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DEMOGRAPHIC PARAMETERS OF LAGUNE CATTLE HERDS IN THE OUEME VALLEY IN SOUTHERN BENIN

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ABSTRACT

This study, which deals with the determination of the demographic parameters of the different types of Lagune cattle herds in the Oueme valley in southern Benin, took place between October to December 2016 and concerns 56 herds of Lagunecattle with a total of 1,837 head. It aims to compare the demographic parameters of four different types of Lagune cattle farms: Lagune cattle farms of Toffin fishermen (Type 1); Goun farmer-herder (Type 2); semi-transhumant Fulani livestock (Type 3) and the Ranch of Samiondji (Type 4), breeding system identified as a result of a typological survey carried out in a previous study. Data were collected from a 12-month retrospective survey (12MO). The different demographic parameters (annual growth rate, parturition rate, abortion rate, mortality rate, offtake rate, intake rate and annual multiplication rate) were calculated and analyzed under software R3.3.2. with the t12mo package. The type of breeding system had a significant effect ($p<0.05$) on all the demographic parameters of the surveyed herds. Thus, the parturition rate was higher ($p <0.05$) in herds of types 1 and 2 comparatively to types 3 and 4 (0.94 and 0.90 vs. 0.79 and 0.81 year^{-1}). The abortion rate was lower in types 1, 2, and 4 comparatively to type 3(0.05, 0.04, and 0.09 vs. 0.12 year^{-1}). The management rates were consistent with the strategies developed by the different types of Lagune cattle breeding systems. The types 1 and 2, with a net growth of 26and 25% respectively and an exploitation rate of 6% for each, are

oriented towards a reconstruction of their herds. Then type 3 and 4 with a net growth rate of 4and 11%, and an exploitation rate of 12and 16% are oriented towards a strategy of regular destocking of herds and emergency investment.

KEYWORDS-Age pyramids; offtake rate; Lagune cattle; Oueme Valley; Taurin.

INTRODUCTION

In Africa south of the Sahara, livestock farming accounts for one-third of the value of agricultural production (Boutonnet*et al.*, 2000). It is recognized that the livestock sector has the potential to make a significant contribution to solving the problems of food security, poverty and quality of life of small rural households in African countries (Winrock International, 1992; Perry et *al*., 2003). In Benin, this sector can contribute up to 44% of agricultural GDP and 12% of national GDP (MAEP, 2011). The cattle breeding is much more developed in the northern part of the country, where more than 70% of the national livestock population (Tidjani et *al.*, 2006) is home to a diversity of breeds such as the Borgou, the Gudali, the Somba and M'Bororo. In the regions of the center and more particular of the Oueme valley region in the south is also met the breeding of Lagune cattle. The diagnostic study conducted in Lagune cattle farms in this region allowed us to distinguish four types (Assogba and Alkoiret 2015):

Type 1 includes the Toffin fishermen from the island of So-Ava whose breeding of Lagune cattle is a secondary activity. They have average herds mainly constituted by entrusting and composed on average of 34 heads with a minimum of 02 heads. They practice free-range breeding of animals on communal areas in the various islands of the municipality.

Type 2 includes agro-pastoralists from the valley regions located between the municipalities of Bonou and Misserete. This group is made up mainly of Goun farmers who also practice the breeding of Lagune cattle. Their herd is reduced to a few head of cattle on average 5 with an average cultivation area of 1.4 ha. They practice a sedentary breeding marked by the attachment of the animals to stakes on the pasture.

Type 3 consists of the Fulani breeders encountered on the plateaus regions of Ouinhi, and Zangnando. They conduct mixed herds of cattle of the Borgou, Lagune and crossbreeds. The herd predominantly formed by confection, has a relatively higher size, 59 heads on average. They practice semi-transhumant breeding.

Type 4 includes the Lagune herds of the Samiondji Breeding Farm. It is a state farm, whose objective is the conservation of the Lagune breed. The herds of this farm are constituted by purchase, and composed on average of 136 head. The method of rearing is sedentary with food supplementation accompanied by a sanitary monitoring of the animals.

Numerous studies on the productivity of bovine livestock systems in Benin have so far been carried out to evaluate the Borgou cattle breeding systems (Alkoiret et al 2010a, 2010b, 2011, Youssao*et al.*, 2013, ChabiToko*et al* , 2016) and Zebu Gudali (Assani*et al*., 2015) located in the north of the country. The present work attempts to address the performance of the TaurinLagune farming systems in southern Benin by providing additional and quantitative information to qualitative knowledge already reinforced by the typological survey and to compare the productivity of the four types of breeding of Lagunetaurin identified in the Oueme valley and this through, structure, demography as well as the main parameters of production and reproduction.

MATERIAL AND METHOD

Study environment

Data collection for this study was carried out in the various communes located in the Oueme valley. The Oueme valley is located between 10 ° and 6 ° 30 north latitude. It originates in the north of the country in the department of Donga and flows to the south where it feeds the lagoon system of Lake Nokoué and the lagoon of Porto-Novo Its watershed covers an area of 50,000 square kilometers, most of which extends over the nearly impermeable granite and gneispeneplain that terminates slightly north of the Bohicon-Zangnanado road (Balarin, 1984). The rainfall of the Oueme basin, like that of the country, is unevenly distributed over the entire territory of the basin. The annual rainfall heights range from 1050 mm of rain per year in the extreme north to 1300 mm in the extreme south-east between 1971 - 2000. Two essential climatic zones are defined by the annual precipitation regime that characterizes the basin. A subequatorial zone from the coast to the latitude of Bohicon characterized by a bimodal regime with four (04) seasons: a large dry season from mid-November to mid-March, a major rainy season from mid-March to mid- July and a small dry season from mid-July to mid-September and a small rainy season from mid-September to mid-November. The valley area is influenced by this rain regime. A semi-arid Sudanian zone north of 10 ° N, characterized by annual rainfall ranging from 900 mm (or even today 700 mm in the extreme north) to 1100 mm, a high rainfall deficit and two seasons per year : A

rainy season of 5 months (mid-May to mid-October) and a dry season of 7 months. Our study area is located in the sub-equatorial zone and includes the communes of Zangnando, Ouinhi, Bonou, Adjohoun, Dangbo, Missérété and Sô-ava (Figure 1).

The vegetation of the region is characterized by degraded natural formations consisting of wooded and shrub savannahs, forest galleries, plantations and especially classified forests. The vegetation cover in the lower valley of the Oueme consists of herbaceous plants making low meadows periodically floodable to *Paspalumvaginatum*. There are also *Thyphaaustralis* and *Cyperus papyrus* which overhang forest islets. Among the floating plants *are Eichlorniacrassipes* (water hyacinth), *Pistiastratiotes*and *Lemnepaucicostata* (water lettuces); (Ali *et al*., 2014).

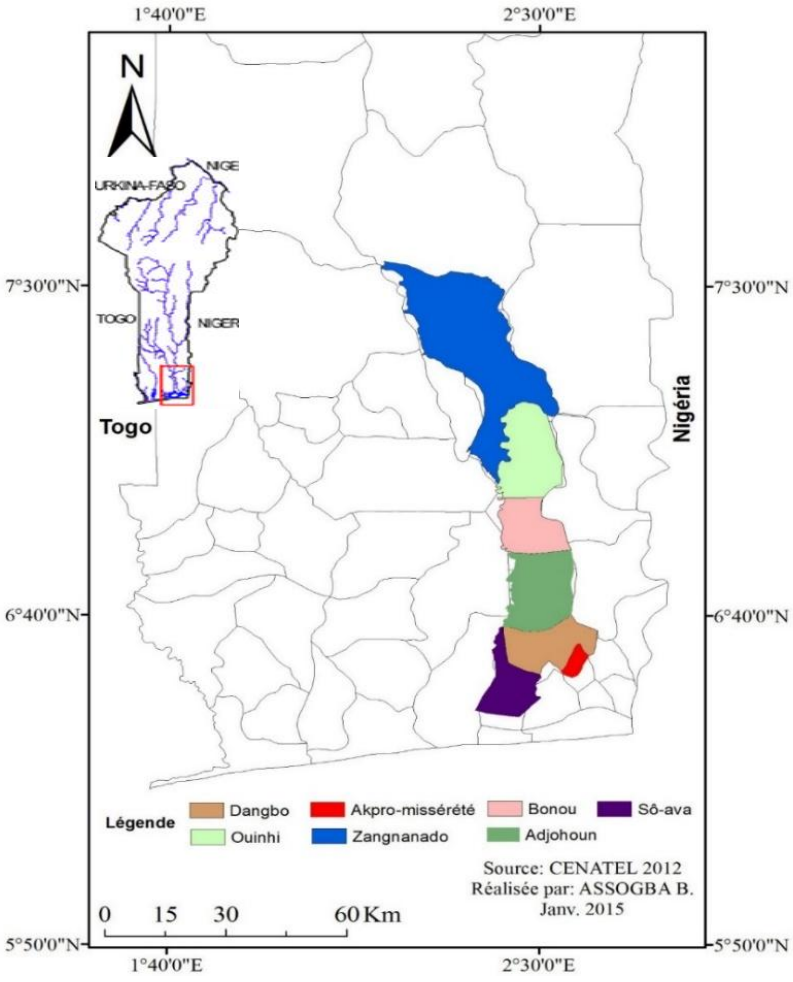


Figure 1: Map of the study area

Methodology

The study was carried out in 56 Lagune breeding farms with a population of 1,837 heads, located in the Oueme valley regions. It was conducted between October and November 2016. The retrospective survey method "12MO" developed by Lesnoff*et al* (2009) was used to determine the zootechnical parameters of the different Lagune cattle herds identified. 12 MO is a retrospective cross-sectional survey method used to estimate the demographic parameters of a domestic ruminant herd (annual reproduction, mortality and exploitation rates). This method is based on interviews with breeders and on their memory of the demographic events in the herds. The interviews are carried out in a single visit in each cattle farm with the breeders in the presence of the animals. The 12MO method consists of reconstructing the herd's demographics in the 12 months preceding the survey and has been developed to quantify the impact of shocks (eg droughts, floods or epizootics) or development projects on the short term. This method considers that the herd consists of only one species. If the farmer hasseveral species, the "herd" is limited to the animals of the target species chosen to be surveyed in this farm (here, the cattle) (Lesnoff*et al.,* 2009). This method is implemented in several local and national Sahelian countries and has been used in numerous studies to determine the zootechnical parameters of ruminant herds (Assani*et al.,* 2016;Jorat, 2011, Ba *et al.,* 2011, Hourcade, 2010; lesnoff*et al.,* 2009). This tool was also used by ILRI in four West African countries (Gambia, Guinea, Mali, Senegal) as part of a project on the conservation of endemic breeds of small and large domestic ruminants PROGEBE) (Lesnoff*et al*., 2008). The Demographic questionnaire "12 MO" consists of two sub-questionnaires: the Q1 sub-questionnaire, which provides information on herd structure and reproduction over the last twelve months, and the Q2 sub-questionnaire, Animals that have taken place in the herd always during the last twelve months.

Data analysis

At the end of the retrospective survey carried out on the 12MO questionnaires, the data collected were entered in the Access database and analyzed under software R.3.3.2. The various parameters were then calculated from the t12mo package to the R.3.3.2 software. Three types of demographic parameters were estimated from the data collected (Lesnoff*et al*., 2010). These include:

- Variables describing herd's status at the time of survey (herd size, age classes by sex);

- Annual demographic rates (including natural rates such as parturition, abortion and mortality, as well as management rates such as exploitation and import rates); and

- General demographic indicators summarizing the dynamics and productions of the herd over the demographic parameters determined are summarized in Table 1.

Two methods were then used to compare the different demographic parameters between theme 12 months (such as annual growth rate and production rate).

The first concerns the different demographic rates which represent annual proportions that follow the distribution of Poisson. These different proportions calculated for all herds of the different types of Lagune bull farming identified were subjected to an analysis of proportion beta regression using the betareg function of software R.3.3.2 and the results were presented under form Instantaneous rate ± Confidence Interval (CI) and expressed in $Year^{-1}$. The two-sided test of Z was then used for comparison of proportions.

For each calculated proportion (P), a 95% confidence interval (CI) was calculated using the formula:

$$\text{IC} = 1{,}96 * \frac{\sqrt{P(1-P)}}{\sqrt{N}}$$

The instantaneous rate (h) still referred to as the instantaneous risk rate is estimated for a particular category of animals (eg all animals, all males over one year of age, etc.) by the formula:

$$\mathbf{h = m/T}$$

Where **m** is the number of events (eg, number of mortalities, number of animals entering the herd, etc.) occurring during the 12 months, and**T** is the 'total time at risk' by animals in the category in the past 12 months).

T is approximated by averaging the number of animals in this category for 12 months (**nt-1**), and the current number of animals in this category. **nt-1** for a particular age class (**i**) is calculated as follows:

$$\boldsymbol{nt\text{-}1,i = nt,i+1 - ((ment,i - mexi,i)/2) - ((ment,i+1 - mexi,i+1)/2)}$$

Where ***ment***and ***mexi***are respectively the inputs and outputs in the age group ***i*** during the last 12 months. ***nt,i*** is known from the data.

Table 1: Estimated demographic parameters for the "12 months" retrospective survey (Lesnoff et al 2010)

Natural Rates	
Abortion rate	Instant annual rate of abortion risk (expected number of abortions per female when staying all year in the herd, an abortion is a gestation that has not reached its end). It is also calculated on the complete reproductive history of the females (in the form of a regression curve adjusted between ages and parities of the females present in the herd)
Prolificacy rate	Average number of products (stillbirths or live births) per parturition
Mortality rate	Annual instantaneous rate of risk of natural death (natural death concerns all types of death except slaughter)
Management Rates	
Offtake rate	Instant annual rate of exploitation risk (traction, slaughter, sales, loans, gifts etc.)
Intake rate	Immediate annual import risk rate (purchases, loans, grants, etc.)
Additional demographic rates derived from basic annual demographic rates	
Net Prolificity Rate	Average number of products born alive per parturition, calculated directly or by: Prolificacy rate * (1 - stillbirth rate)
Fertility rate	Average number of products (live or stillborn) per reproductive female per year, calculated directly or by: Parturition rate * Prolificacy rate.
Net fertility rate	Average number of products born per reproductive female per year, calculated either directly or by: parturition rate * Net prolificacy rate
General demographic indicators	
Annual multiplication rate	Annual multiplication rate, calculated as follows: Herd size at time of survey / Herd size 12 months before. A value> 1 indicates a positive growth rate in the year
Annual growth rate	Rate of annual population growth, calculated as follows: 100 * (Annual rate of multiplication -1)
Annual production rate	Annual production rate in the form P / N where P is (Herd size at time of survey - Herd size 12 months before) + (Number of harvests during the year - Number of imports during the year - Year), and N mean herd size during the year. Note that the numerator (P) represents the difference between the number of births and the number of deaths.

The second method concerns the overall exploitation indicators which follow a normal distribution. These various indicators were subjected to an analysis of variances and the structuring of the averages was made using the generalized linear model (GLM) used to compare the overall operating indicators. The gml function of R.3.3.2 was used in this case.

When the probability is significant ($p < 0.05$), the Student Newman and Keuls test (SNK) is used to compare the averages.

RESULTS

Structure of different types of Lagune cattle herds in the Oueme valley

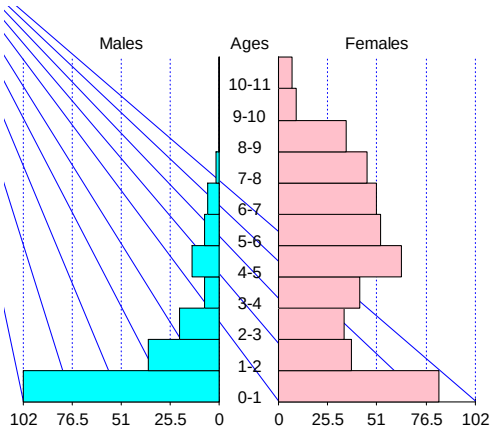
The structure of the different Lagune cattle herds identified in the Oueme valley shows that herds were generally more female than male, regardless of the type of livestock (Table 2).

Table 2: Composition (%) of Lagune cattle herds in theOueme valley in males and females according to type of livestock

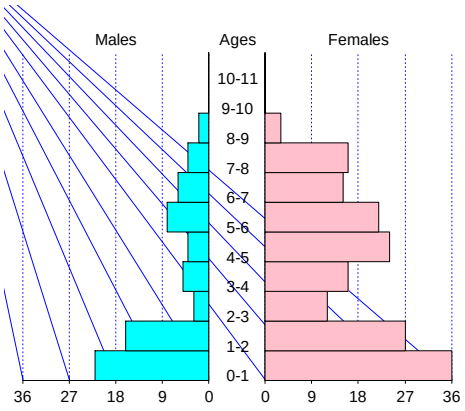
Type of livestock	Males		Females		Prob
	N	Proportion	N	Proportion	
Type1	194	$0.30^{a} \pm 0.03$	452	$0.70^{b} \pm 0.02$	0.0001
Type2	63	$0.25^{a} \pm 0.05$	192	$0.75^{b} \pm 0.03$	0.0001
Type3	76	$0.36^{a} \pm 0.06$	138	$0.64^{b} \pm 0.04$	0.0001
Type4	215	$0.30^{a} \pm 0.03$	507	$0.70^{b} \pm 0.02$	0.0001

a, b, the instantaneous rates on the same line with different letters are significantly different at 5 % ($p<0.05$). SEM : Standard Error of Means

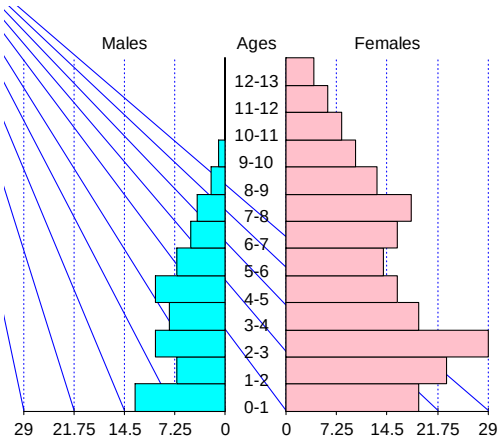
The age structure of the animals in the different herds of the typecattle herds, illustrated by age pyramids (Figure).This structure shows broad-based age pyramids indicating a high proportion of young animals (Males calves, Female calves, heifers and bulls) breasts of these herds. The age pyramids of type 1 and type 2 farms show a low in the young females and males of the 1 to 2 year age group. Cows in the 10 years and over age group were more numerous in type 3 and 4 farms. The proportions of males remained high in the highest age groups in type 3 and 4 farms. Bulls aged 5 years and older were in low proportions in type 1 and 2 farms compared to type 3 and 4 farms.



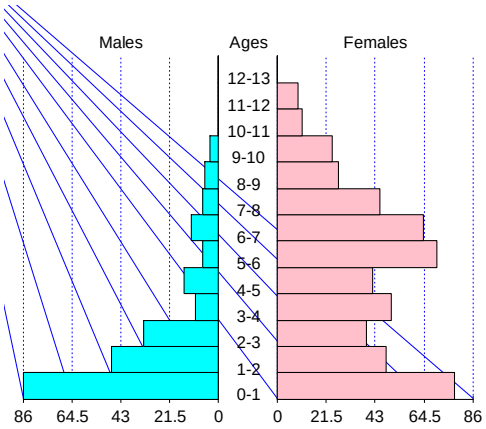
Type 1



Type 2



Type 3



Type 4

Figure 2: Structure of the different types of Lagune cattle farms identified in the Oueme valley

Annual demographic parameters of different types of Lagune cattle farm of the Oueme valley

The different demographic parameters of reproduction of mortality as well as the annual management rates are presented in table 3. The type of breeding had a significant influence on the reproductive performance of the different types of breeding. Thus, the

annual instantaneous parturition, net fertility and net prolificacy rates were better in the type 1 rearing compared to the Types 3 and 4 with a relatively equal net prolificacy rate.

Demographic rates of abortion, stillbirth and mortality were also influenced by the type of cattle farms. These rates were better ($p < 0.05$) in Types 1, 2 and 4 cattle farms compared to type 3 cattle farms. Thus,out of 100 animals in a Lagune herd of type 4, it is probable that there will be about 7 cases of mortality annually compared to just 2 cases in the types 1 and 4 cattle farms and about 5 cases of mortality per year 0 in cattle farms of type 2.

The annual abortions were more frequent ($p < 0.001$) in type 3 farms, is 12 probable abortions to be recorded annually in 100 cows in breeding animals of this type. The offtake rate was lower ($p<0.05$) in type 1 and 2 cattle farms than in type 3 and 4 cattle farms. This rate ranges from single to double of types 1 and 2 cattle farms to types 3 and 4 cattle farms. The type of cattle farms did not affect the annual intake rate ($p>0.05$). However, imports were higher in Type 1 cattle farms.

Table 3. Annual demographic parameters (instantaneous rate in $Year^{-1}$ ± IC) according to the different types of Lagune cattle farms in the Oueme valley

Parameters	**Type 1**	**Type 2**	**Type 3**	**Type 4**	**Prob**
Natural rates					
Parturition rate	0.94 ± 0.06^{a}	0.90 ± 0.06^{a}	0.79 ± 0.09^{b}	0.81 ± 0.08^{b}	0.0016
Net fecundity rate	0.92 ± 0.05^{a}	0.87 ± 0.07^{a}	0.64 ± 0.01^{b}	0.78 ± 0.09^{b}	0.0004
Net Prolificacy rate	0.97 ± 0.04^{a}	0.94 ± 0.05^{a}	0.84 ± 0.09^{b}	0.96 ± 0.04^{a}	0.005
Abortion rate	0.05 ± 0.04^{a}	0.04 ± 0.05^{a}	0.12 ± 0.07^{b}	0.09 ± 0.06^{a}	0.001
Mortinatility rate	0.03 ± 0.03^{a}	0.05 ± 0.05^{a}	0.06 ± 0.04^{b}	0.04 ± 0.04^{a}	0.015
Mortality rate	0.02 ± 0.04^{a}	0.05 ± 0.04^{a}	0.07 ± 0.06^{b}	0.02 ± 0.04^{a}	0.04
Management rates					
Offtake rate	0.06 ± 0.05^{a}	0.06 ± 0.05^{a}	0.12 ± 0.07^{b}	0.16 ± 0.08^{b}	0.034
Intake rate	0.07 ± 0.05^{a}	0.05 ± 0.04^{a}	0.04 ± 0.04^{a}	0.01 ± 0.02^{a}	0.29

a, b, the instantaneous rates on the same line with different letters are significantly different at 5 ($p<0.05$).

The overall demographic indicators (Table 4) show that the type of rearing had no significant effect ($p> 0.05$) on the multiplication and annual growth rates. The multiplication rate greater than 1 in all four types of breeding identified indicates a positive growth in these different types of breeding. The annual production rate that indicates the share of animals

produced as a result of the herd's reproductive capacity was significantly higher ($p < 0.05$) in type 1, 2 and 4 farms compared to type 3.

Table 4: Total demographic indicators (instantaneous rate in $Year^{-1}$) according to the different types of Lagune cattle farm of the Oueme valley

Parameters	Type 1	Type 2	Type 3	Type 4	Prob
Annual multiplication rate	$1.26^{a}\pm 0.27$	$1.25^{a}\pm 0.34$	$1.04^{a}\pm 0.23$	$1.11^{a}\pm 0.04$	0.586
Annual growth rate	$0.26^{a}\pm 0.27$	$0.25^{a}\pm 0.34$	$0.04^{a}\pm 0.23$	$0.11^{a}\pm 0.04$	0.426
Annual production rate	$0.27^{a}\pm 0.13$	$0.24^{a}\pm 0.17$	$0.15^{b}\pm 0.18$	$0.23^{a}\pm 0.06$	0.046

a, b, the instantaneous rates on the same line with different letters are significantly different at 5 ($p<0.05$).

DISCUSSION

Structure of Lagune cattle herds of different types of cattle herds

In general, Lagune cattle herds, of the different types of breeding identified in the Oueme valley in southern Benin, account for two thirds (2/3) of females and one third (1/3) of males. The same observations were made by Assani et *al.* (2015) in Zebu Goudali cattle farms in the far north of the country. Alkoiret et *al.* (2010, 2009) observed the herds of 1/3 of males compared to 2/3 of females in sedentary, semi-sedentary and transhumant cattle of Borgou cattle, respectively in the town of Gogounou and Ouaké. In the case of the Lagunaire cattle farms, the phenomenon was particularly visible in type 1 and 4 farms. Type 2 cattle breeding accounts for about one-quarter (1/4) of males against three-quarters (3/4) of females. This result is close to that obtained by Dehoux and Hounsou-Vê (1993) during their work carried out in a natural environment in the East of the department of Borgou. According to these authors, the herds in this region account for about 26.9% of males for 73.1% of females. The proportion of males was particularly high in type 3 farms. The same observations were made by ChabiToko et *al.* (2016) in traditional breeding in Northern Benin and by Akpa et *al.* (2012) in Nigeria. The proportion of males was higher in type 3 (36%). This could be explained by a late sale of males. The same observation was made in Guadeloupe, in the French West Indies (Salas et *al.*, 1988).

Indeed, such farms are kept by the Fulani breeders to whom the officials of the region entrust the animals they buy in order to save a part of their income. The animals are only removed when there is an urgent need for liquidity. There are other reasons for this,

according to Salas et *al.* (1988), late commercialization and low intensity in general, the use of animal traction (even if it is less and less frequent) Savings and capitalization of livestock, as well as the anarchic organization of marketing channels, can explain this trend and often lead livestock producers to "store" the animals on their farms.

The age pyramid is a double histogram that provides an instant representation of the population structure by sex and age. This representation is conventionally used (Langlois 1976, Vera et *al.*, 1978). It is a reflection of the past (Lhoste et *al.*, 1993). Their profile allows us to highlight a significant episode in the past, such as high mortality of young people or a catastrophic fall in fertility. The age pyramids of the four types of livestock breeders (particularly type 1, 2 and 4) have an unstable demographic regime with an extended base, which means that Lagoon herds of these types are being reconstituted (Lhoste et *al.*, 1993).

The age pyramids of type 1, 2 and 4 farms have a broad base with a tapered top. In these animals there are a high proportion of young animals. According to Salas et *al.* (1988), breeders of these types have young herds and market the products more quickly. The distribution of males in type 1, 2 and 4 farms shows a small proportion of males in the age group of three years and over. In fact, type 1 farms are kept by fishermen in the Lacustres region of the valley, which saves part of the income from fishing in the form of livestock. They renew their savings by selling the young males to buy the females. The same practices are also observed in the agro-pastoralists of the region who save the surplus of their agricultural production in cattle.

However, the objective of type 4 breeding is the protection of the Lagune breed. In this breeding, the young males are sold to cover the loads of the farm. Lagune cattle farms type 1, 2 and 3 thus provide a saving function, evidenced by the high proportion of females. These females are untreated. These are farms specialized in the production of meat. The saving function of cattle farms has been described by several authors (Moll, 2005, Randolph et *al.*, 2007, Herrero et *al.*, 2009). Numerous studies have also highlighted the important role of livestock as a means of accumulating wealth and insuring against risk in societies where credit markets do not function properly (Doran et al 1979, Dercon, 1998 Turner and Williams, 2002). Livestock was a saving function, especially in rural areas, and would be a production tool (draft animals) and a fertilizer source (fertilizer) (Broutin and Diakhane, 2000; Duteurtre, 2006a). In addition, livestock products (milk, meat) are important sources of income and protein (Duteurtre, 2006a).

In the structure of the age pyramids of types 1 and 2, a trough is observed in females of the 1 to 3 year age group. Contrary to what one might think of an epidemic that would have decimated the young females, here the practice is that of the production of young breeders that is given to those who want to invest in the livestock breeding Lagune. The same observations were made in the age group of 0 to 1 years in the Guadeloupean cattle herds by Salas et *al.* (1988) only that the reasons mentioned were a high mortality of the young or an early sale. After 7 years, the percentage of male animals becomes negligible in type 1, 2 and 4 farms, contrary to type 3 farms. The relatively higher proportion of males observed in type 3 farms can be explained by the fact that these breeders Many animals from local officials who do not detox the males in case of emergency liquidity needs. These observations are contrary to those reported by Manuel Hourcade (2010) on Southeast Lowveld cotton producers in Zimbabwe who are late in harvesting males because of their use for agricultural labor and especially for labor.

Demographic parameters of different types of cattle herds

The reproductive demographic parameters of type 1 and 2 farms were better than those of type 3 and 4 farms. The netting and net fertility rates of type 1 and 2 farms were higher than those of Type 3 and 4. This can be explained by the farming practices observed in the different types of farming. In fact, type 1 farms are located on islets in the lake region of Sô-Ava where feeding animals is not a limiting factor. Since breeders of this type are fishermen engaged in animal husbandry as a secondary activity, the non-immersed area of islets is exclusively exploited by livestock for pasture. Thus the taurinsLagune only bovine breed encountered on the island exploit the available grazing all year round. This fodder availability could improve the fertility of Lagune females, the conduct of gestation as well as farrowing. Type 2 herds are made up of herds limited to a few Lagune heads of cattle, driven by the farmers of the Oueme valley.

These farms with smaller herds, their animals could benefit from more care from these agro-breeders, which could improve the reproductive performance of such farms. The same observation was made by Assani et *al.* (2015), among the agro-breeders of cattle Goudali in the communes of Karimama and Malanville in the extreme north of Benin. Similar observations were also made by Alkoiret et *al.* (2010a, 2010b, 2011) in the Borgou cattle farms in the commune of Gogounou, in the Okpara farm and in Ouaké commune. The best reproductive performances obtained by these authors in a peasant environment were

obtained in the sedentary breeding of Borgou cattle of modest size and kept by the agro-breeders of these regions.

The annual calving rates were lower in type 3 and 4 farms. This could be explained by the farming practices observed in these farms. Indeed, type 3 groups the transhumant seedlings led by the Fulani breeders installed in the region of Oueme valley. Seasonal movements could therefore affect the reproductive performance of herds. On the other hand, on the State farm in Samiondji where the herds of type 4 are found, the herd's mode of reproduction is based on the practice of the male effect and the regrouping of births. This practice could reduce the number of fertilized females at each introduction of the bull and thus the betting rate. In the station at the Okpara breeding farm, Alkoiret et *al.* (2010a) obtained a betting rate of 70 ± 15 against 81% for the Lagune cows of the Samiondji farm. In the traditional farms of Northern Benin, ChabiToko et al (2016) obtained a low birth rate of 64% compared to an average of 87.6% in our study. Lesnoff et *al.* (2006) obtained a calving rate ranging between 46 and 53% in Niger, whereas Ejlertsen et al (2011) obtained a lower rate (40%) in Senegal.

The abortion and mortality rates were significantly higher in type 3 farms compared to the Lagune cattle type 1, 2 and 3 rearing. The type 3 breeding herds consist of transhumant herds marked by a displacement seasonal herd to areas of depression during the lean season in search of fresh pasture and water. These seasonal movements may explain the higher abortion and mortality rates observed in these farms. These results are similar to those found by Dehoux and Hounsou (1993) who showed that transhumant herds pay a higher price for different causes of mortality than sedentary herds. Mortality rates in sedentary and free-range herds on Sô-Ava Island were lower than in the cattle herds of Gogounou (Alkoiret et *al.*, 2009) and Kalale (Dehoux and Housou-Vê, 1993). However, they are close to other results, notably cattle herds in the Gambia (Agyemang et *al.*, 1997), southern Mali (Ba et al 2011) and sub-Saharan Africa (Otte and Chilonda, 2002) 6-8% for the overall mortality rate with 13-22% for calves. In controlled breeding (Okpara farm), the overall mortality rate is 1.2 ± 0.5% (Youssao et al 2000). The mortality rate of young animals according to these authors is 2.5 ± 0.2%. These results were achieved through the birth cohort program, good diet, and good weaning (Youssao et *al.*, 2000). At the closed breeding of Samiondji this rate was about 2%. The mortality rates recorded in the type 3 herds are lower than those obtained by Assani et al (2015) on the Goudali zebus in the communes of Malanville and Karimama in the extreme of Benin. The low mortality rate observed in Lagune farming in the Oueme valley indicates a good adaptability of the breed in its natural habitat.

The stillbirth rates were higher in type 2 and 3 farms. These rates were relatively higher than those reported in the farms of Ouaké commune in northwest Benin (Alkoiret et *al.*, 2010). The highest rate reported by the same author was estimated to be 7.02 ± 5.56 and was obtained in semi-transhumant farms. The contact was practically the same during our study. This rate was 6% and was obtained in semi-transhumant farms (type 3).

Management parametersof different types of cattle herds

Herd exploitation was lower in type 1 and 2 farms. This is consistent with the results of Scoones (1990), which shows that livestock in communal areas is mainly conserved for its contribution to Crop production through animal traction and manure more than for its final benefit (meat and money). The animal slaughter is restricted to situations where the animal is almost dead, or to social gatherings such as funerals.

The multiplication and net growth rates were higher in Type 1 and Type 2 farms than in Type 3 and 4 farms. The annual growth rate was 26 and 25% in both types, breeding. Lagune cattle herds'type 1 is kept by the fishermen-breeder of the island of Sô-Ava (type 1) whose main activity is fishing.

The Lagunecattle breeding are only a source of saving for the surplus released from fishing. The same was true for agro-pastoralists (type 2) in the Oueme valley region, whose agricultural surplus is used in the form of savings in livestock farming. These two types of farming are therefore characterized by a strategy oriented towards the storage and the reconstitution of the herd. Manuel Hourcade also identified in 2010 in the Southeast Lowveld region of Zimbabwe types of herds whose strategy is also geared towards stocking and replenishment, but with annual growth rates lower by 8%, 13%, 5% and 4%, respectively, for the four types of breeding identified by their work, compared with 25%, 26%, 4% and 11% respectively for the four types of Lagune breeding identified in the Oueme valley. Assani et *al.* (2016) report an annual growth of 22.5% in sedentary livestock farming around the Upper Alibori forest, compared with 23.7% and 14.2% for the transhumant nationals and those from the countries Neighbors such as Burkina Faso and Niger. The annual growth was very low in semi-transhumant (type 3) vineyards in the Oueme valley, ie 4%, with a relatively high exploitation rate (12%).

CONCLUSION

The Lagune cattle farms located in the Oueme valley in southern Benin have the same structure as the Sahelian cattle herds. This structure, characterized by a predominance of

females, makes it possible to perpetuate the herd and to manage it sustainably. Livestock performance is relatively high with a significant annual calving and fertility rate and a relatively high mortality rate. The exploitation of herds is in line with the management strategies put in place in the different types of livestock. These strategies are much more geared towards stocking and replenishment than to the market. Nevertheless, these animals are used for the slaughter and allowsupplying the markets of the region before the arrival of the animals of the north and the Sahelian countries. The zootechnical performances recorded in the different types of farming, in this environment of Sudano-Guinean climate recognized as hostile to the raising of the cattle testifies to the good adaptation of the taurinLagune to their natural environment.

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