

# **Weight Growth And Factors Of Variation In Nelore Calves Reared On Natural Semi-flooded Pasture In The Republic Of Congo**

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## **Abstract**

*The Influence Of Variation Factors On The Weight Growth Of Neloran Calves Born At Kila Ranch, Republic Of Congo, Was Studied. Data On The Growth Performance Records Of Calves Born In The Year 2021 Were Taken. 82 Calves Of Which 41 Males And 41 Females Were Weighed From Birth To 7 Months Every 30 Days. The Collected Data Were Analysed And Processed Using R Software Version 2. 10.1. The Independent Variables Included In The Analyses Were Sex And Season Of Birth Of The Calf. The Comparison Of The Modalities Of The Variables Studied By Analysis Of Variance And The Test Of Comparison Of Means Were Done By Tukey's Test. The Sex Of The Calf Significantly Affected The Weights At Typical Ages: Male Calves Were Heavier Than Females At All Ages, Sexual Dimorphism Is Well Pronounced. The Season Of Birth Showed A Significant Effect On Weights In Males From Birth To 7 Months. From Birth To The First Month Of Life Of The Calves, Average Weight Gains Were  $689.33 \pm 1.33$ g/Day And  $652.7 \pm 10.66$ g/Day For Males And Females Respectively. From Birth To 7 Months, The Recorded GMQ Was  $537.43 \pm 2.95$ g/Day And  $497.95 \pm 13.33$ g/Day For Males And Females. The Season Of Birth Only Influences The GMQ At Birth. During The Rainy Season, From Birth To One Month, The GMQ Is  $665.67 \pm 15.33$  G/Day; While In The Dry Season The GMQ Is  $718.33 \pm 5$  G/Day. A Favourable Asset Would Be To Group Births In The Rainy Season To Promote Good Calf Growth.*

**Key Words:** Growth, Performance, Variation Factors, Nelore, Congo

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## **I. Introduction**

The favourable context in which the Congo finds itself with numerous assets for the development of its livestock, notably an abundant hydrography, 12 million hectares of grassland that can contain 2 million head of animals, a temperature that fluctuates around 25°C on average throughout the year, and abundant rainfall with more than 2000 mm of water per year should encourage the development of the livestock sub-sector in a relatively short time (FAD, 2009).

Despite these natural advantages, livestock production in general and cattle production in particular in Congo remains low. According to the report of the general agricultural census, the national cattle population stands at 3,070,98 head (MAEP, 2017).

Unfortunately, the extensive farming system often practiced does not give the animals the opportunity to express their performance in a timely manner, which prolongs the time of muscle fixation and the accumulation of intra and intermuscular fat. This poor accumulation slows down growth.

Weight growth is an important trait in the management and/or selection of livestock species. It reflects their ability to adapt to environmental conditions and their economic value (Thiruvankadan et al., 2009). Weight change is the main assessment criterion reflecting adaptation to a harsh environment where feeding is a major concern,

Thus, from 2012 to 2014, 4418 head of Néloure cattle were imported from Brazil and transferred to the northern part of the country in the Cuvette department, to the Kila ranch, with a view to adapting them to the climatic conditions of the Congo and then using them as an improver breed. These animals have been studied and show good adaptation to the climatic conditions of the country (DIMI, 2021).

The results observed by DIMI et. al (2021) on the growth of these animals are encouraging, but genetic improvement and the dissemination of genetic progress require the evaluation of the effect of non-genetic factors. In the field of cattle breeding, the performance recorded before weaning is of interest in the context of

genetic improvement, they are directly involved in the establishment of selection criteria (Planchenault et al., 1986).

However, imported animals have their own requirements and it is not always obvious to expect a better result in the short term without conducting a study on the weight growth of the calves.

The aim of the present study is to determine the effect of variation factors on growth traits including birth weight at 7 months and average daily gain (ADG) in Neloran calves born at Kila Ranch.

## **II. Materials and Methods**

### **Study environment**

The present study was conducted in the department of the Cuvette in the north-east of the Republic of Congo, specifically at the Kila ranch. It is located south of the equator, between 1°11' 25.80" South latitude and 16°01' 56.11" East longitude of the Greenwich meridian at an altitude of 311m above sea level, in the south-western part of the Congolese Cuvette. Kila Ranch is located 15km north of the sub-prefecture of Oyo on the Oyo-Obouya axis, on National Road No. 2 between the village of Bara and Opokagnia. It specialises in the production and distribution of beef for the domestic market of the Republic of Congo.

The study took place during the year 2021 with animals born in the rainy and dry seasons. The study started with 41 calves and 41 calves, and recorded 5 deaths, including 3 calves and 2 calves.

**Climatic aspects:** The area is under the influence of the equatorial Congolese climate of the "Guinean Forest" type, characterised by relatively high rainfall, i.e. 1600 -1800 mm of water per year, with an average annual temperature of 26°C and a low annual thermal difference of around 2°C. In this locality, the year is divided into four seasons: a long rainy season from October to December, a short dry season from January to February, a short rainy season from March to April and a long dry season from May to September.

**Hydrographic aspects:** The study area is watered mainly on the eastern side by the Alima, one of the tributaries of the Congo River, with an average flow of 537 m<sup>3</sup>/s.

**Soil and vegetation aspects:** In the study area, the soil is characterised by almost permanent hydromorphy with an accumulation of organic matter. It is 86-96% sandy, rich in fine sand (62-73%), clay (0 - 8.5%) and very permeable. The pH varies between 5.2 and 5.9 (YOKA et al., 2007). Soil moisture also varies with depth.

### **Animal husbandry**

**Feeding:** The animals graze on natural pastures (figure 1 and 2), where we find species such as: *Bulbostylis laniceps*, *Trachypogon spicatus*, *Ctenium newtonii*, *Hyparrhenia wombaliensis* (MOPOUNDZA et al, 2016). The farm also has artificial grass pastures of: *Panicum massaye*, *Brachiara brizenta*, *Brachiara omidicola*, *Bracharia Laneiro* (Figure 3,4,5 and 6). The brewery grain is distributed twice a week with a vitaminised mineral supplement based on cooking salt. Drinking water is served ad libitum.

### **Natural pastures**



**Figure 1: Natural pasture in flooded areas**



**Figure 2: Natural pasture on dry land**

### Artificial pastures



Figure 3 :*Brachiara brizenta* Figure 4 :*Brachiara omidicola*



Figure 5 :*Panicum Massaye* Figure 6 : *Bracharia Laneiro*

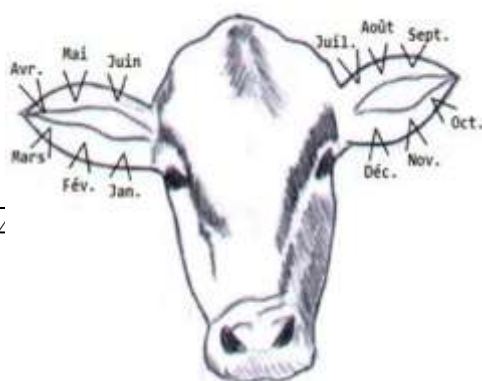
**Prophylaxis:** The animals are regularly dewormed and treated with trypanocides. They are vaccinated against pasteurellosis and contagious bovine pleuropneumonia and are screened for brucellosis and tuberculosis. The herds are natural and the breeding bulls are kept there permanently.

### Methods

#### Weighing and weight growth

Eighty-two calves (41 males and 41 females) born at the kila ranch during 2018 were tested for weight performance from birth to weaning.

Calves were weighed in the morning on an empty stomach once a month from birth until 7 months of age. The age of the calves was made possible from the month of birth, marked by the notch made in the edge of the ear with a cookie cutter (Figure 7). It is the location of the notches that provides information on the month of birth. The identity of the animal is summarised in the form of a unique number tattooed on the inside of the auricular pinna. The calves were weighed using a HANGING SCALE two-hook  $\pm 0.1$  kg, from which they passed between their legs.



**Figure 7: Coding of month of birth according to location of calf punching**

The average daily gain (ADG) is determined by the formula proposed by LHOSTE et al (1993).

$$GMQ = \frac{Wf - Wi}{\Delta T} \times 1000$$

with GMQ in grams/day

Where: Wf = final weight; Wi = initial weight; ΔT = time between two weighings in days.

### III. Results

#### Weights at standard age (WAS) and factors of variation

At the Kila Ranch, the weights at standard age of the Neloran calves characterise growth over a given time. They are influenced by sex and season of birth.

#### Influence of sex on weight

Table 1 shows the dynamics of the weights of the calves after rearing on pasture according to their age, the weights at standard age of the males were significantly higher than those of the females. The average difference between males and females increased from 1.09 kg at birth to 9.18 kg at 7 months.

**Table 1: Influence of sex on calf weight**

Age	Source of variation	Average	Sd	N	Letter
P <sub>0</sub>	Male weight	27,97	0,58	23	a
	Female weight	26,88	0,61	24	b
P <sub>1</sub>	Male weight	48,65	0,54	22	a
	Female weight	46,46	0,93	23	b
P <sub>2</sub>	Male weight	60,35	0,95	22	a
	Female weight	56,20	0,72	23	b
P <sub>3</sub>	Male weight	79,02	0,81	21	a
	Female weight	71,16	1,01	23	b
P <sub>4</sub>	Male weight	88,29	0,69	20	a
	Female weight	81,99	1,38	22	b
P <sub>5</sub>	Male weight	103,26	3,58	20	a
	Female weight	95,38	1,49	22	b
P <sub>6</sub>	Male weight	120,86	1,63	20	a
	Female weight	111,39	1,46	22	b
P <sub>7</sub>	Male weight	140,63	1,20	20	a
	Female weight	131,45	3,41	22	b

*The letters a, b, being different, the means are significant*

#### Influence of the season on the weight

Table 2 shows the weights according to the season. It can be seen from this table that the season has a significant influence on the weights. In the first, second and seventh month this influence was not significant. However, calves born in the rainy season had a higher growth rate than those born in the dry season.

**Table 2: Influence of birth season on calf weight**

Age	Source of variation	Average	Sd	N	Letter
P <sub>0</sub>	Rainy season	27,62083	0,9118507	23	a
	Dry season	25,65111	1,2168555	24	b
P <sub>1</sub>	Rainy season	47,58542	1,372215	22	a
	Dry season	47,20222	1,361899	23	ab
	Rainy season	58,22292	2,464060	22	a

P <sub>2</sub>	Dry season	57,69111	2,168663	23	ab
P <sub>3</sub>	Rainy season	75,56458	3,987080	21	a
	Dry season	73,66444	3,868001	23	b
P <sub>4</sub>	Rainy season	85,09583	3,602951	20	a
	Dry season	84,29556	3,101829	22	b
P <sub>5</sub>	Rainy season	99,32292	4,866308	20	a
	Dry season	97,34000	4,552642	22	b
P <sub>6</sub>	Rainy season	116,6833	4,891910	20	a
	Dry season	114,5178	4,723216	22	b
P <sub>7</sub>	Rainy season	135,9792	5,359460	20	a
	Dry season	134,7444	5,320823	22	ab

*The letters a, b, being different, the means are significant*

#### Average daily gain (ADG)

The average daily gain is an indicator of animal growth used in zootechnics. It is used to monitor animal nutrition performance mainly on farms.

#### Influence of sex and season of birth

Sex had a significant effect on the growth of the calves in all periods. From birth to 7 months (weaning), male calves grew faster than females as shown in Table 3.

From birth to the first month of life of the calves, average weight gains were 689.33±1.33 g/day for males and 652.7±10.66 g/day. Over the period from birth to 7 months the average weight gains recorded were 537.43±2.95 g/day and 497.95±13.33 g/day for males and females respectively.

The season of birth influenced the average daily gain only at birth. During the rainy season, from birth to one month, the average daily gain is 665.67±15.33 g/day; while during the same period in the dry season the weight gain is 718.33±5 g/day.

**Table 3: Average daily gains and variation factors**

Source of variation	Période (jours)		
	0 – 30	30 – 210	0 – 210
<b>Sex</b>			
<i>Male</i>	689,33±1,33 <sup>a</sup>	511±1,5 <sup>a</sup>	537,43±2,95 <sup>a</sup>
<i>Female</i>	652,7±10,66 <sup>b</sup>	472,17±13,78 <sup>b</sup>	497,95±13,33 <sup>b</sup>
<b>Season of Birth</b>			
<i>Rainy</i>	665,67±15,33 <sup>a</sup>	491,06±22,17	516±21,2
<i>Dry</i>	718,33±5 <sup>b</sup>	486,33±22	519,48±19,52

*The letters a, b, being different, the means are significant*

## IV. Discussion

The weight development of young cattle is the expression of their growth potential under the control of various factors including nutrition, genetic potential and especially the environment. The growth of Neloran calves under the influence of variation factors has been extensively studied in Brazil, the country of origin of Nelorans. These authors often study the influence of different factors on weights at typical age and generally agree to find significant effects.

In this study the average birth weights of the calves were  $27.97 \pm 0.91$  kg and  $26.88 \pm 0.61$  kg for males and females respectively, while at weaning the males reached  $140.63 \pm 1.20$  kg and the females  $131.45 \pm 3.41$  kg. The influence of sex on weight was significant ( $P < 0.05$ ) from birth to weaning, with males being heavier than females. These results are close to those obtained by CUBAS et al. (2001), respectively  $29.8 \pm 1.41$  kg for males and  $27.2 \pm 0.72$  kg for females and at weaning  $148.21 \pm 0.22$  kg for males and  $139.13 \pm 4.23$  kg. VIANA et al (2009) in Brazil, the country of origin of the animals, obtained  $31.57 \pm 4.50$  kg for males and  $30.6 \pm 1.12$  kg for females and at weaning  $196.03 \pm 23.31$  kg and  $187.03 \pm 1.33$  kg. They are similar to those obtained by GAUR et al (2002), who obtained  $27.1 \pm 0.2$  kg for males and  $25.3 \pm 0.3$  kg for females, and  $139.02 \pm 0.61$  kg for males and  $133.21 \pm 0.24$  kg at weaning in India, the birthplace of these animals.

The growth of Zebu calves has also been studied by many authors in the tropics. The results of their studies reveal that males are heavier than females from birth to weaning, as in the case of Wagenaar et al. (1988) and Ouédraogo (2013) for Fulani Zebu in Mali and Burkina Faso, Gobra in Senegal and by Youssao et al. (2000) for Borgou calves in Benin.

The season has a significant effect on weight, except during the dry season in the first, second and seventh month. Seasonal effects are undoubtedly those that induce the most marked fluctuations in the monthly growth of calves.

These fluctuations have a double effect on the growth before the calf is weaned. On the one hand, the effect on the mother, who is not able to provide her calf with a normal milk supply, and on the other hand, the direct effect on the calf, which at certain seasons does not have the possibility to satisfy its food requirements on natural pasture.

Among the factors that influence the weight of the calf at weaning, one can mainly mention the nutritional level before weaning, which is strongly dependent on the nutritional level of the mother in relation to the milk production in the first months of life, the potential and the interactions between these factors (JENKINS et al., 1991).

According to ESPASANDIN et al (2001), the level of forage supply to which the herd is subjected influences the milk production of the cows and, consequently, the growth of the calves until weaning. This justifies the opportunity to conduct studies on the influence of the quantity and quality of grass fodder on milk production in the Cuvette Congolaise.

The average daily gain recorded in our study was  $535.14$  g/day in males and  $496.81$  g/day in females from birth to weaning. These results are comparable to those observed by CUBAS et al (2001) in Brazil who had  $537$  g/day for males and  $482$  g/day for females. Males gained more weight than females, the season effect was marked at birth, at weaning males and females had almost the same weight gains.

The fluctuations in average daily gains observed in our study can be explained by the fact that lactating dams with their calves are reared on artificial pastures on an alternating basis; and that these pastures are sown with different forage species, which certainly do not have the same nutritional value. Also the supplementation of Nitrogen Vitamin Mineral Supplements and Mineral Vitamin Supplements accelerates the calves' GMQ at certain periods.

## V. Conclusion

The results of this study show that Neloran calves show growth performance below their dispersal range and similar to their original range. Sexual dimorphism was pronounced from birth to weaning, the sex effect was noticed and calves born during the rainy season were heavier than those born during the dry season.

All these results show the importance of knowing the growth performance of a herd before starting an improvement operation with a local breed.

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