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The Effects of Chicken Droppings on the Production of *Vigna unguiculata* (L.) Walp., *Panicum Maximum* Jacq. and *Pennisetum purpureum* Schumach in Degraded Savannah Areas in the Ignié Zone, Congo

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Abstract **Original Research Article**

The development of pastoral livestock farming requires sufficient quantities of good quality fodder. The advantage of fodder crops is that they provide both sufficient quantities and good quality fodder throughout the year. The objective of this study is to evaluate fodder production in relation to chicken droppings in degraded savannah areas in the Ignié region. Two non-random Fischer block experimental designs were set up, one with pure crops with one treatment and three replicates, and the other with associed crops with one treatment and four replicates. The treatments were based on chicken droppings at a dose of 2.5 g per 25 m² plot. The soil was prepared mechanically during the dry season. The chicken droppings was spread two weeks before planting. The crops were planted in rows, spaced 0.5 m x 0.5 m apart, by sowing, cuttings and root suckers on plots of 25 m² each during the rainy season. The herbaceous above-ground biomass was measured using the harvest method in 1 m² plots with four replicates for each crop. The samples were dried in an oven at 70°C for 24 hours. The results show that the herbaceous above-ground biomass of untreated and treated pure crops varies with species and treatment. After three months, above-ground biomass is higher with the addition of chicken droppings. It is 9.95 t DM/ha for *Vigna unguiculata* (L.) Walp.; 13.1 t DM/ha for *Panicum maximum* Jacq. and 15.95 t DM/ha for *Pennisetum purpureum* Schumach. The same trend is observed for associeted crops. The most productive combination is *Panicum maximum* Jacq. - *Vigna unguiculata* (L.) Walp. - *Pennisetum purpureum* Schumach., with 27.9 t DM/ha. The use of chicken droppings could be an alternative to mineral fertilisers for improving pastures.
Keywords: Chicken droppings, fodder crops, herbaceous above-ground biomass, degraded pastures, sustainable management.

INTRODUCTION

The savannah is a fundamental pillar of the global economy, representing the main source of income for many populations. It forms the basis of food and nutritional security for populations and contributes more than 60% of agricultural household income (SCADD, 2013). Savannahs encourage producers to place importance on agricultural exploitation, as they constitute valuable resources for agriculture and livestock farming (Yoka *et al*., 2013). Several authors have shown that tropical savannahs offer a wide range of agricultural and pastoral potential (Dadet and Poissonet, 1971; Cornet, 1981; Fournier *et al*., 1982; Sinsin, 1993; Yoka *et al*., 2014). Savannahs provide food for livestock in extensive farming systems (Rakotoarimanana *et al*., 2008). They are therefore excellent grazing land for ruminants.

In Congo, savannahs are used as grazing land for Ndama cattle (Yoka *et al*., 2011; Amboua *et al*., 2019). This exploitation has led to the emergence of less palatable plant species and soil denudation, which characterise the degradation of grazing land. The restoration of degraded pastures through the introduction of fodder crops is necessary for the sustainable management of pastoral areas in the study zone. Fodder crops are quantitatively and qualitatively better for feeding domestic herbivores (Amboua, 2021). Their low production can be explained, among other things, by the poor nutrient content of the soil. The use of fertilisers is an essential lever for responding to the increase in herbaceous above-ground biomass (Yoka *et al*., 2021; Ampion 2021). Chicken droppings is very important in improving the biological properties of soils and the nutritional value of pastures (Azangue *et al*., 2020). In Congo, there appear to be no studies on the effects of chicken droppings on fodder crops in degraded areas, even though the development of pastoral livestock farming depends on it. To address this scientific gap, the present study was conducted in the Ignié zone.

The objective of this study is to evaluate fodder production in relation to chicken droppings in degraded savannah areas.

1. MATERIALS AND METHODS

1.1 Study environment

The study was conducted in the Djoué-Léfini Department, specifically in the Ignié area, located 45 km north of Brazzaville on National Road No. 2. The site selected for the study is near the village of Ngatchou, located approximately 45 km from the town of Ignié, at 4°00′ south latitude and 15°30′ east longitude, where the pastures of the General Trading Company (GTC) are located.

The climate of the area is tropical humid, typical of the lower Congo Basin. The average annual temperature is 25.5°C (Samba-Kimbata, 1991). Rainfall is very unevenly distributed throughout the year, with 93 to 97% falling during the rainy season and less than 10% of the total annual rainfall occurring during the dry season (Samba-Kimbata, 1991). Rainfall is not constant. November and April are the rainiest months of the year. Average annual rainfall is around 1.200 to 1.400 mm, unevenly distributed.

The soils are derived from relatively homogeneous source material. They are sandy, acidic, poor in fine particles and highly depleted in bases (Mbongabi, 2021).

The Djoué-Léfini Department is dominated by two vegetation types: forests and savannahs.

1.2. Plant material and fertiliser

The plant material consisted of 20 cm long cuttings of *Pennisetum purpureum* Schumach with three nodes; 15 cm long *Panicum maximum* Jacq. Root cuttings (two roots per clump), all sourced from the Centre de Vérification des Techniques Agricoles (CVTA) in Kombé; and white *Vigna unguiculata* (L.) Walp. Cultivar seeds purchased at the Bacongo state market (Brazzaville).

The fertiliser consisted of chicken droppings from the N'semi poultry farm in Kindzaba (Bouenza Department). According to Mankoussou *et al.* (2017), the chemical composition of chicken droppings is as follows (Table 1):

Table 1: Chemical composition of chicken droppings

Mineral elements	Total nitrogen (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Ir (mg/Kg)	Mn (mg/Kg)	Zn (mg/Kg)	Co (mg/Kg)
Chicken droppings	4.4	2.1	2.6	2.3	1.0	0.6	1000	413	480	172

P: phosphorus; K: potassium; Ca: calcium; Mg: magnesium; S: sulphur; Ir: iron; Mn: manganese; Zn: zinc; Co: copper

1.3. METHODS

- **Experimental setups**

Two experimental non-random Fisher block designs were set up for this study. One design was for pure crops and the other for associated crops. The pure crop design and the associated crop design covered areas of 23 m x 16 m (368 m²) and 30 m x 16 m (480 m²) respectively. For pure crops, the plot is divided into three blocks, each corresponding to a forage crop. For associated crops, the plot is divided into four blocks, each corresponding to a combination of forage crops. For both devices, each block comprises two treatments, each corresponding to a 5 m x 5 m plot, i.e. an area of 25 m². The spacing between plots is 2 m. The two treatments are as follows: T0 = Unfertilised plot; T1 = Plot fertilised with chicken droppings.

- **Soil preparation, fertilisation and sowing**

The soil was prepared mechanically after the shrubs were uprooted during the dry season (August 2023). The site was fenced off with barbed wire and boundary markers to protect the crops from cattle and bush fires. This was done manually during the dry season using machetes, hoes, shovels, string and rakes. The average spacing between two plots is 2 m and the spacing between two plants is 0.5 cm.

Chicken droppings was used as a base fertiliser, spread two weeks before planting with a standard dose of 2.5 g/plot. Planting by seed, cuttings or root cuttings took place in November 2023 (rainy season) on 25 m² plots with 50 cm x 50 cm spacing. For the sowing of *Vigna unguiculata* (L.) Walp., three seeds were sown per hole (Yoka *et al*., 2014).

For the planting of *Pennisetum purpureum* Schumach, young cuttings (4 to 6 months old) are preferred, as older, drier canes have a lower planting capacity (Amboua, 2021). The cuttings were cut into 20 cm segments, each with at least 3 nodes. The cuttings were planted in rows, 50 cm x 50 cm apart. *Panicum maximum* Jacq. was planted using root cuttings. Two young 15 cm root cuttings were transplanted per pot. The trials were conducted over a period of three months.

- **Measurement of herbaceous above-ground biomass and carrying capacity**

The method used to measure herbaceous above-ground biomass was harvesting (Fournier, 1994). For each treatment or forage crop, samples were taken from 1 m² plots, with four replicates per month, during the three-month cycle. The aerial parts of the plants were cut flush with the ground using secateurs. The plant samples obtained, wrapped in newspaper, were dried in the open air in the field, then in an oven at 70°C for 24 hours. After drying in the oven, the samples were weighed to obtain their dry weight. An average biomass was calculated for all the plots.

The method for calculating carrying capacity recommended by Boudet (1978) and adapted from Agonyisa and Sinsin (1998) can be summarised by the following formula:

$$CC = (1/3) \times \frac{\text{Amount of plant biomass produced } (kg\ \frac{DM}{ha})}{6{,}25 \text{ kg} \times 365 \text{ j}}$$

With CC: carrying capacity; DM: Dry matter

- **Data processing**

The collected data was processed as follows:

- Arranging data and creating graphs in Microsoft Excel Spreadsheet version 2016;
- Analysis of Variance (ANOVA), Normality Test: Shapiro-Wilk ($p < 0.05$), Non-parametric Test: Kruskal-Wallis, used for comparing medians, and Student's Test, in R Software via R Studio, version R.4.4.0.
- Interpretation of results:

a, b et c: Averages marked with the same letter in the same column are not statistically different at the 5% level;

**: significant difference (P-value = 0.01);

***: very significant difference (P-value = 0.001).

2. RESULTS

2.1. Herbaceous above-ground biomass and carrying capacity of three pure forage crops

The data on herbaceous above-ground biomass and carrying capacity of the experimental plots of *Vigna unguiculata* (L.) Walp., *Pennisetum purpureum* Schumach and *Panicum maximum* Jacq. in pure, unfertilised cultivation during three months of testing are presented in Table 2. They vary from one forage species to another, from one treatment to another and over time as follows: from 0.22 t DM/ha to 1.17 t DM/ha at 1 month; from 1.85 t DM/ha to 6.52 t DM/ha at 2 months and from 0.95 t DM/ha to 10.05 t DM/ha at 3 months. Three months after planting, the most productive forage crop is *Pennisetum purpureum* Schumach (10.05 t DM/ha), followed by *Panicum maximum* Jacq. (7.65 t DM/ha) and *Vigna unguiculata* (L.) Walp. is the crop that produces the least above-ground biomass (0.95 t DM/ha). The results obtained show statistically significant differences at the 5% threshold. The above-ground biomass of these pure crops enables them to support a carrying capacity from 0.03 to 0.16 TCU/ha/year at 1 month; from 0.26 to 0.94 TCU/ha/year at 2 months; and from 0.13 to 1.45 TCU/ha/year at 3 months.

Table 2: Data-t-on herbaceous aboveground phytomass and carrying capacity of unfertilised pure crops

Pure crops	Biom. t DM/ha			C.C. TCU/ha/year		
	Witness					
	First month	Second month	Third month	First month	Second month	Third month
UPC1	0.62 ± 0.04c	1.85 ± 0.22c	0.95 ± 0.08c	0.09 ± 0.006c	0.26 ± 0.03c	0.13 ± 0.01c
Pc2	1.17 ± 0.04b	2.65 ± 0.33b	7.65 ± 0.25b	0.16 ± 0.006b	0.38 ± 0.04b	1.10 ± 0.03b
Pc3	0.22 ± 0.04a	6.52 ± 0.10a	10.05 ± 0.25a	0.03 ± 0.006a	0.94 ± 0.01a	1.45 ± 0.03a
P-value	***	***	***	***	***	***

UPC: unfertilised pure crops**; UPC1:** *Vigna Unguiculata* (L.) Walp.; **UPC2:** *Panicum maximum* Jacq.; **UPC3:** *Pennisetum purpureum* Schuma. Biom.: biomass; CC: Carrying capacity; t DM/ha: tonnes of dry matter per hectare; TCU: tropical cattle unit.

2.2. Herbaceous above-ground biomass and carrying capacity of three fertilised pure crops

Table 3 presents data on the herbaceous above-ground biomass of pure crops fertilised with chicken droppings.

The results obtained show that herbaceous above-ground biomass and carrying capacity vary depending on forage crops and weather conditions. Overall, above-ground biomass varies from 1.51 t DM/ha to 2.57 t DM/ha at 1 month; 4.65 t DM/ha to 9.07 t DM/ha at 2 months; and 1.95 t DM/ha to 15.95 t DM/ha at 3 months. Three months after planting, *Pennisetum purpureum* Schumach (15.95 t DM/ha) is the most productive species, followed by *Panicum maximum* Jacq. (13.1 t DM/ha). *Vigna unguiculata* (L.) Walp. (1.95 t DM/ha) is the least productive species. These results show statistically significant differences. For the same crops, the carrying capacity varies from 0.21 TCU/ha/year to 0.37 TCU/ha/year at 1 month; from 0.67 TCU/ha/year to 1.31 TCU/ha/year at 2 months; and from 0.28 TCU/ha/year to 2.30 TCU/ha/year at 3 months.

Table 3: Herbaceous above-ground biomass and carrying capacity of fertilised pure crops

Pure crops	Biom. T DM/ha			C.C. TCU/ha/year		
	Fertilised					
	First month	Second month	Third month	First month	Second month	Third month
FPC1	1.51 ± 0.03b	4.65 ± 0.25b	1.95 ± 0.14c	0.21 ± 0.004b	0.67 ± 0.03c	0.28 ± 0.02c
FPC2	1.62 ± 0.14b	8.72 ± 1.35a	13.1 ± 0.65b	0.23 ± 0.02b	1.26 ± 0.19b	1.90 ± 0.09b
FPC3	2.57 ± 0.31a	9.07 ± 0.10a	15.95 ± 1.45a	0.37 ± 0,05a	1.31 ± 0.01a	2.30 ± 0.20a
P-value	**	**	***	**	***	***

FPC: fertilised pure crops; **FPC1:** *Vigna Unguiculata* (L.) Walp.; **FPC2**. *Panicum maximum* Jacq.; **FPC3:** *Pennisetum purpureum* Schumach; Biom.: biomass; CC: Carrying capacity; t DM/ha: tonnes of dry matter per hectare; TCU: tropical cattle unit.

2.3. Herbaceous above-ground biomass and carrying capacity of three associated crops

Table 4 shows the results for herbaceous above-ground biomass and carrying capacity of unfertilised associated crops.

The results obtained show that herbaceous above-ground biomass and carrying capacity vary depending on crops, treatments and time. Overall, it ranges from 0.62 t DM/ha to 1.35 t DM/ha at 1 month; 6.2 t DM/ha to 10.25 t DM/ha at 2 months and 10.45 t DM/ha to 14.5 t DM/ha at 3 months. At three months, the combination of *Panicum maximum* Jacq. – *Vigna unguiculata* (L.) Walp. – *Pennisetum purpureum* Schumach. (14.5 t DM/ha) was the most productive, followed by *Panicum maximum* Jacq. – *Pennisetum purpureum* Schumach (13.35 t DM/ha) and *Pennisetum purpureum* Schumach -*Vigna Unguiculata* (L.) Walp. (12.3 t DM/ha). The least productive combination is *Panicum maximum* Jacq – *Vigna unguiculata* (L.) Walp. (10.45 t DM/ha). These results show statistically significant differences. The carrying capacity varies from 0.09 TCU/ha/year to 0.19 TCU/ha/year at 1 month; 0.09 TCU/ha/year to 1.48 TCU/ha/year at 2 months and 1.18 TCU/ha/year to 2.09 TCU/ha/year at 3 months.

Table 4: Results on herbaceous above-ground biomass and carrying capacity of unfertilised associated crops

Associated crops	Biom. T DM/ha			C.C. TCU/ha/year		
	Witness					
	First month	Second month	Third month	First month	Second month	Third month
UAC1	1.02 ± 0.04b	6.2 ± 0.18a	13.35 ± 1.85ac	0.14 ± 0.006b	0.89 ± 0.02b	1.93 ± 0.2b
UAC 2	0.62 ± 0.04a	6.97 ± 0.62a	12.3 ± 0.9a	0.09 ± 0.006a	0.09 ± 0.006a	1.18 ± 0.13a
UAC 3	1.35 ± 0.11c	5.02 ± 0.41b	10.45 ± 0.05b	0.19 ± 0.01c	0.72 ± 0.05c	1.51 ± 0.007c
UAC 4	1.32 ± 0.08c	10.25 ± 1.16c	14.5 ± 0.6c	0.19 ± 0.01c	1.48 ± 0.16d	2.09 ± 0.8b
P-value	***	***	***	***	***	***

UAC: unfertilised associated crops; **UAC 1:** *Panicum maximum* Jacq. – *Pennisetum purpureum* Schumach; **UAC 2:** *Pennisetum purpureum* Schumach -*Vigna Unguiculata* (L.) Walp; **UAC 3:** *Panicum maximum* Jacq – *Vigna unguiculata* (L.) Walp.; **UAC 4:** *Panicum maximum* Jacq. – *Vigna unguiculata* (L.) Walp. – *Pennisetum purpureum* Schumach.; Biom.: biomass; CC: Carrying capacity; t DM/ha: tonnes of dry matter per hectare; TCU: tropical cattle unit.

Data-t-on herbaceous aboveground biomass and the carrying capacity of fertilised crop combinations are presented in Table 5.

The results obtained show that herbaceous above-ground biomass and carrying capacity vary depending on forage crops and weather conditions. Overall, it varies from 2.25 t DM/ha to 4.52 t DM/ha at 1 month; 10.35 t DM/ha to 16.62 t DM/ha at 2 months; and 16.7 t DM/ha to 27.9 t DM/ha at 3 months. The combination of *Panicum maximum* Jacq. –*Vigna unguiculata* (L.) Walp. – *Pennisetum purpureum* Schumach (27.9 t DM/ha) is the most productive at three months, followed by *Panicum maximum* Jacq. – *Pennisetum purpureum* Schumach (24.15 t DM/ha) and *Pennisetum purpureum* Schumach – *Vigna Unguiculata* (L.) Walp. (19.25 t DM/ha).

The combination of *Panicum maximum* Jacq. – *Vigna unguiculata* (L.) Walp. (16.7 t DM/ha) is the least productive. These results show very significant differences. The carrying capacity varies from 0.32 TCU/ha/year to 0.65 TCU/ha/year at 1 month; 1.49 TCU/ha/year to 2.40 TCU/ha/year at 2 months and 2.41 TCU/ha/year to 4.03 TCU/ha/year at 3 months.

Table 5: Data-t-on herbaceous aboveground biomass and carrying capacity of fertilised associated crops

Associated crops	Biom. T DM/ha			C.C. TCU/ha/year		
	Fertilised					
	First month	Second month	Third month	First month	Second month	Third month
FAC1	4.42 ± 0.04b	14.1 ± 0.46b	24.15 ± 1.35b	0.64 ± 0.006b	2.03 ± 0.06a	3.49 ± 0.19b
FAC 2	3.75 ± 0.40a	12.22 ± 5.11ab	19.25 ± 1.05a	0.54 ± 0.05a	1.76 ± 0.73a	2.78 ± 0.15a
FAC 3	2.25 ± 0.23c	10.35 ± 0.65a	16.7 ± 0.4c	0.32 ± 0.03c	1.49 ± 0.09b	2.41 ± 0.05c
FAC 4	4.52 ± 0.08d	16.62 ± 1.97a	27.9 ± 0.4d	0.65 ± 0.01b	2.40 ± 0.28a	4.03 ± 0.05d
P-value	***	***	***	***	**	***

FAC: fertilised associated crops; **FAC 1:** *Panicum maximum* Jacq. – *Pennisetum purpureum* Schumach; **FAC2:** *Pennisetum purpureum* Schumach -*Vigna Unguiculata* (L.) Walp.; **FAC3:** *Panicum maximum* Jacq. –*Vigna unguiculata* (L.) Walp.; **FAC4:** *Panicum maximum* Jacq. –*Vigna unguiculata* (L.) Walp. – *Pennisetum purpureum* Schumach; Biom.: biomass; CC: Carrying capacity; t DM/ha: tonnes of dry matter per hectare; TCU: tropical cattle unit.

3. DISCUSSION

The herbaceous above-ground biomass of pure crops varies from one forage crop to another and increases with fertilisation using chicken droppings. In unfertilised pure crops, it varies from 0.22 ± 0.04 to 10.05 ± 0.25 t DM/ha over a period of three months. In fertilised pure crops, it varies from 1.51 ± 0.03 to 15.95 ± 1.45 t DM/ha over the 3-month experiment. For all pure unfertilised crops, the herbaceous above-ground biomass is lower than that of pure fertilised crops. The same is true for carrying capacity. This means that chicken droppings is a significant fertiliser for increasing forage production.

With regard to the pure, unfertilised crops of *Vigna Unguiculata* (L.) Walp. at two months (1.85 t DM/ha with 0.26 TCU/ha/year), our results are higher than those of Moukala *et al*. (2017), who found an average herbaceous above-ground biomass of 0.67 t DM/ha in the Kombé area. This difference could be explained by the fact that the Kombé area is heavily exploited, resulting in a loss of soil fertility. To this could be added differences in cultivars. However, these results are slightly higher than those of Amboua (2021) in the Boundji area, where the average biomass is 1.39 t DM/ha and the average carrying capacity is 0.2 TCU/ha/year, Moutari (2002) in Niamey for the IN92E-26 variety and Ado (2014) in Dakar for the TN256-87 and IN92E-26 varieties, with respective values of 1.35 t DM/ha, 1.42 t DM/ha and 1.22 t DM/ha. This slight difference could be explained by differences in the cultivars and varieties used.

In pure culture, whether fertilised or not, *Pennisetum purpureum* Schumach produces more biomass, followed by *Panicum maximum* Jacq. The high biomass in pure culture fertilised compared to unfertilised could be explained by the addition of chicken droppings, which improved soil fertility. The results for the two parameters studied (biomass and carrying capacity) for the species *Panicum maximum* Jacq. differ from those found by Sana (2015) in Burkina Faso, showing an herbaceous above-ground biomass of 1.6 t DM/ha in the Sahelian zone and 4.41 t DM/ha in the North Sudanese zone, with a carrying capacity of 5 TCU/ha/year and 2.5 TCU/ha/year respectively. For the species *Pennisetum purpureum* Schumach, our results are similar to those of Amboua (2021) in Boundji, in Congo, and Granier (1972) in Madagascar, who found herbaceous above-ground biomass of 5.76 t DM/ha and 6 t DM/ha, respectively, and higher than those of Valenza (1965) in Senegal, who found an average herbaceous above-ground biomass of 2.61 t DM/ha. Similarly, the work of Amboua (2021) conducted in Boundji shows an average carrying capacity of 0.83 TCU/ha/year, which is close to that found in the present study. The similarity or difference in results between the present study and previous studies can be explained by the cultivars and soils used.

In pure fertilised crops of *Vigna Unguiculata* (L.) Walp. at two months (4.65 t DM/ha with 0.67 TCU/ha/year), the results are superior to those of Yoka et al. (2021), who found values ranging from 2.08 to 3.44 t DM/ha and 0.3 to 0.5 TCU/ha/year, depending on the cultivars. The difference in these results can be explained by the difference in cultivars and soil quality.

The results for pure crops fertilised with chicken droppings are superior to those for unfertilised pure crops. This can be explained by the fact that chicken droppings is rich in nutrients that are essential for crop growth, as already demonstrated by Adeleye *et al*. (2010), Ojeniyi *et al*. (2013) and Imasuen *et al.* (2015). The use of chicken droppings could therefore be an alternative to mineral fertilisers, which are responsible for soil pollution. Chicken droppings is therefore recommended in pasture improvement programmes with a view to sustainable management.

4. CONCLUSION

This study, which aimed to evaluate the production of fodder crops in relation to chicken droppings in degraded savannah areas in the Ignié zone, showed that among the four fodder crops used in pure crops, the most productive species in terms of herbaceous above-ground biomass is *Pennisetum purpureum* Schumach. The combination of *Panicum maximum* Jacq. – *Vigna unguiculata* (L.) Walp. – *Pennisetum purpureum* Schumach is the most productive. Fertilised plots produce more biomass than unfertilised plots. Chicken droppings therefore has a positive effect on herbaceous above-ground biomass and could serve as an alternative to chemical fertilisers. These results could be used in pasture improvement programmes with a view to sustainable management.

REFERENCES

- Adeleye, E.O., Ayeni, L.S and Ojeniyi, S.O. (2010). Effect of poultry Manure on Soil physico – chemical properties, Leaf Nutrient Contents and Yield of Yam *(Dioscorea rotundata)* on Alfisol in Southwestern Nigeria. *Journal of American Science*, 6 (10), 871-878.
- Ado, A. (2014). Analyse technico-économique de la production de quatre (4) variétés fourragères de niébé dans la station agronomique de l'INRAN et évaluation de la valeur alimentaire de ses fanes. Mémoire de Master en production animale et développement durable. Ecole Inter-états des Sciences et Médecines Vétérinaires de Dakar (E.I.S.M.V), n°1, 34 p.
- Agbede, T.M., Ojeniyi, S.O. and Adeyemo, A.J. (2008). Effect of poultry manure on soil physical and chemical properties, yrowth and grain yield of sorghum in southwest Nigeria. American – Eurasian. *Journal of Sustainable Agriculture*, 2 (1) : 72:77.
- Agonyissa, D. et Sinsin, B. (1998). Productivité et capacité de charge des pâturages naturels au Bénin. *Revue d'Elevage et de Médecine Vétérinaire des Pays Tropicaux*, 51, 239-249.
- Amboua Issengue, O. (2021). Amélioration des pâturages embroussaillés par l'introduction des cultures fourragères au ranch Essimbi de Boundji (République du Congo) ; Thèse de Doctorat, Université Marien Ngouabi, Brazzaville, 205 p.
- Amboua Issengue, O., Assongba, Y.F., Yoka, J., Akouango P. et Djego J.G. (2019). Effet des arbustes sur la diversité floristique et la production herbacée dans les pâturages au ranch d'Essimbi à Boundji (République du Congo). *Journal of Applied Biosciences*, 134, 13618-13629.
- Ampion Tielena Likibi, M.S. (2021). Evaluation de la production du niébé (*Vigna unguiculata* (L.) Walp.) et son impact sur l'amélioration des caractéristiques physico-chimiques et microbiologiques des sols de la vallée du Niari (République du Congo). Thèse de Doctorat, Université Marien Ngouabi, 151 p.
- Azangue, J.G., Tendonkeng, F., Nguetsop, V.F., Fokom, W.D. Pamo T.E. (2020). Growth and biomass Yield of *Brachiaria ruziziensis* (Poaceae) under the direct and residuel effets of fertilization with hen dropings at flowering in West Cameroon. *Journal of Agriculture and Ecolgy Research International*, 21, 44-52. DOI : 10.9734/JAERI/2020/v2Lil 30126.
- Boudet, G. (1978). Manuel sur les pâturages tropicaux et les cultures fourragères. Manuel et précis d'élevage. Institut d'Elevage et de Médecine Vétérinaire des Pays tropicaux, 3ème édition, 258 p.
- Cornet, A. (1981). Mesure de biomasse et détermination de production nette aérienne de la strate herbacée dans trois groupements végétaux de la zone sahélienne au Sénégal. *Acta Oecologica, Oecol Plant*, 2(16) n°3, 257-266.
- Daget, P. & Poissonet J. (1971). Méthode d'analyse de la végétation des pâturages. Critères d'application. *Annales Agronomique*, 22, 5-41.
- Fournier, A. (1994). Cycle saisonnier et production nette de la matière végétale herbacée en savanes soudaniennes pâturées. Les jachères de la région de Bouyoukly (Burkina-Faso*). Ecologie*, 25(3) : 173-188.
- Fournier, A., Hoffmann, O. et Devineau, J.L. (1982). Variation de la phytomasse herbacée le long d'une toposéquence en zone soudano-guinéenne, Ouango-Fitini (Côte d'Ivoire). Bull. IFAN, 44. Série A, 1-2, 71-77.
- Imasuen, E.E., Chokor, J. and Orhue, E.R. (2015). Influence of poultry manure on some hemical properties and yield of Okra (*Abelmoschus esculentus* L. Moench). *Nigerian Journal of Agriculture, Food and Environment*, 11 (2), 33-37.
- Mankoussou, M., Mialoundama F,. & Diamouangana J. (2017). Influence du potassium dans la production du maïs (*Zea mays* L. variété Espoir) dans la vallée du Niari (Congo). *Journal of Applied Biosciences*, 111, 10882-10893.
- Mbongabi, C. (2021). Caractéristiques écologiques de la savane à *Hyparrhenia diplandra* (Hack.) Stapf dans la zone d'Ignié dans le plateau de Mbé (Département du Pool, Congo). Mémoire de master, Université Marien Ngouabi, 52 p.
- Moukala Bakala, J., Mpika, J., Yoka J. et Attibayeba. (2017). Influence de la densité culturale sur la croissance et le rendement de trois cultivars de Niébé (*Vigna unguiculata* (L.) Walp.) dans la zone de Kombé en République du Congo. *Journal of Applied Biosciences*, 118, 11794-11802.
- Moutari, A. (2002). Rapport technique de la sélection niébé. Niamey, INRAN, 11 p.
- Ojeniyi, S.O., Amusan, O.A. and Adekiya, A.O. (2013). Effect of poultry Manure on Soil physical Properties, Nutrient Uptake and Yield of Cocoyam (*Xanthosoma saggitifolium*) in Southwest Nigeria. *American-Eurasian journal of agricultural & Environmental Sciences*, 13 (1), 212-125.
- Rakotoarimanana, V., Gondard, H., Ranaivoarivelo, H. et Carrire S. (2008). Influence du pâturage sur la diversité floristique, la production et la qualité fourragère d'une savane des Hautes Terres malgaches (Région de Fianarantsoa). *Sciences et changements planétaires/Sécheresse*, 19 (1), 39-46.
- Samba-Kimbata, M.J. (1991). Précipitation et bilan de l'eau dans les bassins forestiers du Congo et ses marges. Thèse de Doctorat d'Etat, Centre de Recherche de Climatologie, Dijon, 241p. +163 fig.

- Sana Youssoufou. (2015). Production de *Panicum maximum* Jacq. Cultivar C1 et valorisation en alimentation animale au Burkina Faso. Thèse de Doctorat de l'Université Polytechnique de Bobo – Dioulasso, 178 p.
- SCADD. (2013). Rapport de performances à mi-parcours 2013. Ouagadougou, Burkina Faso. 56 p.
- Sinsin, B. (1993). Phytosociologie, écologie, valeur pastorale, production et capacité de charge des pâturages naturels du périmètre Nikki-kalalé au Nord-Bénin. Thèse de Docteur Ingénieur, Université Libre de Bruxelles, Bruxelles, 390 p.
- Valenza, J. (1965). Essais de charge des pâturages en République du Sénégal. Institut d'Elevage et de Médecine Vétérinaire des Pays tropicaux, 166-176 pp.
- Yoka, J., Amiaud, B., Epron, D., Loumeto, J.J., & Vouidibio, J. (2011). Evolution sous pâture de la composition floristique des savanes de la Cuvette congolaise (République du Congo). *Annales de l'Université Marien Ngouabi*, 12(4), 23-38.
- Yoka, J., Loumeto, J. J., Vouidibio, J. & Epron, D. (2013). Productivité herbacée des savanes de la Cuvette congolaise (Congo-Brazzaville). *Afrique Science*, 09 (1), 89-101.
- Yoka, J., Loumeto, J.J., Djego, J.G, Houinato, M. & Akouango, P. (2014). Adaptation d'un cultivar de Niébé (*Vgna unguiculata* (L.) Walp.) aux conditions pédoclimatiques de Boundji. (République du Congo). *Afrique Science*, 10 (1), 217-225.
- Yoka, J., Bassoukissa, B.O.D., Assongba, Y.F., Loumeto, J.J., Djego, J.G. & Baba-Moussa, L.S. (2021). Influence of poultry dropings on the production and mineral profile of cowpea (*Vigna unguiculata* (L.) Walp.) in Kombé (Brazzaville, Cogo). *Current Journal of Applied Science and Technology*, 40 (31), 27-35.