Productivity of Cattle Herd in Transhumance in Classified Forest of Upper Alibori Northern Benin

Article · November 2016

CITATIONS
0

READS
2

3 authors, including:

Assani Seidou Alassan
University of Parakou
6 PUBLICATIONS **4** CITATIONS

SEE PROFILE

JOURNAL OF ANIMAL SCIENCE ADVANCES

Productivity of Cattle Herd in Transhumance in Classified Forest of Upper Alibori Northern Benin

Assani S. A., Alkoiret I. T. and Houinato M.

J Anim Sci Adv 2016, 6(11): 1802-1810

DOI: 10.5455/jasa.19691231040000011

Online version is available on: www.grjournals.com

ISSN: 2251-7219

Original Article

Productivity of Cattle Herd in Transhumance in Classified Forest of Upper Alibori Northern Benin

[*1]Assani S. A., [1]Alkoiret I. T. and [2]Houinato M.

[1] Laboratory of Ecology, Health and Animal Production, Faculty of Agronomy, University of Parakou, Po Box 123 Parakou, Benin Republic.

[2] Laboratory of Applied Ecology, Faculty of Agricultural Sciences, University of Abomey-Calavi, 01 Po Box 526 Cotonou, Benin Republic.

Abstract

A study involving 40 cattle herds with a total of 3645 head was carried out in the Classified Forest of Upper Alibori (northern Benin) to compare the productivity of four types of cattle breeding systems: the riparian small transhumant livestock (type 1), the riparian medium transhumant livestock (type 2), the national great transhumant livestock (type 3) and the cross-border transhumant (type 4). The type of cattle herd had a significant effect ($p < 0.05$) on birth weight (17.8 vs. 16.6 vs. 21.0 vs. 23.4 kg), weight at three months (45.8 vs. 40.5 vs. 67.2 vs. 72.5 kg) five months of age (60.4 vs. 54.4 vs. 71.9 vs. 81.5 kg) for calves types 1, 2, 3 and 4 respectively. The type cattle herd had also a significant effect on the quantity of milk taken at the 4th week of lactation (4.7 vs. 1.5 vs. 1.1 kg) for types 1, 2 and 3 respectively. Demographic parameters (mortality rate, fertility rate and the proportion of cows) from herds surveyed were significantly ($p < 0.05$) influenced by the type of cattle herd. Thus, the proportion of cows was higher ($p < 0.05$) in herds of type 4 (33.8 *vs.* 33.4 *vs.* 20.4 and 29.6 % for types 3, 2 and 1 respectively). The annual mortinatality rate had higher ($p<0.05$) in the herds of types 3 and 4 (0.073 et 0.049/year vs. 0.022 et 0. 023 for types 1 and 2). The annual fecundity rate had higher ($P<0.05$) in type 1 herds (0.712 vs. 0.707 vs. 0.619 et 0,582/year for types 2, 3 and 4 respectively). The annual growth rate had higher ($p < 0.05$) in herds of type 3 (0.237 vs. 0.225 vs. 0.160 et 0.142/year for types 1, 2 and 4 respectively). This study showed that animals of type 1 herds had the best demographic parameters, while herds of type 2 are distinguished by better milk. The types 3 and 4 herds had better growth performance production.

Keywords: Benin, herd' structure, demographics parameters, growth, milk, protected area, transhumance.

[*]Corresponding author: Laboratory of Ecology, Health and Animal Production, Faculty of Agronomy, University of Parakou, Po Box 123 Parakou, Benin Republic.

Received on: 11 Nov 2016
Revised on: 21 Nov 2016
Accepted on: 22 Nov 2016
Online Published on: 30 Nov 2016
1802 J. Anim. Sci. Adv., 2016, 6(11): 1802-1810

Introduction

Pastoral and agro-pastoral systems in the Sahel area and West Africa contribute over 80% to the supply of animal products. Pastoralism represents 70 to 90% of the cattle, and 30-40% of sheep and goats. The share of transhumant pastoralism in the supply of animal products is estimated at 65% for cattle meat, 40% for sheep and goat meats, and 70% for milk (OECD, 2008).

In Benin, livestock is the second resource in the primary sector, participating up to 44% of agricultural GDP (MAEP, 2011). It also contributes for 5.9% to the national GDP and proves to be a source of income for over 70% of the workforce and the first form of capitalization to almost all rural households and even urban (FAO, 2009). Cattle ranching is the most practiced in northern of Benin. This type of farming depends on transhumance as a lifestyle and use of resources such as pastures, agricultural by-products and water resources. The practice of transhumance has been for a long time for the majority of national and foreign breeders (Sahel region). It is increasingly cited as an effective means of adapting to climate change in progress and sustainable management of natural resources (FAO, 2012). In Northern Benin, the transhumance is increasingly oriented towards protected areas to escape the scarcity of grazing areas, land transhumance corridors, the unsuitability of land legislation and the many social conflicts (Lesse *et al.*, 2015). The classified forest of upper Alibori (CFUA) is a protected area of northern Benin. It was created to protect the watershed of the Alibori River and its tributaries and to conserve biological diversity. But today it is one of the favorite destinations of national and foreign transhumance. Indeed, high animal concentrations are recorded there, causing pollution to biodiversity and many conflicts between pastoralists and farmers. One can question the capabilities of the classified forest sustainably support this level of control. The zootechnical diagnosis of cattle herds in transhumance was made within the CFUA to identify the impact of the presence of bovine herds in this protected area. The typology of cattle herds in transhumance in classified forest of Upper Alibori was the starting point of this zootechnical diagnosis (Assani *et al.*, 2016). Four types of cattle herds have been identified (Assani *et al.*, 2016): the riparian small transhumant livestock (type 1), the riparian medium transhumant livestock (type 2), the national great transhumant livestock (type 3) and the cross-border transhumant (type 4).

These four types of cattle herds were distinguished by the nationality of herders, the proximity of the original camps, the number and age of herdsmen, the number of cattle per herd, the times and entry reasons in the CFUA and the transhumance practices adopted (Assani *et al.*, 2016). This study aims to compare the productivity of different types of cattle herds identified in the classified forest of Upper Alibori of and present the main results obtained on demographics and herd structure and the main parameters of production and reproduction.

Materials and Methods

Study Environment

The classified forest of upper Alibori (CFUA) was created by Decree No. 6459 of August 20, 1955. It covers an area of 250,205.73 hectares and forms a vast area covering six commons (Pehunco, Kerou, Banikoara Gogounou, Sinende and Kandi) and straddling the departments of Atacora, Donga, Borgou and Alibori. According to the vegetation map of the forest, this forest presents five strata: woodland, gallery forest, tree and shrub savannah, savannah with agricultural presence and mosaic of crops and fallow. The climate of the area is tropical with two seasons observable during the year: a dry season from November to March and rainy season from April to October. Rainfall is unevenly distributed in time and space with water depths ranging from 900 mm in June to a high of 1316.5 mm in July and August (PGFTR, 2010).

The population of the six (6) riparian commons to the CFUA is estimated at 808 968 inhabitants made up 50.2 % of women against 49.7 % of men (INSAE, 2013). There are three (03) socio-cultural groups are represented by: Bariba, sedentary Fulani; transhumant Fulani. This population consists of Muslims, animists and Christians.

Survey Methodology

The retrospective method for estimating demographic parameters in tropical ruminant livestock population developed by Lesnoff *et al.*, (2008) was used for this study. This method of last twelve months (12MO) has already been implemented in several Sahelian countries, both locally and nationally.

Ten herds were selected randomly from each of the four types of cattle herds identified in the classified forest of Upper Alibori (Assani *et al.*, 2016) to make the sample comprising 40 herds with a total of 3645 head. The surveys were conducted using a semi structured interview guide. Individual interviews with the herdsmen were used to collect information on events in the herds (birth, purchase, death, sale, gift, exchange, late pregnancy, parturition, abortion and stillbirth) and the herd structure (female calves, heifers, cows, male calves, subadult bulls and reproductive bulls). The data were collected for the last 12 months preceding the survey and were subsequently verified and completed during the counting and categorizing of each herd.

Determination of Milk Production

In each herd of the sample, the cows that calved during the investigation were subject to milk production control at the 4^{th} week of lactation, which is considered the peak of lactation in local breed cows (Dehoux and Hounsou Ve, 1993). Hand milking was done by the herdsmen twice a day (7 a.m. and 18 p.m.). Calves were allowed to suck for about one minute in order to stimulate milk let down. They were then tied in front of their dams while cows were hand milked. Partial milking was done in order to reserve milk for sucking calves which were prevented from sucking the dams.

After milking, calves were allowed to resuckle their respective dams for 30 minute. The daily milk offtake (i.e. extractable milk for human consumption) at the 4th week of lactation (MO) was the sum of the morning and evening milk offtake and was weighed using a balance (50 g sensitivity). The amount of milk consumed by calves (CM) was determined by weighing calves at birth and at three months. The difference in weight multiplied by the coefficient 7.4 is the estimate of the amount of milk consumed by the calves, according to an equation based on N'Dama and Baoule breeds (Hoste *et al.*, 1983), two breeds closed to local breeds.

Animal Weighting

The weight of calves at birth, 3 and 5 months of age were identified using a balance (100 g sensitivity). Weightings were made early in the morning before the access of calves to feed and check for pasture.

Demographic Parameters of the Herds Surveyed

Demographic parameters of the herds were calculated (Table 1) using the formulas proposed by lesnoff *et al.*, (2008) through the t12mo package of 12MO tool under the R.2.14.2 software (R Development Core Team, 2012).

Statistical Analysis

The characters analysed were : the daily milk offtake at the 4^{th} week of lactation (MO), the quantity of milk consumed by the calf of 0-3 months of age (CM), the weights of calves at birth (P0), 3 months (P3) and 5 months old (P5). The fixed factors tested were: the type of cattle herds, sex of calf, breed of animals and the lactation number of cows. The data were analysed according to the fixed linear model below using the general linear models (GLM) procedure of software R.2.14.2 (R Development Core Team, 2012). Duncan's test was used to compare least squares means significantly different.

$$Y_{ijk} = \mu + T_i + P_j + R_k + E_{ijk}$$

Where:

Y_{ijk} = observed character (MO, CM, P0, P3, P5);

μ = overall mean;

T_i = fixed effect of the type of cattle herds (T = 1, 2, 3, 4; 4 classes);

P_j = fixed effect of sex of calf (P = female, male; 2 classes) or fixed effect of lactation number of cows (P = L1-2, L3-5, L ≥ 6; 3 classes);

R_k = fixed effect of animal breed (R = Borgou, Gudali, Azawak, M'bororo and crossbreed race; 5 classes);

E_{ijk} = random residual effect.

Table 1: Demographic parameters estimated with 12MO (Lesnoff *et al*., 2010).

Natural rates	
Abortion rate	Annual instantaneous hazard rate of abortion (expected number of abortions per female when spending all the year in the herd; an abortion is a gestation that has not reach its term)
Parturition rate	Annual instantaneous hazard rate of parturition (expected number of parturitions per female when spending all the year in the herd)
Prolificacy rate	Average number of offspring (stillborn or born alive) per parturition
Net prolificacy rate	Average number of offspring born alive per parturition, calculated directly or by: Prolificacy rate * (1 – Stillbirth rate)
Mortinatility rate	Probability that an offspring is a stillborn (stillbirth is not included in the mortality rate, which only concerns animals born alive)
Mortality rate	Annual instantaneous hazard rate of natural death (natural deaths refer to all types of death except slaughtering)
Net fecundity rate	Average number of offspring born alive per reproductive female and year, calculated directly or by: Parturition rate * Net prolificacy rate
Management rates	
Offtake rate	Annual instantaneous hazard rate of offtake (slaughtering, sales, loans, gifts, etc.)
Intake rate	Annual instantaneous hazard rate of intake (purchases, loans, gifts, etc.)
Annual population multiplication rate (AMR)	AMR = nt / nt-1, where nt represents the herd size at the date of the survey and nt-1 the herd size twelve months before. Herds showing a value AMR > 1 had a positive growth in the year.
Annual population growth rate (AGR)	AGR = AMR – 1.
Annual production rates (APR)	APR = P/N, where P represents a production (number of births over the year-number of natural deaths over the year) and N a number of animals (the mean herd size calculated over the year).

Demographic parameters of the herds were subjected to analysis of variance ANOVA (type of cattle herd) in R.2.14.2 (R Development Core Team, 2012). If F test was significant, the means were compared with the Fisher LSD test.

Results

Calves Growth Performances

The type of cattle herds had a significant effect ($p<0.05$) on calves body weight at all ages considered (Table 2). Whether at birth, 3 or 5 months of age, live weight of calves of type 4 herds were the highest ($p<0.05$), followed by type 3 cattle herds. The lowest body weight ($p<0.05$) were recorded in type 2 herds. The effect of sex on calf body weight was significant ($p<0.05$) at birth, at 3 months and at 5 months of age, live weight of males was higher ($p<0.05$) than females. The breed of calves had a significant effect ($p<0.05$) on their weight at birth, 3 and 6 months of age (Table 2). Thus, zebus and crossbreed calves had the highest body weights ($p<0.05$), followed by Borgou.

Milk production

The type of cattle herds had a significant effect ($p<0.05$) on the daily milk offtake (MO) at the 4^{th} week of lactation (Table 3). The MO was higher ($p<0.05$) in type 2 cattle herds, following by type 1 herds and finally type 3 herds. The effect of lactation number on MO was significant ($p<0.05$). Breeders took more ($p<0.05$) milk from cows whose lactation numbers were between 3 and 5, followed by those with lactation number superior or equal to 6. By cons, cows in early career (L1-2) were less ($p<0.05$) collected. The amount of milk consumed by calves during the period of 0-3 months (CM) was significantly ($p<0.05$) affected by the type of cattle herd and the lactation number (Table 3).

Table 2: Least squares means (LSM) and standard deviation (SE) for calves' body weight (Kg) at birth, 3 and 5 months of age.

	Weight at birth			Weight at 3 months			Weight at 5 months		
Sources of variation	N	LSM	SD	N	LSM	SD	N	LSM	SD
Type of cattle herds									
1	46	17.8^{c}	2.5	36	45.8^{c}	3.7	26	60.4^{c}	5.4
2	31	16.6^{c}	2.0	41	40.5^{d}	3.9	16	54.4^{d}	3.3
3	23	21.0^{b}	1.7	58	67.2^{b}	5.1	22	71.9^{b}	7.5
4	16	23.4^{a}	3.0	24	72.5^{a}	6.1	19	81.5^{a}	2.7
Sex									
F	62	17.6^{b}	2.5	75	53.1^{b}	12.3	26	61.8^{b}	9.2
M	54	20.3^{a}	3.5	84	59.2^{a}	14.7	38	68.2^{a}	11.3
Breeds									
Borgou	31	15.2^{b}	2.4	42	47.8^{c}	5.0	52	57.4^{b}	9.2
Gudali	21	23.8^{a}	4.3	34	74.0^{a}	6.1	-	-	-
Azawak	22	23.4^{a}	2.4	24	73.8^{a}	6.5	-	-	-
Mbororo	20	23.1^{a}	2.6	21	70.1^{a}	6.1	-	-	-
Crossbreed	22	19.3^{b}	2.3	38	55.6^{b}	5.7	32	72.2^{a}	3.2

^{a,b,c}Least-squares means with different superscript letters on the same column differ significantly ($p<0.05$).

Indeed the amount of milk consumed by calves in type 3 cattle herds was significantly lower ($P<0.05$) than that consumed by calves in types 1 and 2 cattle herds. The lactation number had a significant influence ($P<0.05$) on CM. Thus, the amount of milk consumed by the calves' increased with first calves to peak at 3-5 lactations before falling from the 6th lactation. The breed had a significant effect ($P< 0.05$) on the amount of milk consumed by the calves. Thus, the largest CM was consumed by crossbreed calves.

Table 3: Least squares means (LSM) and standard errors (SE) for daily milk offtake (MO) and amount of milk consumed by the calves (CM).

Sources of variation	**MO, kg**			**CM, kg**		
	N	**LSM**	**SD**	**N**	**LSM**	**SD**
Type of cattle herds						
1	71	1.30^{a}	0.3	36	195.9^{a}	28.0
2	56	1.50^{a}	0.5	41	177.2^{b}	29.0
3	43	1.10^{b}	0.5	58	127.6^{c}	37.6
4	-	-	-	-	-	-
Lactation number						
L 1-2	63	0.94^{c}	0.6	51	122.1^{c}	17.3
L 3-5	42	1.71^{b}	0.6	42	190.5^{a}	28.2
L ≥6	39	1.20^{a}	0.4	42	166.0^{b}	35.8
Breeds						
Borgou	89	1.32^{b}	0.6	97	143.8^{b}	37.4
Crossbreed	44	1.70^{a}	0.2	38	224.0^{a}	19.6

^{a,b,c}Least-squares means with different superscript letters on the same column differ significantly ($p<0.05$).

Demographic Parameters

Herd's Structure

The reports of the various animal categories in the herd structure (Table 4) showed significant variations ($p<0.05$). Thus, the proportion of cows was higher ($p<0.05$) in herds in types 3 and 4 compared with types 1 and 2. For cons, the proportion of heifer type 2 herds was higher ($p<0.05$) than that of types 1, 3 and 4 (Table 4). The proportions of total male and total female were identical ($p>0.05$) in the 4 types of cattle herds studied.

Table 4: Herd structure (%) by the type of cattle herds identified in classified forest of Upper Alibori

Animal categories	Type 1	Type 2	Type 3	Type 4
Female (%)				
Female calves	12.1 ± 5.0[a]	13.8 ± 2.5[a]	8.6 ± 2.3[b]	6.0 ± 2.0[b]
Heifers	12.8 ± 5.3[a]	16.7 ± 3.1[a]	11.1 ± 4.2[a]	9.4 ± 1.0[b]
Cows	29.6 ± 1.8[a]	20.4 ± 4.0[b]	33.4 ± 4.5[a]	33.8 ± 2.6[a]
Total Female	67.5 ± 4.4[a]	67.7± 5.7[a]	64.6 ± 3.3[a]	57.5 ± 3.0[a]
Male (%)				
Male calves	9.4 ± 3.2[a]	9.1 ± 1.7[a]	7.8 ± 1.5[b]	8.8 ± 1.0[b]
Subadult bulls	4.2 ± 2.2[b]	6.0 ± 2.1[b]	8.7 ± 1.6[a]	11.0 ± 2.2[a]
Reproductive bulls	14.6 ± 4.6[a]	11.1 ± 1.8[a]	10.2 ± 2.1[a]	11.8 ± 2.4[a]
Total Male	32.5 ± 4.4[a]	32.3 ± 5.7[a]	35.4 ± 3.6[a]	42.5 ± 3.0[a]
Herd size (head)	44 ± 20	94 ± 20	112 ± 13	144 ± 15

[a,b,c]Means with different superscript letters on the same row differ significantly ($p<0.05$).

Demographic Parameters

Cattle herds in type 1 had the best ($p<0.05$) reproductive parameters (Table 5), characterized by the highest ($p<0.05$) parturition and Net fecundity rate ($p<0.05$), the lowest ($p<0.05$) abortion rate (Table 4). The riparian cattle herds (Type 1) had the lowest ($p<0.05$) mortinatality and overall mortality rates. By contrast, the type of cattle herd did not affect ($p>0.05$) the Net prolificacy rate (Table 5). The offtake rate was higher ($p<0.05$) in type 4 herds and the intake rate was also higher ($p>0.05$) in type 1 cattle herd.

Table 5: Annual demographic rates (year^{-1}) and standard errors (SE) by the type cattle in transhumance in classified forest of upper Alibori.

Parameters	Type 1	Type 2	Type 3	Type 4
Natural rates				
Mortinatility rate	0.023 ± 0.02[b]	0.022 ± 0.02[b]	0.049 ± 0.04[a]	0.073 ± 0.04[a]
Mortality rate	0.041 ± 0.03[b]	0.077 ± 0.03[a]	0.081 ± 0.02[a]	0.098 ± 0.02[a]
Abortion rate	0.009 ± 0.002[c]	0.031 ± 0.005[b]	0.051 ± 0.008[b]	0.10 ± 0.01[a]
Parturition rate	0.734 ± 0.13[a]	0.719 ± 0.21[a]	0.651 ± 0.10[b]	0.628 ± 0.08[b]
Net prolificacy rate	0.976 ± 0.02[a]	0.977 ± 0.02[a]	0.950 ± 0.04[a]	0.926 ± 0.04[a]
Net fecundity rate	0.712 ± 0.02[a]	0.707 ± 0.01[a]	0.619 ± 0.02[b]	0.582 ± 0.02[b]
Management rates				
Offtake rate	0.005 ± 0.001[c]	0.013 ± 0.01[b]	0.027 ± 0.016[b]	0.08 ± 0.023[a]
Intake rate	0.064 ± 0.045[a]	0.026 ± 0.016[b]	0.031 ± 0.006[b]	0.038 ± 0.016[b]

[a,b,c]Means with different superscript letters on the same row differ significantly ($p<0.05$).

Global Demographic Indicators

Cattle herds in type 1 had higher ($p <0.05$) annual population multiplication rate those herds types 2, 3 and 4. The best ($p <0.05$) annual production rates were observed in herds of Type 1 and 2, followed by types 3 and 4. The type herds had not affect ($p> 0.05$) the annual population growth rate.

Table 6: *Global demographic indicators* (year^{-1}) and standard errors (SE) by the type cattle in transhumance in classified forest of upper Alibori.

Parameters	Type 1	Type 2	Type 3	Type 4
Annual population multiplication rate	1.4 ± 0.03[a]	1.2 ± 0.01[b]	1.1 ± 0.01[b]	1.0 ± 0.01[b]
Annual production rates	0.208 ± 0.02[a]	0.185 ± 0.01[a]	0.136 ± 0.009[b]	0.114 ± 0.01[b]
Annual population growth rate	0.225 ± 0.04[a]	0.160 ± 0.03[b]	0.237 ± 0.02[a]	0.142 ± 0.01[b]

[a,b,c]Means with different superscript letters on the same row differ significantly ($p<0.05$).

Discussion

The superiority of weight according to age groups of calves of type 4 could be explained by the mode of breeding used and the breed of animals raised. Indeed, the animal type 4 herds are all race zebu M'bororo, Gudali, Azawak or Djalli. While animals of type 3 herds are a mixture of zebu and Borgou and types 1 and 2 all breeds Borgou and cross-border (Borgou * Zebu). The weight of the animals of type 2 herds is less than type 1. This could be explained by the fact farmers type 2 carry over animal movements. Indeed during the dry season, the supply feed is limited, so the feed resources available cannot fully meet their food needs.

The average birth weight of calves (17.2 kg) of migratory herds within the classified forest of Upper Alibori is interesting in light of what is reported by Chabi Macco (1992) on the average weight the birth of the calf Borgou (16.5 kg) in northern Benin. Our results reflect the favorable breeding conditions within the classified forest of Higher Alibori. Higher values of birth weight (18.83 ± 1.63 kg) were found by Alkoiret *et al.,* (2009) in Borgou breed calves at Gogounou. The average birth weight, 3 and 5 months of age zebu type 4 herds are lower than reported (25.7 kg at birth, 75.1 kg at 3 months and 95.3 kg at 5 months) by Assani *et al.,* (2015) in cattle farms of zebu Gudali in the commons of Malanville and Karimama.

The effect of the type of cattle herds on MO and CM is linked both to the milk production of the animals and also the number of milking cows in the herd. Thus, breeders of type 2 with few cows tend to take more milk than those of types 1 and 3 with a lot of cows, thus reducing the amount of available milk for calves. The evolution of milk production with lactation number is well known. Dehoux and Hounsou-Ve (1993) noted an increase in milk production in Borgou 'cows from 1st to 3rd row of calving. A 34% increase in milk production was also observed in N'Dama cows between 1st and 7th rows of calving (Hoste *et al.,* 1983). At the station Loumbila (Burkina Faso), the average increase in daily milk production over the first lactation was respectively 0.83, 0.34 and 0.80 l / d for the 2nd, 3rd and 4th lactation, followed by a decrease respectively from 0.39 and 0.45 l / d for the 5th and 6th rows of lactation (Boly *et al.,* 2000). Senou *et al.,* (2009) observed on Borgou cows daily milk production of 1.37, 1.63 and 2.43 l / d for the 2nd, 3rd and 4th lactations respectively. This increase in milk production is linked to lower growth needs of cows completing their growth at the end of the 2nd lactation. From the 6th lactation, milk production drops because the cows become old (Rivière 1991).

The high proportion of cows in the type 2 herds is related to the acquisition mode of the animals that were purchased at almost 2/3 (Assani *et al.,* 2016) and not the result of natural increase of the herd size. Moreover, these herds content a high number of draft animals, hence the high proportion of reproductive bulls. The cattle herd' structure in the classified forest of Upper Alibori is consistent with observations made in the traditional herds in eastern of Borgou department of Benin (Dehoux and Housssou-Ve 1993), in the district of Gogounou in northeast Benin (Alkoiret *et al.,* 2010a), in the ranch of Okpara, Benin (Alkoiret *et al.,* 2010b) and in a rural highland district of Ethiopia (Boji, West Wellega) on Horro cattle (Lesnoff *et al.,* 2002).

The superiority of the reproductive and mortality parameters in herds of type 1 could be explained by the method of managing such herds. Indeed, the herdsmen of the type 1 are all installed around the classified forest with fragmented herds in low size. The herds of type 1 had so benefited from improved farming conditions and had more reproductive bulls, hence the improvement of reproductive performances. Dehoux and Hounsou-Ve (1993) obtained in their study area (northeast of Benin) a fertility rate of 65.4% and an abortion rate of 4%, lower than that of Ouake district. The mortality rates in this study are higher than those of cattle herds in the district of Gogounou (Alkoiret *et al.,* 2010a) and those recorded at the ranch of Wakwain Cameroon (Mbah *et al.,* 1991). This is similar to other cattle mortality results in Gambia (Agyemang *et al.,* 1997), in southern Mali (Ba *et al.,* 2011) and Sub-Saharan Africa (Otte and Chilonda, 2002) who have obtained values of 6-8% for the overall mortality rate and a mortality rate of 13-22% of calves.

Conclusion

This study compared the productivity of cattle herds in transhumance within the classified forest of Upper Alibori. Annual population growth rate on the 12 month period is positive for all four types of cattle herds. Although this can be considered a positive trend, it calls for caution as regards the available natural resources. A positive growing rate of herds in a competition area for the cultivation and conservation of natural resources of the CFUA, could potentially lead to overloading of the course and / or conflicts over the exploitation of these resources.

The best demographic parameters were obtained in type 1 herd.

The cattle herds of type 2 are distinguished by better milk production.

The herds of types 3 and 4 had the best growth performance.

Acknowledgments

The authors thank the International Foundation for Science (IFS) for funding this study by the grant D/5824-1. They also expressed their acknowledgments to the breeders surveyed during the execution of this research.

References

Agyemang K, Dwinger RH, Little DA, Rowlands GJ (1997). Village N'dama cattle production in West Africa – Six years of research in The Gambia. International Livestock Research Institute (ILRI), Nairobi, Kenya; International Trypanotolerance Centre (ITC), Banjul, The Gambia. pp. 131.

Alkoiret TI, Awohouédji DYG, Gbangboche AB, Bosma RH (2010). Productivité des élevages bovins des Communes de Gogonou au Nord Est du Bénin. Annale des Sciences Agronomiques, 14(2): 145-163.

Alkoiret TI, Radji M, Babatoundé S (2011) Typology of cattle farms located in the district of Ouake northwest of Benin. *Livest. Res. Rural Dev.*, Volume 23, Article # 50, Retrieved November 21, 2016 from http://www.lrrd.org/lrrd23/3/alko23050.htm

Arouna O, Sinsin B, et Houndagba CJ (2008). L'exploitation des ressources biologiques et la dynamique de la forêt classée de l'Alibori supérieur au Bénin (secteur de l'arrondissement de Bagou). Colloque international sur la gestion concertée des ressources naturelles et de l'environnement. p. 117.

Assani SA, Alkoiret IT, Houinato M, Mensah GA (2016). Typology of cattle herd in transhumance in classified forest of Upper Alibori Northern Benin. Eur. Sci. J., 12(15): 251-262

Assani SA, Assogba B, Toukourou Y, Alkoiret TI (2015). Productivity of Gudali cattle farms located in the commons of Malancity and Karimama extreme north of Benin. Livest. Res. Rural Dev., 27(7).

Ba A, Lesnoff M, Poccard-Chapuis R, Moulin CH (2011). Demographic dynamics and off-take of cattle herds in southern Mali. Trop. Anim. Health Prod., 43: 1101-1109.

Chabi Macco Y (1992). Etude de quelques paramètres de productivité de la race bovine Borgou. Mémoire d'Ingénieur agronome, Université nationale du Bénin, Cotonou, Bénin. pp. 137.

CIA-CSR (1996). Contribution à la connaissance des paramètres de reproduction et de production des bovins de races Borgou et Lagunaire. Rapport Final. Cotonou, Bénin, Université nationale du Bénin, FSA/CIA, p. 44.

Dehoux JP, Hounsou-Ve G (1993). Productivity of Borgou cattle breed in traditional farming systems in north-east of Benin. World Anim. Rev., 74/75: 36-48.

FAO (2009). Database on Rural Income Generating Activities: Retrieved March 23, 2016, from: www.fao.org/fr/ESA/riga/french/index_en.htm.

FAO (2012). La transhumance transfrontalière en Afrique de l'Ouest: Proposition de plan d'action, Organisation des Nations Unies pour l'Alimentation et l'Agriculture, Ouagadougou. p. 143.

FAO (2015). FAO Statistic Data. Retrieved May 15, 2016, from http://faostat.fao.org/site/573/DesktopDefault.aspx?PageID=573#ancor.

Hoste C, Cloe L, Deslandes P, Poivey JP (1993). Etude de la production laitière et de la croissance des veaux de vaches allaitantes N'Dama et Baoulé en Côte d'Ivoire. II. Relations entre la production laitière et la croissance des veaux. *Revue Elev. Méd. Vét. Pays Trop*., 36: 207-213.

INSAE (2013). Résultat provisoire du troisième recensement général de la population (RGPH4). p. 8.

Lesnoff M, Diedhiou M, Laval G, Bonnet P, Workalemahu A, Kifle D (2002). Demographic parameters of a domestic cattle herd in a contagious bovinepleuropneumonia infected area of Ethiopian highlands. Rev. Elev. Méd. Vét. Pays Trop., 55(2).

Lesnoff M, Saley M, Adamou K, N'Djafa Ouaga H, Ayantunde A, Gérard B (2008). 12MO: A retrospective method for estimating demographic parameters in tropical ruminant livestock populations. CIRAD (French Agricultural Research Centre for International Development), ILRI (International Livestock Research Institute).

Lesse P, Houinato MRB, Djenontin J, Dossa H, Yabi B, Toko I, Tente B, et Sinsin B (2015). Transhumance en République du Bénin : états des lieux et contraintes. *Int.*

J. Biol. Chem. Sci., 9(5): 2668-2681. ISSN: 1997-342X (Online), ISSN: 1991-8631 (Print).

MAEP (Ministère d'Agriculture de l'Elevage et de la Pêche). (2011). Plan Stratégique de Relance du Secteur Agricole (PSRSA), Cotonou, République du Bénin. p. 112.

OECD (2008). Élevage et marché régionale au Sahel et en Afrique de l'Ouest, CEDEAO, CSAO. p. 157.

Otte MJ, Chilonda P (2002). Cattle and small ruminant production systems in sub-Saharan Africa – *A systematic review*. FAO, Rome.

R Development Core Team (2012). R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN: 3-900051-07-0. http://www.Rproject.org.

Rivière R (1991). Manuel d'alimentation des ruminants domestiques. Collection Manuel et précis d'élevage. IEMVT, Ministère de la coopération et du développement. La documentation française. pp. 525.

Senou M, Toleba SS, Adandedjan C, Poivey JP, Ahissou A, Toure FZ, Monsia C (2008). Increased milk yield in Borgou cows in alternative feeding systems. Rev. Elev. Méd. Vét. Pays Trop., 61(2).

Youssao AKI, Ahissou A, Touré Z, Leroy PL (2000). Productivité de la race bovine Borgou à la ferme d'élevage de l'Okpara au Bénin. Revue Elev. Méd. Vét. Pays Trop., 53(1): 67-74.