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Typology of local turkey (*Meleagris gallopavo*) breedings located in Ouaké commune in northwestern Benin

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Abstract

The study was conducted in northwestern Benin in the commune of Ouaké. It aims to characterize the different types of local turkey farming in this municipality. Surveys were conducted with 75 turkey farms. Three types of breeding have been identified. Type 1 (49.3% of the sample) consists mainly of farmers with an average age of 58.1 ± 1.92 years. They have an average of 6.6 ± 0.87heads of turkey acquired primarily by purchase. Turkeys have no shelter and no health monitoring. In type 2 (26.7% of the sample), the farmers are younger (47.3 ± 2.88 years) and have on average 6.3 ± 0.76 turkey heads, also acquired mainly by purchase . Livestock practices are improved. Turkeys have shelters and receive care. This type corresponds to peasant farmers. In type 3 (24% of the sample), corresponding to the group of agro-pastoralists, the average age is 54.7 ± 2.69 years. Nearly half of them have been educated and have an average of 6.7 ± 1.04 turkey heads purchased through purchase, inheritance and donation. Farming practices are better than in the two previous types (turkey shelters, health monitoring, choice of breeders). Each type of turkey farm in the commune of Ouaké therefore has particularities that must be taken into account in order to develop strategies and appropriate options for the development of the sector.

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Introduction

In Benin, the agricultural sector is of paramount importance for the strengthening of the Beninese economy as it contributes an average of 32.7% to GDP, 75% to export earnings, 15% to state revenue and provides about 70% of jobs (MAEP, 2014). It is therefore considered as the one whose many potentialities must be judiciously exploited to support national economic growth and thus contribute to the effective fight against poverty and malnutrition. Livestock occupies a prominent place because it comes in second place after agriculture (MAEP, 2014). Conventional species consist mainly of cattle, sheep, goats, pigs and poultry (FAO, 2015).

Poultry farming is an important alternative for increasing animal protein intake in rural areas (Gueye, 1997). About 22% of total protein consumption is provided by poultry products (Fanou, 2006). The national poultry flock is estimated at 20,120,500heads of poultry (BCEAO, 2017) and the local poultry is the most important both in terms of numbers (more than thirteen millionheads) and its contribution to income generation and therefore to poverty reduction (Fanou, 2006). The chicken is the highest poultry, it follows the guinea fowl, the duck, the turkey and the pigeons. The turkey is mostly bred in the Northwest (Copargo, Ouaké Djougou and Bassila) and the South East (Adjarra especially) (MAEP, 2014). The craze for turkey farming can be explained by the high level of yield and carcass weight, the quality of the meat and the existence of a marketing market with a sale price interesting, especially as the holidays approach. The species and breeds encountered require little care and food. However, they are susceptible to diseases, especially since veterinary care is scarce (FAO, 2015).

The aim of the present study is to make the typology of the family farming of turkeys in the Commune of Ouaké in order to characterize the farms of turkey and to identify the constraints of this breeding with a view to the development of strategies and options appropriate for the development of the sector.

Material and methods

Study zone

The Commune of Ouaké is located in the north-west of the department of Donga between parallels 9° and 10° north latitude and meridians 1° and 2° east longitude. Covering an area of 1500 km², it is bounded on the North by the municipality of Copargo, on the South by that of Bassila, on the East by the Commune of Djougou and on the West by the Republic of Togo (Fig. 1.) (PDC Ouaké, 2004). The climate is Sudanese wet type with two seasons: a rainy season "Yoluma" from May to October and a dry season "Lunlè" from November to April. The average temperature is around 27° C. The average annual rainfall calculated over 20 years is 1250 mm (PDC Ouaké, 2004).
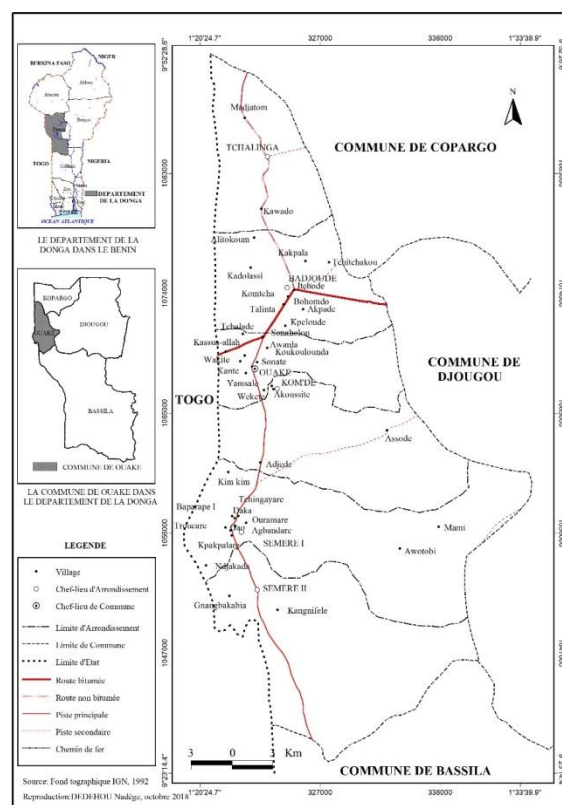

Fig. 1. Map of commune of Ouaké.

Methods of diagnosis of turkey farms

The Livestock Survey Methodology Survey (MCD, 1989), developed by IEMVT and CIRAD (Salas et al., 1986, Cervantes et al., 1986, Lhoste et al., 1993, Alkoiret et al., 2009) was used to carry out this study. Turkey farms in the Ouaké Commune have been identified and inventoried. A representative sample of 75 turkey farms with 490heads of poultry

representing 10% of the municipal herd was realized. These farms were subjected to a brief survey which made it possible to make their typology according to various criteria such as the ethnicity of the farmer, the size of the breeding, the size of the household, the formations received, the associated activities at the breeding, the type of breeding, the main crops, the total area planted, the modes of reproduction.

Statistical analysis of the data

The data collected during the exploratory survey was analyzed using the SAS® software (Statistical Analysis System, 1989). The PROC CORRESP procedure was used to perform the Multiple Correspondence Analysis (MCA) of the data and the PROC CLUST procedure was subsequently used to make an Ascending Hierarchical Classification (AHC) of the data.

Results

Characteristics of the sample

Breeders

The geographic distribution of turkey farms in the Ouaké Commune is not uniform. Thus, three of the six districts (Komdè, Badjoudè and Tchalinga) that account the commune, home to 85.3% of recorded turkey farms. Most turkey farmers are of the Lokpa ethnic group and breeders of other ethnicities (Bariba, Fodo, Peulh, Yidé and Yom) represent only 18.7% of the breeders surveyed. Their level of schooling is very low; thus, only 36% of them were in school and only 21.3% of them were either literate or literate and trained in animal health and animal production techniques. The average age of the breeders surveyed is quite high (54.4 ± 1.48 years).

Animals

The average size of the turkeys in the farms surveyed was 6.5 ± 0.21heads. A total of 490 turkeys (all categories combined) were recorded on the farms in the sample. From the phenotypic point of view, three types of turkeys were found: the tanned turkey (67.4%), the gray turkey (18.7%) and the black turkey (13.9%). Poultry of different species (chickens, guinea fowl, ducks, pigeons) were found in 95% of the farms surveyed. The average number of other poultry species (21.6±0.39heads) is greater than the number of turkeys.

Small ruminants (sheep, goats) are reared by 84% of the breeders surveyed. The sheep encountered are of the Djallonke breed and goats of the Guinean dwarf breed. Mean numbers were 4.1 ± 0.22heads and 3.1 ± 0.15heads, respectively, for sheep and goats. Only 30.7% of the surveyed breeders own cattle. The Borgou breed is predominant. The average size was 1.4 ± 0.13heads with a maximum of 15heads among Fulani breeders. The cattle encountered are usually draft oxen for harnessed culture.

Breeding practices

A good part of the year, turkeys are free and manage in nature to feed. They are fed during the growing seasons when they are locked up. However, in all the farms surveyed, they receive from time to time from the farmer a few handfuls of cereal grains, kitchen waste or other agricultural by-products.

In 80% of the farms, the turkeys are housed either in unoccupied rooms of the houses which they share with the other birds of the poultry yard or with the small ruminants (goats, sheep), or in small shelters of approximately 1 m² of surface and having a height varying between 0.5m and 2.5m. In 20% of the farms, they do not have shelter and perch on tree trunks or hide in the foliage of the trees or shelter under attics. The poultry houses are very often rectangular in shape with a straw roof. The walls are not plastered and the floor is never cemented.

Nearly half of the sample (44.8%) of the breeders surveyed do not make any particular health monitoring of their poultry. 14.9% of farmers have their animals vaccinated by village poultry vaccinators using attenuated vaccines purchased from private veterinarians and only 1.9% give them vermifuges. Most of the breeders surveyed (79.1%) do not choose breeding stock. But some (20.9%) choose the breeders based on criteria such as the size, the smooth legs, the color of the plumage.

Typology of turkey farms in the municipality of Ouaké

Study of the variables

The study of the correlations between the various variables considered made it possible to retain for the

Multiple Correspondence Analysis (MCA) a set of 18 active variables giving 61 modalities. The study of the relative contribution of the modalities of the variables to the inertia explained by the axes made it possible to define the meaning of each axis and the links between variables (Table 1).

The cumulative contribution to the total inertia of the three factorial axes was 70.7% (Table 2).

Table 1. Definition of factorial axes.

Factorial axes	Negative	Positive
1	Young breeder	Old breeder
	High schooling level and training	Low schooling level and training
	Salaried labor	Family labor
	Low household size	High household size
	New farm	Old farm
	Low number of turkey	High number of turkey
2	Low number of small ruminants and poultry	High number of small ruminants and poultry
	No cattle	Possession of cattle
	Low cultivated area	High cultivated area
	Purchase of turkeys	inheritance and donation of turkeys
	Traditional breeding	Improved traditional breeding
	Endogenous treatments	Veterinary follow-up
3	Cereal bran, and kitchen waste	Grains and bran of cereal, kitchen waste
	No choice of the reproductive turkeys	Choice of the reproductive turkeys
	No shelters	Henhouses or rooms of the house

Table 2. Cumulative contribution of the total inertia of the factorial axes.

Factorial axes	Inertia (%)	Cumulative (%)
1	46,5	46,5
2	13,6	60,1
3	10,6	70,7

Definition of groups

In order to define breeders' classes more precisely from the Multiple Correspondence Analysis (MCA) examination, a Hierarchical Ascending Classification was carried out on the three factors selected.
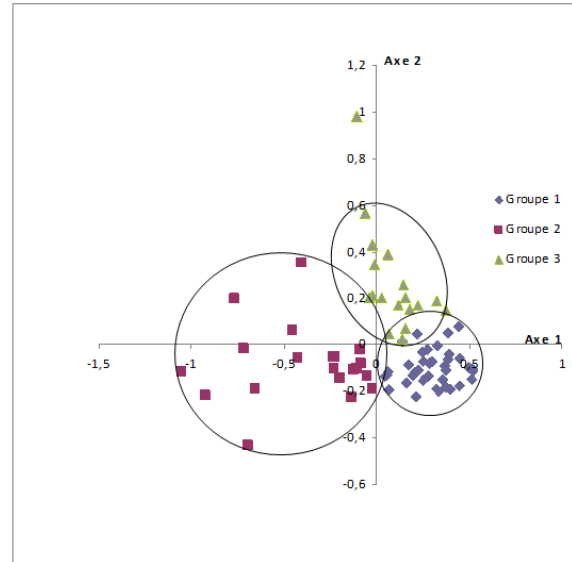

Fig. 2. Projection of turkey farms on axes 1 and 3.

The study of the distribution of groups on the Multiple Correspondence Analysis (MCA) graphs (and the return to the initial data file) made it possible to identify the characteristics of each group. The frequencies of the different modalities of the variables relating to the 3 typology groups are presented in Table 3. The general characteristics of the groups of turkey farmers in the Commune of Ouaké are as follows:

Table 3. Frequency (%) of the various modalities according to the groups of the typology.

Variables	Modalities	Group 1	Group 2	Group 3
BDL = Breeder district of location	Badjoudè	10,8	33,3	50
	Komdè	32,4	38,9	25
	Ouaké Centre	27	11,1	15
	Sèmèrè 1	10,8	0	0
	Sèmèrè 2	16,2	16,7	5
	Tchalinga	2,7	0	5
BEG = Breeder ethnic group	Bariba	2,7	0	0
	Fodo	8,1	0	0
	Lokpa	73	83,3	95
	Peulh	0	11,1	0
	Yidé	13,5	5,6	5
	Yom	2,7	0	0
BSL = Breeder schooling level	Not provided with schooling	70,3	61,1	55
	Primary standard	24,3	33,3	20
	Secondary standard	5,4	5,6	25
TTL = Training and Teaching of literacy	Untrained illiterate	86,5	72,2	70
	Literate	5,4	11,1	10
	Trained	8,1	16,7	10

Variables	Modalities	Group 1	Group 2	Group 3
	Literate and trained	0	0	10
TAC = Total area cultivated	TAC ≤ 2ha	97,3	27,8	65
	TAC > 2ha	2,7	72,2	35
HHS = Household size	HHS ≤ 7	16,2	11,1	10
	7 < HHS ≤ 14	54,1	27,8	50
	HHS > 14	29,7	61,1	40
AGE = Age of the breeder	AGE ≤ 40	13,5	11,1	20
	40 < AGE ≤ 55	27	38,9	10
	AGE > 55	49,5	50	70
LAU = Labor used	Family	67,6	33,3	50
	Salaried	32,4	55,6	45
	Family + salaried	0	11,1	5
NOT = Number of turkey	NOT ≤ 5	64,9	50	55
	5 < NOT ≤ 10	16,2	33,3	30
	NOT > 10	18,9	16,7	15
NOP = Number of poultry	NOP ≤ 15	89,8	66,7	0
	15 < NOP ≤ 25	10,2	33,3	20
	NOP > 25	0	0	80
NSG = Number of sheep and goats	NSG ≤ 5	75,7	22,2	65
	5 < NSG ≤ 10	18,9	55,6	10
	NSG > 10	5,4	22,2	25
NOC = Number of cattle	NOC ≤ 2	100	61,1	25
	NOC > 2	0	38,9	75
HCM = Herd constitution mode	Purchase	70,3	77,8	65
	Inheritance	0	0	10
	Donation	27	11,1	25
	Inheritance + purchase	2,7	11,1	0
DEB = Duration of existence of the breeding	DEB ≤ 5 years	43,2	16,7	40
	5 < DEB ≤ 10 years	10,8	5,5	25
	DEB > 10 years	46	77,8	35
ANH = Animal Housing	Without shelter	29,7	16,7	15
	Chicken coops	21,6	38,9	35
	Unoccupied rooms of the house	48,7	44,4	50
HMA = Health monitoring of turkeys	No health follow-up	59,5	50	25
	Vaccination	13,5	11,1	20
	Deworming	0	5,6	0
	Vaccination + deworming	27	33,3	55
CRA = Choice of reproductive animal	No choice	94,6	77,8	65
	Loan	0	22,2	20
	Purchase	5,4	0	15
FOC = Food complementation	Cereal grains	48,7	44,5	50
	Cereal bran	22,6	44,4	30
	Kitchen waste	29,7	11,1	20

Group 1 (37 farms or 49.3% of the sample)

This group of breeders is the largest of the sample. They are present in all the districts of the commune of Ouaké, even if their distribution is not uniform. Similarly, all ethnic groups of turkey farmers surveyed are represented with the exception of Fulani. The average age of farmers in this age group (58.1 ± 1.92 years) is above the sample average and their average household size (12.2 ± 0.89) is smaller. This group has more out-of-school breeders and untrained illiterates than the average sample of turkey farmers surveyed. They are relatively less old in turkey farming (6.5 ± 0.56 years). They also practice agriculture and cover small areas (1.14 ± 0.08ha) using more family labor.

Farmers in this group have an average of 6.6 ± 0.87 turkey heads purchased primarily through purchase. They also have someheads of poultry other than turkey (8.4 ± 1heads) and small ruminants (3.6 ± 0.53heads). On the other hand, none of them has cattle.

In this group, the breeding of turkeys is very extensive and reduced to its simplest form: no shelter for animals, no choice of breeding stock, no health monitoring and the complementation is reduced to the use of the remains of cooked. It is therefore a gathering farm and the turkey farmers in this group are essentially farmers.

Group 2 (20 individuals or 26.7% of the sample)

The breeders of this group are concentrated in Komdè and Badjoudè, poorly represented in the districts of Ouaké Center and Sèmèrè 1 and 2 and totally absent in Tchalinga. They are mainly of the Lokpa ethnic group, followed by Fulani and Yidé ethnic groups. The other ethnic groups are totally absent. Farmers in this group are younger (47.3 ± 2.88 years), but have larger households (14.8 ± 1.63) and have been farming turkeys for 7.1 ± 1 years. Nearly a third of them were either educated or literate and trained. They cover larger areas (2.25 ± 0.35ha), using more paid labor than family.

Farmers in this group have an average of 6.3 ± 0.76 turkey heads, acquired primarily through purchase. On the other hand, they have a considerable number of poultry other than turkeys (52.9 ± 4.47heads), and a significant number of small ruminants (9.9 ± 1.59heads). In the case of cattle, 35% of them have at least one pair. They are cattle oxen used for harness cultivation. The average number of cattle in this group is 1.5 ± 0.29heads.

Breeding practices are a little better in this group. Thus, the animals are housed in chicken coops made of local materials or in unoccupied rooms of the house. They receive a complementation of grains and cereal bran in addition to the remains of kitchens and are de-wormed and vaccinated. Some breeders in this group use efficient brood stock to mate their turkeys. This is the group of peasant breeders.

Group 3 (18 individuals or 24% of the sample)
The turkey farmers in this group are mainly located in the district of Badjoudè, less in Komdè and weakly in all the other districts of the commune. They are mostly Lokpa with a minority of Yidé. Other ethnic groups are not represented in this group. Nearly half of them were educated and 30% of them were either literate or trained in animal health and animal production techniques. The average age of farmers in this group is 54.7 ± 2.69 years and the average household size (16 ± 1.39) is the highest of the three groups. They are the oldest in turkey farming (8.5 ± 0.61 years) and cover the largest areas (3.95 ± 0.49ha) using both salaried and family labor.

Farmers in this group have an average of 6.7 ± 1.04 turkey heads purchased through purchase, inheritance and donation. The average number of poultry other than turkey and small ruminants was 14.1 ± 1.46heads and 10.3 ± 1.58heads, respectively. As for cattle breeding, 83.3% of the breeders surveyed have at least one pair with an average of 3.95 ± 0.9heads.

The breeding practices are the most improved of the three groups: 85% of the animals are housed; 75% of the animals are at least vaccinated or dewormed; 35% of the breeders choose (loan or purchase) the reproductive turkeys and all the breeders supplement their animals with grains and cereal brans in addition to the kitchen waste. This is the group of agro-breeders.

Discussion
Livestock farming in the Ouaké Commune is practiced as a secondary activity. Most farmers associate it with agriculture and some are civil servants, shopkeepers, drivers and craftsmen. These results are consistent with those obtained by Fall *et*

al. (2016) in Senegal who showed that poultry farming was a secondary activity for 69.47% of respondents. According to Guèye (2002), poultry farming is practiced by pluriactifs who make it more a secondary or even tertiary activity because the majority of the farmers have a profession which enables them to have stable monthly incomes.

Breeders are usually people who have not been to school and very few have trained, this may have an influence on the level of production as reported by Godonou, (2002). In Thiès, on the other hand, the rate of education of poultry farmers is 100% and is the result of the almost total schooling of urban dwellers. The size of the farms is reduced and would be linked to the high mortality, especially juvenile. The average age of the breeders surveyed is quite high (54.4 ± 1.48 years) compared to those reported by other authors in Benin and Africa for chicken farms (Karim *et al.,* 2013, Mahmoudi *et al.,* 2015, Fall *et al.,* 2016). This would partly explain the lack of dynamism of the sector.

The majority of farmers have housing for their poultry which mostly receive cereals and leftovers as a food supplement. These results are similar to those reported by Ayssiwede *et al.* (2013) and Fall *et al.* (2016). However, the condition of livestock buildings (uncracked walls, bare soil), lack of hygiene and conditions of farmed hygiene could favor the development of diseases and consequently high mortality. According to Douifi *et al.* (2011), lack of hygiene in buildings is a factor in weakening poultry health and reducing performance. (Picard *et al.,* 1993) reported that the state of the environment in livestock buildings can greatly affect the performance of fast growing broilers.

All the farmers surveyed estimated that compared to chicken, turkey diseases are fewer, less frequent but more acute. These results are similar to those reported by (MAEP, 2010) that species and breeds of turkeys encountered in Benin require little care and food. However, they are susceptible to diseases, especially since veterinary care is rare.

The size of the farms is small with an average of 6.5 ± 0.21heads of turkeys. These results are similar to those of FAO (2015) which reported in Benin an average of 7 subjects in village herds and an average of 25 subjects per band in improved breeding. Considering that more than half of the respondents have practiced this breeding for at least a decade, the size of the farms is small and would be linked either to a high mortality, or to fairly pronounced exit movements of turkeys (sale, donations and consumption).

The study of the typology of turkey farmers in the Ouaké Commune allowed us to distinguish three types of farmers: farmers (group 1), peasant-breeders (group 2) and agro-breeders (group 3). In the case of group 1, breeders have gradually shifted away from agricultural production, probably because of age (they are the oldest) or a main off-farm activity. In the case of groups 2 and 3 the farmers remained in the agricultural sector. The difference between the two groups lies mainly in the areas planted for crops. Farmers in the 3rd group have larger areas than group 2 and for this they use draft oxen (hence the importance of livestock ownership). Within these last two groups, more dynamic and better equipped breeders can evolve farming systems. At the same time, some breeders in these same groups, constrained by difficulties (poor results, lack of motivation, etc.), could join Group 1 by reducing their agricultural activity to another sector.

The study of this typology inspires several remarks:
- Possession of arable land (often synonymous with stability) is no doubt an advantage to peasant initiatives. But this could lead to a dominance of agriculture over livestock.

- It can be seen through this typology that the geographical factor (and therefore the environment and its resources) does not seem to be decisive. There was no, for example, individualization of a group of more advanced breeders and mono-geographical origin. The farming systems currently found in Ouaké are not very different from each other and are more or less close to what might be called a 'traditional model', a model shaped by history and by different economic and social- contexts.

According to Pagot (1985), breeders in Group 1 practice subsistence farming. Surpluses are sold only to solve one-off problems. In such a breeding, the capitalization relates only to the surplus growth of the herd. Those of group 2 practice according to the same author a breeding of rent. The exclusive purpose is the monetary profit. Finally, the group 3 breeders practice a breeding of savings. Note that according to Pagot (1985) the concern of saving is not totally absent from subsistence farms, but it is not the purpose; saving livestock is done by peasant farmers who invest their savings in their herds.

The typologies are generally based on a series of variables describing the farm structure, the practices implemented by farmers and the technical and economic performance they obtain (Faye *et al.,* 1991). The economic performance of turkey farms in the commune of Ouaké was not taken into account in this study.

Conclusion

In the municipality of Ouaké, turkey farming is a favorite activity of Lokpa populations, concentrated mainly in the districts of Komdè, Badjoudè and Chalinga and a fairly high average age of 54.4 years. The average size of turkeys per farm was 6.5heads. Three types of turkeys were encountered: tanned turkeys, gray turkeys and black turkeys. Three types of turkey farmers were encountered in this commune: farmers, peasant-breeders and agro–breeders.

This study shows that turkey rearing in village areas suffers from shortcomings in terms of health, nutrition, reproduction and production system.

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