Production and Reproduction Parameters Analysis of N’Dama Cattle Breed in the Dairy Station of Yamoussoukro (SLY), in the Savannah Zone, in Côte d’Ivoire

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Abstract— The reproductions and productions of the N'Dama breed were analyzed on the basis of anucleus breeding of the dairy station of Yamoussoukro in Côte d’Ivoire. Data collections were done from 2010 to 2015. The first calving age varied from 20 to 65 months for an average of 33.20 ± 5.64 months. The interval between calving and the calving – fertilizing insemination of the N’Dama cow varied from 300 to 822 days and from 67 to 233 days for respective averages of 474±147.81 days and 166.4 days. On average, the fertility rates in free mating (86.79 %) and in artificial insemination (91.94 %) respectively varied from 86±0.9 to 87.8% and from 94.0 to 87.2%. The gravidity duration was on average 244±25±11.14 days for variation from 244 to 358 days. For the birth weight, it was estimated on average to 17 kg for females and to 19 for males. The average weight of the different age bracket from 1 to 6 ; 7 to12 and 19 from 24 months respectively were 89.24 ±17.17 kg, 133.67±20.95 kg and 197.46 ±39.72 kg for the females and 96.5±16.56 kg, 145.8 ±33.76 and 244.73 ±55.94 kg for the males.

Index Terms— Production, Performances, N’Dama Cattle Breed, Livestock, Côte d’Ivoire.

I. INTRODUCTION

The numerical potential of Ivorian livestock is at present estimated to 1 582 652 cattle, 3 031 990 small ruminants (1 700 303 sheeps), 1 331 687 goats, 349 739 pigs and 43 133 297 poultries ([19]; [18]). Such animal resources are 95% in traditional breeding and contribute around 4.5% in farm GDP and 2% in total GDP. The livestock breeding sector plays an important role in the national economics in terms of inter-regional balance and of food statute of populations ([124]; [18]). However, the national production of animal based protein is still weak and the Côte d’Ivoire imports almost than the half of its meat consumption 88% of it diary consumption ([18]). One of the mains reasons to that deficit is the miss-knowledge of Ivorian livestock productivity.

The cattle population, one of the priority species in Côte d’Ivoire is made up of zeus and of two trypanotolerant local breeds (N’Dama, Baoulé) in the West Africa ([111]:[8];[23]). Among that breeds, the N’Dama constitutes a major issue in livestock also in the national programs of breeding development in Côte d’Ivoire as anywhere else in the West Africa.

However, the limited knowledge of the zootechniques characteristics of the N’Dama stays a major issue in the strategy of cattle breeding development in Côte d’Ivoire. In fact, the evaluation in station of zootechnical performance of the N’Dama goes back to 1970s and 1980s ([7]; [5]; [13]; [15]), whereas the most recent date from the 2000s are done in traditional breeding [27]. If the station evaluations have good zootechniques performances of the breed to the fact of the improved breeding conditions, would not it be old to justify the breed performance today? Would the traditional breeding evaluations be objective for appreciating the intrinsic performance of the breed knowing the traditional breeding constraints?

That fact confirms the necessity of studies currying having the goal of making more precise the characteristics and the performances of reproduction of that important potential of development of cattle breeding which represent the N’Dama in Côte d’Ivoire and also in the West Africa. That is the interest of the present article which aims to analyze the reproduction and production parameters of the N’Dama in breeding conditions in the dairy station of Yamoussoukro.

II. MATERIAL AND METHODS

A. Study site

The study is carried out in the dairy station of Yamoussoukro (SLY) in the centre of Côte d’Ivoire, between latitude 06°49 and 06°47 north and longitude 05°16 and 05°15 west.

The climate of that region of the Côte d’Ivoire is characterized by four alternating seasons (two dry seasons and two rainy seasons) with an average temperature oscillating between 25°C and 38°C and a pluviometer going from 900 to 1100 mm per year. The long rainy season goes
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from mid-March to mid-July and the small season goes from September to mid-November. The dry seasons stretch from mid-November to mid-March for the long season and the small season goes from mid-July to August. The vegetation is pre-forest savannah planted more or less with small trees broken by forest Small Island and with galleries of forest in the lowlands.

B. Animals and their breeding conditions

The study is about the N’Dama breed (fig. 1), from 2010 to 2015. The animals are lead in a semi-intensive breeding system. The reproduction way is the natural mating and the artificial insemination. The main food supply is the cultivated pasture (Panicum maximum K187B and Panicum maximumCI) associated to the legumes Aeschynomene hystrix and the natural pasture which the floristic species are not yet identified and characterized. The animals are lead in pasture from 8.am to 12.Am and from 2 pm to 5pm with a rest from 12 to 2 pm. The complementary food, made up of hay, cotton cattle-cake and of brewery draft are given only during the dry seasons. The licked stone is used for mineral complementation.

The sanitary prophylaxis is done by glossina traps setting and external deparasity twice per month during the dry season and thrice par month during the rainy season. The external deparasity start as soon as three months old and keep on every six months. At birth the calves receive an oral suspension of calcium, phosphor and vitamins and dose of spiramycin. There are after deparasited with the sulfadimerazine 33 during the first weeks of the birth.

Gravidity duraton | GD | day
Weight | W | kilogram
Average milk production/day | Milk | kilogram

The reproduction parameters were calculated thanks to the above formula:
AFC = birth date - date of the first calving;
IBC = date of the last calving – date of previous calving;
InC-FI = calving date – date of the fertilizing insemination;
GD = date of serving fecundity - date of calving;
Fertility rate (FR) = number of fertilized cow/ All the cow put in production;
Weighing is done the last Friday of each month thanks to a weighing machine. It takes place the mornings between 6am and 9am per age bracket.
The quantity of milk produced per cow (milk) was estimated from the growth of the calves between the birth and 4 months by the formula : Milk = 9.18 (P4 – P0)/120).
The estimated value in kilogram is converted in liter by multiplying per the factor 1.0223

To appreciate the different studied parameters tendencies, data collection was submitted to descriptive elementary statistic analysis (frequencies calculation, average and standard deviation). The averages of least square were next estimated and compared by the analysis of variance (ANOVA) with the help of Kruskal Wallis test to the threshold of 5%. That different analysis was done thanks to R software.

III. RESULTS

A. Age of the first calving
The first calving age varied from 20 to 65 month for an average of 33.20 ± 5.64 month with a variation coefficient of 17 p. 100. The cow having calved before the age of 24 months represented only 4.4 p. 100, whereas those having done their first calving at an age between 30 and 36 months represented 61.3 p.100 (fig 2). The modal class corresponded to the class 33-36 month (26.5 p. 100).

B- Interval between calvings

<table>
<thead>
<tr>
<th>Reproduction parameters</th>
<th>code</th>
<th>Unity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of the first calving</td>
<td>AFC</td>
<td>month</td>
</tr>
<tr>
<td>Interval between calving</td>
<td>IBC</td>
<td>day</td>
</tr>
<tr>
<td>Interval between calving</td>
<td>InC-FI</td>
<td>day</td>
</tr>
<tr>
<td>Fertilizing insemination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fertility rates</td>
<td>FR</td>
<td>percentage</td>
</tr>
</tbody>
</table>

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With a coefficient of variation of 31.2%, the interval between calving was on average 474.10±147.81 days for variations going from 300 to 822 days. It was inferior to 360 days for 16.9 p. 100 of cows, between 366 and 547 days for 66.7 p. 100 and superior to 547 days for 16.4 p. 100 of cows (figure 3).

C. Calving -fertilizing insemination interval

The calving – fertilizing insemination interval was on average 166.4 days (be it 5.48 ± 3.97 months), with a variation coefficient 72.4 p. 100. It varied between 67 and 233 days. The interval was inferior to 90 days for 39.7 p. 100 whereas only 8.2 p. 100 have had a calving-fertilizing insemination interval superior to 365 days (fig 4).

D. Fertility rates

The fertility rates calculated for the different ways of reproduction are presented in the figure 5. The fecundity rates varied from 86.09 to 87.8% in natural mating and from 9.40 to 26.50% in artificial insemination (IA) for the respective average of 86.79 % and 19.43%.

E. Duration of gravidity

It was on average 284.25 ± 11.14 days (be it 9.47 ± 0.37 month) for a variation coefficient of 3.9 p.100. It varied from 244 to 358 days and the modal corresponded to the class 280 - 290 days (42.7 p. 100) (fig 6).

F. Different age bracket weight

The table 2 shows the results of the analysis of the different age bracket weight variance. Apart from animals from 1 to 6 months, the sex has a significant effect on the weight (p<0.05).
Table II: Arithmetic average weight (kg) and standard deviation of the different age bracket

<table>
<thead>
<tr>
<th>Age type</th>
<th>Female</th>
<th>Male</th>
<th>p</th>
<th>( \bar{y}_M - \bar{y}_F )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-6 month</td>
<td>N 70</td>
<td>14</td>
<td></td>
<td>0.063 NS</td>
</tr>
<tr>
<td></td>
<td>A 89.24</td>
<td>96.57</td>
<td></td>
<td>17.172 16.561</td>
</tr>
<tr>
<td>7-12 month</td>
<td>N 63</td>
<td>15</td>
<td></td>
<td>0.002 ***</td>
</tr>
<tr>
<td></td>
<td>A 133.67</td>
<td>145.8</td>
<td></td>
<td>20.958 33.762</td>
</tr>
<tr>
<td>13-18 month</td>
<td>N 63</td>
<td>13</td>
<td></td>
<td>0.000 ***</td>
</tr>
<tr>
<td></td>
<td>A 166.70</td>
<td>202.570</td>
<td></td>
<td>31.570 48.821</td>
</tr>
<tr>
<td>19-24 month</td>
<td>N 72</td>
<td>15</td>
<td></td>
<td>0.000 ***</td>
</tr>
<tr>
<td></td>
<td>A 197.46</td>
<td>244.73</td>
<td></td>
<td>39.726 55.942</td>
</tr>
<tr>
<td>25-30 month</td>
<td>N 84</td>
<td>18</td>
<td></td>
<td>0.000 ***</td>
</tr>
<tr>
<td></td>
<td>A 224.49</td>
<td>283.61</td>
<td></td>
<td>35.422 68.978</td>
</tr>
</tbody>
</table>

\( N = \) number of animals, \( A = \) average, \( \delta^2 = \) standard deviation, \( \bar{y}_M - \bar{y}_F = \) difference between the arithmetic average of female and male weight, * significant to the threshold of 5% (\( P < 0.05 \)); NS: no significant (\( P > 0.05 \))

**G. Average production of Milk**

The estimated quantity of milk per day per cow varied from 0.3 to 6.1 kg be it from 0.31 to 6.25 liters for an average of 3.79 kg (3.87 liters). Only 5.5 p.100 and 16.1 p.100 of cow have had an average milk production inferior to 2 kg/day and superior to 5 kg/day respectively. With a proportion 47.7 p.100, the cow class which average production varied between 2 and 4 kg constituted the modal class (fig 7).

**H. Weight growth**

The comparison of the growth of N’Dama male and female is presented on the figure 8. The average weight at birth is 19 kg for the males whereas it is 17 kg for the females. During the first 30 months, the males had on average a growth rate higher than those of the females. The difference was observed from 2 month old until to the age of 29 months to cancel each other out at 30\(^\text{ème}\) and 31\(^\text{ème}\) months (figure 8). From the age of 32 months, it is the females’ growth rate which becomes higher (5 kg) than those of males. The males weight hold steady to 225 kg from 32 months whereas those of the females hold steady (to 235 kg) to one month later.

**IV. DISCUSSION**

The first calving age of 33.20 ± 5.64 month observed to the N’Dama at the dairy station of Yamoussoukro is near to 35 months 17± 29 days obtained by Coulomb [7] to CRZ of Minankro Bouaké. But these results are superior to 43 and 40 months age on the first calving obtained on traditional breeding by [29] and [27] respectively and even to those (48 month ±10 days) observed at the breeding station of Okpara in Bénin [30]. In addition, the weight growth curve showed that the corresponding weight to the age of the first calving of the N’Dama is 235 kg and that the sexual maturity is attained between 27 and 28 for weights going from 205 and 210 kg. That values are near those observed by many authors such are [7] and [22], [17] in Côte d’Ivoire and[16] in Ghana. Therefore, the weight at the sexual maturity at the dairy station of Yamoussoukro stays superior to those from 175 ± 20 to 184.6 ± 21 kg observed by [16] and [20] in Ghana ; [21] and [17] in Côte d’Ivoire and [2] in Congo. The relative precocity of the N’Dama females observed in the dairy station of Yamoussoukro can be explained not only by the good mastery of the breeding conduct technique (feeding, sanitary and medical prophylaxis), but also by the constant presence of bulls in the heifer herd from 22 to 24 months. The presence of the males would have a catalyzing effect on the sexual maturity of the females.

The interval between the averages calving of N’Dama cows was of 474.10 ±147.81 days for average fecundity rates of 86.79 % for natural mating and 19.43% for the artificial
In the breeding farm of Okpara in Bénin, the average weights of the young was estimated to 6 month, 12 month and 24 month to 55.55 kg, 95.9 kg and 158 kg respectively [31]. Those different weight are much less important than those obtained to the young N’Dama from 1 to 6 month (89.24±17.17 to 96.57±16.56 kg), from 7 to 12 months (133.67±20.95 to 145.8±33.76 kg) and from 19 to 24 month (197.46±39.72 to 244.73±55.94 kg) in the dairy station of Yamoussoukro. But, those weights stay close to those obtained by Coulomb ([7]) in Mali and in Côte d’Ivoire (120.7 to 129.7 kg at the age of 12 month and from 190.9 kg to 227.4 kg at 24 months) and by Roberts et al. ([25]) in Nigéri (92.1 to 95.0 kg at the age of 6 and of 120.7 to 137.4 kg per one year).

IV. CONCLUSION

N’Dama breed in the breeding conditions in the dairy station of Yamoussoukro, presented on average reproduction and production performances better than traditional area breeding and even certain stations. However, the effects of certain factors of production which were not taken into account in the present study deserve to be tested in order to better understand their impact on the productivity of the breed. In addition, the studied reproduction and production parameters revealed a variability showing the heterogeneity of that N’Dama population. That fact help understand that a selection of the N’Dama race on the said parameters in optimal breeding conditions can permit to have efficient animals for a basis of the N’Dama breed in Côte d’Ivoire and even in the tropical humid zone of the West Africa.

REFERENCES

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