parameters	Minimum	Average ± standard Deviation	Maximum
Age of reform males (Year)	Of 1.00	To 2.71 ± 0,070	7.00
Age of reform females (Year)	1.50	3.48 ± 0.060	6.00
laying Cycle per Year	1.00	2.40 ± 0.039	3.00
Ages to the 1era ponte	5.00	6.81 era 0.094	1.00
Number of eggs laid/ Cycle	9.00	13.50 ± 0.130	16.00
Duration of spawning	9.00	13.50 ± 0.130	16.00
Number of eggs hatched/ Cycle	9.00	13.51 ± 0.130	16.00
Duration of brooding	28.00	30.07 ± 0.107	35.00
Number of eggs hatched/ Cycle	7.00	12.03 ± 1.967	16.00
Age of weaning (Months)	Of 1.00	To 2.08 ± 0.045	4.00
Number duckling weaning	4.00	9.82 ± 0.171	16.00
Number of pre-weaning mortality	1.00	2.75 ± 0.090	7.00
Number of mortality after weaning	1.00	1.33 ± 0.140	3.00

3.6.4. The hatching rate, survival to weaning and pre-weaning mortality

Table X shows the hatching rate, survival to weaning at 02 months and the rate of mortality before weaning.

Table 10 The different rates

Parameters	Minimum	Average ± standard Deviation	Maximum
hatching Rate (%)	55.56	84.59 ± 0.60	100.00
survival Rate to weaning (%)	constitute 41.67 per	81.53 ± 1.04	100.00
Rates of pre-weaning mortality (%)	6,67	22.94 ± 1.50	58.3

3.6.5. Conduct health

The producers have stated that their ducks were suffering from different diseases, they reported the most frequent symptoms namely : diarrhoea (white, yellow, and green), the flow of the mouth, nasal discharge, paralysis, breathing problems, posture problems, the button at the rump, dizziness, and disturbances of vision, but with a frequency of occurrence variable. The other parameters of the conduct health are summarised in the table XI.

Table 11 Conduct health

Parameters	Characteristics	Frequency (%)	Total
prophylactic Measures	Yes	14	100
	Non -	86	
Frequency of the occurrence of the disease	once/year	81.33	
	twice/year	16.27	100
	Two or more times	to 1.44	
	Not all years	is 0.96	
Animals attacked	All age groups and	92	
	Adults	5	100
	Ducklings	3	
Products used	Modern	59	
	Traditional	29	100
	traditional and Modern	12	

3.7. Use of the production

3.7.1. Destination eggs, and ducks live

Destination eggs : the majority of the eggs of ducks are intended for reproduction (93%). The remains (7%) are used for the reproduction and consumption.

Destination ducks live : the major part of The producers raise ducks for home consumption-sale-don (Figure 6). Other destinations accounted for a low proportion. The difference was significant (P0,05) between the two destinations.

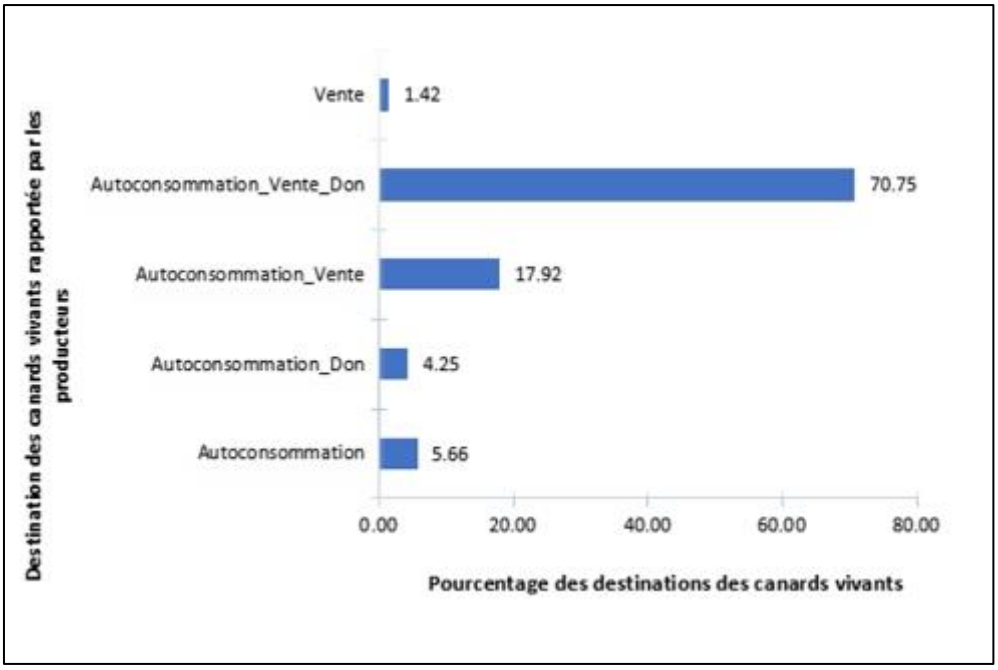

Figure 6 Destination ducks live

3.7.2. Constraints and challenges related to the breeding of ducks

It is clear from figure 7 the different problems related to the breeding of ducks in the area.

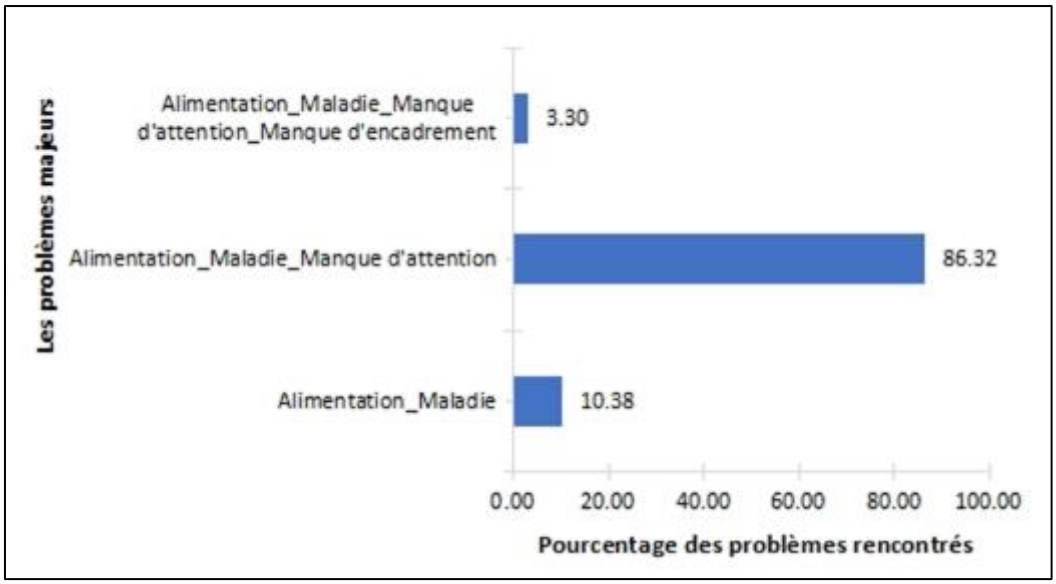

Figure 7 The major difficulties of farms

4. Discussion

The farmers of the study area are mainly men. This result is consistent with the one obtained in Chad (Mopaté *et al*., 1998 ; Mopaté and Maho, 2005, Mahamat and Mukhtar, 2006) ; in the DRC (Moula *et al*., 2012), Kenya (Ndegwa and Kimani, 1996), Côte d'ivoire (Loukou, 2013), Burkina Faso (Hien *et al*., 2005 ; Ouedraogo, 2018). However, this result is different from those obtained in Senegal (Gueye, 1998), Nigeria (Branckaert, 1999), Cameroon (Fotsa *et al*., 2007) and in Senegal (Nahimana *et al*., 2019) who argue that this activity of poultry is traditionally feminine. The farmers are mostly married. This result has been observed by Ndegwa and Kimani (1996), Fotsa *et al.,* (2002), Mopaté and Maho (2005), Mahamat and Muktar (2006) and Moula *et al.,* (2012), Mugumaarhahama *et al*. (2016), in their studies on hens

local. The majority of the farmers of the study area are instructing. The similar results were obtained by Dete (2016) in the farms duck in the department of the atlantic, and by Houessionon (2011) and Tougan (2008) in local chicken in Benin. The average age of the breeders of ducks in the study area is 42 years. These results are close to those reported by Houessionon and Youssao (2018) in the Agro-ecological zone in the South of Benin. The farmers practiced predominantly agriculture as the main activity. The same remarks were reported by Mopaté and Maho (2005), Mahamat and Muktar (2006), Moula *et al.,* (2012), Ndegwa and Kimani (1996), Youssao *et al*. (2013) and Baruwa *et al*. (2018). The farmers of the study area are from various ethnic groups. This result is similar to that reported in Chad (Leng *et al*., 2022), Senegal (Fall *et al*., 2019), Burkina Faso (Hien *et al*., 2005) and Chad (Mopaté and Maho, 2005 ; Issa *et al*., 2013). The farmers have an average duration of about 11 years in the business of breeding ducks. These results are close to those found by Mopaté and Maho (2005) in the study on the characteristics and the productivity of the farming family of chickens villagers in the South of Chad. The same observations were made by Mahamat and Muktar (2006) in the departments of Chari-Baguirmi, Tandjilé Ouest, Chad, Mayo-Banyo , Cameroon ; Moula *et al*. (2012) in the Lower Congo (DRC) and Ndegwa and Kimani (1996) in Kenya in hens. The analysis of the different activities practiced by the farmers of the study area shows that the duck-breeding within the household is always associated with other activities. This result is similar to those of (Aboe *et al*., 2006) in Ghana and (Moula *et al*., 2012) in the DRC.

5. Conclusion

This study carried out on the characterization of the production and reproductive parameters of the ducks of barbarism in the peri-urban area of n'djamena has revealed that this breed is considered as a secondary activity and is practiced by producers mainly men, married, belonging to different layers professional or the main activity is agriculture. It is a breeding yet traditional in practice (rearing infrastructure, power mode, driving mode, and the care of the health of animals). According to the constraints for its farming reported by breeders and its practical yet traditional, this production has reproductive performance acceptable and deserve to be enhanced by the supervisory activities for better productivity. The breeders will be able to benefit from increased headcount and revenues from the sale of the ducks.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed. No

References

[1] Aboe PAT., Boa-Amponsem K, Okantah SA., Butler EA., Dorward PT., Bryant MJ., 2006. Free-range village chickens on the Accra plains, Ghana: Their husbandry and productivity. *Too. Anim. Health Prod*., 38 : 235 - 248. DOI : 10.1007/s11250-006-4356-x

[2] Branckaert RDS. And Gueye EF., 1999. FAO''s programme for support to family poultry production. In : F. Dolberg and P. H. Petersen (eds) Poultry have tool in poverty eradication and promotion of gender equality. Proceedings of a workshop, 22-26 March 1999, Tune Landboskole, Denmark. 244 – 256.

[3] Fasina FO., Mohammed SN, Onyekonwu ON, Wai MD., 2007. Contribution of poultry to the income of households : the case of the municipality of Jos South, Nigeria. Family poultry, 17 (1 & 2) : pp. 30 – 34.

[4] FAO, 2021. Ducks _ Gateway on poultry and poultry products. http://www.fao.org/poultry-production-products/production/poultry-species/ducks/en/

[5] Fotsa Jean Claude, 2008. Characterization of populations of village hens (Gallus gallus) in Cameroon, Thesis, Institute of Agricultural Research for Development, Yaoundé : https://tel.archives-ouvertes.fr/pastel-00004904/document

[6] Fotsa Jean Claude, 2008. Characterization of populations of village hens (Gallus gallus) in Cameroon, Thesis, Institute of Agricultural Research for Development, Yaoundé : https://tel.archives-ouvertes.fr/pastel-00004904/document

[7] Fotsa JC., Rognon X., Tixier-Boichard M., Ngou Ngoupayou JD, Pone Kamdem D., Manjeli Y. and Bordas, A., 2007. Exploitation of the hen's local area of humid drill of Cameroon. Bulletin of animal health and production in Africa, 55 : pp. 59 – 73.

[8] Gueye, E. Fallou, 1998. Village egg and fowl meat production in Africa-regional', Report of the World's Poultry Science Journal, 54: 73 – 86. Hien OC, Diarra B, Drabo Y, Boly, H., and Sawadogo L : 2005. Practical poultry traditional by the various ethnic groups of the cascades region of Burkina Faso, Agronomy African, 17 (3) : pp. 227 – 239.

[9] Hien CO., Diarra, B., Drabo , Y., Boly , H., Sawadogo L., 2005. Practical poultry traditional by the various ethnic groups of the cascades region of Burkina Faso. Agronomie Africaine, 227-239.

[10] Khan, G., 2004 Replica of the native chickens with its acceptability on the market is a key factor in family poultry, Bulletin RIDAF, 14(1) : pp. 2 – 11.

[11] Loukou N'goran Etienne, 2013. Phenotypical and molecular characterization of local hens (Gallus gallus domesticus Linnaeus, 1758) in two agro-ecological zones of Côte-d'ivoire. Thesis, University Felix Houphouet-Boigny. DOI : 10.13140/2.1.1686.5281. 205p.

[12] Mahamat A. and Muktar A., 2006. Village poultry in the departments of Chari-Baguirmi, Mayo B, and Tandjilé O, Practices, dominant pathological and desires of poultry producers, thesis for obtaining the Degree of engineer of farming techniques, Institut universitaire des sciences et techniques d'abéché (IUSTA), Department of science and technology of livestock : 30 pages.

[13] Mopaté L. Y., Idriss O. A., 2002. State of the family poultry in Chad and the prospects of its development. Studies and research sahelian, Insah. Bamako, Mali, vol 6-7 : 7-15.

[14] Mopaté L. Y., Hendrikx , P., Imadine Mr. and Idriss, A., 1998. Socio-economics of production of avian in the region of the North-Guéra in the center of Chad. Scientific journal of Chad 5(2) : 29 - 32.

[15] Mopaté L Y and Maho A., 2005. Characteristics and the productivity of the farming family of chickens villagers in the South of Chad. African journal of animal health and production (RASPA), vol, 3 (1) : 41 – 46.

[16] Moula N., Detiffe N., Farnir F., Antoine - Moussiaux N. and Leroy P., 2012. Family poultry in Bas-Congo, Democratic Republic of the Congo (DRC). Livestock Research for Rural Development, Volume 24, Article # 74. Retrieved November 13, 2014, from http://www.lrrd.org/lrrd24/5/moul240 74.html

[17] Ndegwa J M and Kimani C W., 1996. Proceedings of the 5th Kenya Agricultural Research Institute (KARI) Scientific Conference, (KARI, Nairobi), 15 – 38.

[18] Nahimana G., Ossebi W., Missohou A and Ayssiwede S B., 2019. Analysis of the socio-economic importance of family poultry in the Department of Salemata in Senegal. J. Biol. Chem. Sci. 13(7) : 3131-3143, December 2019 ISSN 1997-342X (Online), ISSN 1991-8631.

[19] Sharmar K., 2007. Role and relevance of poultry farming rural in developing countries ; the case of India, Poultry farming family, 17(1-2) : 35 – 41.

[20] Yakubu Abdulmojeed, 2013. Characterisation of the local Muscovy duck in Nigeria and its potential for eggs and meat production. World's Poultry Science Journal, 69, 931-938. Doi :10.1017/S0043933913000937

[21] Zaman MA, Sorensen P. and Howlider MR., 2004. Egg production performance of a breed and three crossbreeds under planting cavenging system of management, Livestock Research for Rural Development, 16. Available at: http://www.cipav.org.co/lrrd/lrrdl6/8/zama16060.htm.