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# Performance Assessment and Grazing Pattern of Semi-Intensively Managed Maradi Goats supplemented with Palm Kernel Cake and Poultry Dropping Concentrates

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**Targeted audience**: Ruminant Nutritionist, Extension officers, Goat farmers

## Abstract

*Performance assessment and grazing pattern of semi intensively managed goats supplemented with Palm Kernel Cake (PKC) and Poultry Dropping Concentrates (PDM) was studied with 12 billy Maradi goats of average weight of 14.25kg ± 1.03 SEM, 3 replicates per each treatment. Four experimental treatments (T1-T4) were compounded with wheat offal (35%), cassava peel (30%), salt (2.25%) and bone meal (2.25%), T1 (30% PKC), T2 (20% + 10% PDM), T3 (15% PKC + 15% PDM) and T4 (10% PKC+20% PDM) and assigned in a Complete Randomized Design. The goats were tagged and supplemented with the experimental treatments ad libitum twice daily before and after grazing, weather condition monitored. Results showed no significant (P>0.05) difference in the DM of the experimental treatments, T1 had higher significantly (P<0.05) value of 17.50% CP, Maradi goats supplemented with T1 and T4 had higher and similar (P<0.05) feed intake while least significant (P<0.05) feed intake was recorded for goats supplemented with T3. Animals that were supplemented with T1 had highest significant (P<0.05) water consumption compared with animals supplemented with T2, T3 and T4 which had similar (P>0.05) water consumption. The goats fed T4 had the highest (P<0.05) weight gain, there is a significant (P<0.05) difference in the FCR of the experimental animals. Maradi goats supplemented with T4 had the best FCR. There was no significant (P>0.05) in the grazing pattern of the Maradi goats. Conclusively, animals fed T4 (20% PDM inclusion) had the best feed intake, weight gain and FCR. It is therefore recommended that PDM is valuable feed resources for goat production especially under the semi intensive management.*

**Key words:** Grazing pattern; Maradi goat; Poultry dropping.

## Description of Problem

Goats are multipurpose animals producing meat, milk, skin and hairs. However, out of these products meat is the major product consumed in Nigeria. Goats can be reared for various reasons such as income generation, religious purpose, household consumption, hobby and as security against crop failure. They are important to fight against poverty for

millions of the rural poor dwellers in Nigeria. Goats play special role in the conversion of feed that is unsuitable for humans into meat, milk and other useful products **(1)**. Goats play a significant role in the food chain and overall livelihoods of rural households, and urban dwellers. Goat meat is widely accepted and consumed in Nigeria since there is no taboo against it (2).

Goats grazed, browsed on natural pastures and fed on crop residues which are seasonal due to rainfall distribution, there is an acute shortage of feed resources supply during the dry season and the available feed resources during this period are of very poor quality (low in protein and high in fiber content). The problem is aggravated by a lack of alternative feeds during the critical period, resulting in low production, reproductive performance and slow growth rate in growing animals. Undernourished animals are susceptible to diseases and parasites and in extreme cases animals lose body condition and could eventually die.

Deficiencies of protein and energy are the main nutritional factors limiting productivity of goats. An active microbial population in the rumen is essential to digest and extract the nutrients contained in fibrous feedstuffs. However, when the protein content of the pasture falls below 6-7% during the dry season, ruminal microbial growth (i.e., reproduction) and digestion are limited. This directly restricts protein and energy absorbed by the animal. Moreover, due to the inherent nutrient deficiencies, the poor quality pastures and cereal crop residues, which are the main feed resources in West Africa, cannot sustain effective animal production or even maintenance when fed alone, particularly during the dry season. Thus, the provision of appropriate supplementary feedstuffs would be an important step to enhance the productivity of goats under smallholder and pastoral production systems.

Poultry manure contains large amounts of protein, fibre, and minerals, and has been deliberately mixed into animal feed for these nutrients. Thus, poultry litter can serve as a source of nitrogen in ruminant diets and the potentially digestible nitrogenous compounds in the litter are very soluble and are rapidly degraded to ammonia in the rumen. In lieu of these this study intend to assessed the performance and grazing pattern of semi-intensively managed red Sokoto goats fed palm kernel cake and poultry dropping concentrate.

## Materials and Methods

### *Location, collection of experimental materials and treatments*

The study was carried out in the Faculty of Agriculture Demonstration Farm, University of Port Harcourt, Rivers State. Port Harcourt is a coastal city located in the Niger Delta region of Nigeria within latitudes $6^{o}$ 58' – $7^{o}$ 60'E and longitudes $4^{o}$ 40' – $4^{o}$55'N.

Fresh poultry dropping were collected from the layer birds housed in battery cages. Clean polythene sheets were spread underneath for collection of poultry droppings every 24 hours. Collected poultry droppings were sun dried by spreading the waste on clean cemented platform, turning were done at interval and allowed to dry completely for 5 - 6 days, unwanted particles removed and latter milled to have

Poultry Dropping Meal (PDM).

Cassava peel was collected fresh from cottage cassava processing in Aluu and Emuoha, washed and sundried for 5-6 days (September to October 2014). Palm kernel cake, wheat offal, bone meal and salt were purchased from the feed mill in Port Harcourt City. The experimental material was weighed accordingly to Table1 and mixed manually.

***Experimental Treatment***

Twelve (12) Billy Maradi goats with average weight of 14.25 kg ± 1.03 SEM were assigned to the four experimental treatments with three (3) replicates per treatment in Complete Randomized Design. Animals were tagged and fed experimental treatments *ad libitum* twice in the hour of 7.00 – 8.00 am before grazing and 17.00 – 18.00 pm after grazing. The experiment lasted for a period of twelve (12) weeks excluding two weeks of adjustment period (4th December, 2014 – 5th March, 2015).

**Table 1: The percentage composition of experimental concentrates for semi-intensively managed Maradi goat.**

| Ingredients | Treatments | | | |
|---|---|---|---|---|
| | T1 | T2 | T3 | T4 |
| Wheat offal | 35 | 35 | 35 | 35 |
| Palm kernel cake | 30 | 20 | 15 | 15 |
| Poultry dropping meal | - | 10 | 15 | 20 |
| Cassava peel | 30 | 30 | 30 | 30 |
| Salt | 2.25 | 2.25 | 2.25 | 2.25 |
| Bone meal | 2.25 | 2.25 | 2.25 | 2.25 |
| Total | 100 | 100 | 100 | 100 |

***Data Collection***

Feed and water offered to the animals and the left over was measured and subtracted to determine the daily feed intake and water consumption. The weight of the animal was determined by deducting the initial weight from the final weight weighed initially at the start and at the end of the experiment to determine the weight gain.

***Grazing pattern*, *sampling of forages and weather monitoring***

The grazing pattern was done by observational method for three times weekly, the parameters considered were, Field grazing time (FGT) is the time between the onset and end of grazing was recorded as described by (3). Active grazing time (AGT) is the time the animal spends grazing the forage materials of its choice to satisfy its appetite and it was determined with the aid of a stop watch. Non-active grazing time (NGT) is the time spent on some other activities such as grooming, rumination etc. was calculated as NGT = FGT – AGT, The AGT and NGT constitute the total time spent on field by animal while grazing. Grazing distance travelled (GDT) was measured with tape rule.

The samples of forages were taken from the grazing field for proximate analysis using the quadrant of 1x1m. Weather condition of the area were also monitored from the Department of Geography and Environment Management Weather Observatory, Faculty of Social Science. University of Port Harcourt, Choba, Port Harcourt,

Rivers State.

***Chemical and data analysis***

Samples of the experimental treatments was subjected to chemical analysis (4), data collected was also subjected to analysis of variance (5), and significant means was separated (6).

## Results

Table 2 shows the proximate composition of the concentrate supplemented to semi-intensively managed Maradi goat. There is no significant (P>0.05) difference in the DM, EE and CF of the experimental treatments. The CP (17.50%) recorded in T1 significantly higher (P<0.05) than other treatments. Treatment 4 had the highest (28.02%) (P<0.05) level of ash followed by T3, T1 and T2 with value of 20.11%, 14.1% and 10.03% respectively. There is no difference (P>0.05) between the NFE of T2 and T3, while the least significant (P<0.05) value (58.32) of NFE was observed in T1

**Table 2: Proximate composition of concentrate supplemented to Maradi goat managed semi-intensively**

| Parameters | T1 | T2 | T3 | T4 |
|---|---|---|---|---|
| Dry matter | 92.79±0.08 | 92.79±0.79 | 92.61±0.84 | 91.17±0.05 |
| Crude protein | 17.50±0.61$^{a}$ | 9.45±0.22$^{d}$ | 12.24±0.24$^{c}$ | 15.75±0.72$^{b}$ |
| Ether extract | 27.50±0.20$^{ab}$ | 28.40±0.05$^{ab}$ | 26.10±0.29$^{b}$ | 29.00±0.09$^{ab}$ |
| Crude fiber | 10.11±0.43 | 11.21±0.13 | 10.20±0.50 | 10.18±0.09 |
| Ash | 14.10±0.53$^{c}$ | 10.03±0.34$^{d}$ | 20.11±0.80$^{b}$ | 28.02±0.29$^{a}$ |
| Organic matter | 85.90±0.46$^{b}$ | 89.97±1.24$^{a}$ | 79.22±0.36$^{c}$ | 71.98±0.46$^{d}$ |
| Nitrogen free extract | 58.32±2.50$^{c}$ | 77.40±0.24$^{a}$ | 71.99±0.56$^{ab}$ | 65.82±0.91$^{b}$ |

a, b, c. d means with different subscripts on a row are significantly differently (P<0.05)

The mineral profile of the experimental treatments fed semi-intensively managed Maradi goat is indicated in Table 3. There was a significant (P<0.05) difference in the entire minerals (Ca, Mg, Fe, Cu, Zn) of the experimental treatments except in Mn and Fe which shows no significant (P>0.05) difference across the treatments.

**Table 3: Mineral profile of experimental treatments fed to semi -intensively managed Maradi goat**

| | Treatments | | | |
|---|---|---|---|---|
| Parameters | 1 | 2 | 3 | 4 |
| Ca (%) | 1.95±0.01$^{d}$ | 6.05±0.02$^{b}$ | 4.05±0.01$^{c}$ | 10.85±0.06$^{a}$ |
| Mg (%) | 1.01±0.02$^{d}$ | 2.26±0.089$^{c}$ | 3.14±0.02$^{b}$ | 4.68±0.03$^{a}$ |
| K (%) | 0.96±0.69$^{c}$ | 1.09±0.01$^{b}$ | 0.96±0.00$^{c}$ | 1.83±0.01$^{a}$ |
| Na (%) | 0.79±0.17$^{b}$ | 0.88±0.02$^{a}$ | 0.69±0.02$^{b}$ | 0.78±0.00$^{b}$ |
| Mn (%) | 0.01±0.00 | 0.02±0.00 | 0.02±0.00 | 0.03±0.00 |
| Fe (%) | 0.12±0.01 | 0.14±0.01 | 0.10±0.01 | 0.10±0.01 |
| Cu (ppm) | 4.20±0.05$^{d}$ | 7.10±0.11$^{b}$ | 5.50±0.02$^{c}$ | 7.80±0.40$^{a}$ |
| Zn (ppm) | 2.21±0.04$^{d}$ | 3.85±0.08$^{a}$ | 3.26±0.10$^{c}$ | 3.47±0.17$^{b}$ |

a, b, c. d means with different subscripts on a row are significantly differently (P<0.05)

Table 4 shows the proximate composition and minerals content of samples of forages grazed by semi-intensively managed Maradi goat

supplemented with PKC and poultry dropping concentrate. The value of DM was 93.15%, CP (15.21)%, EE (3.12%), CF (21.17%), ash (13.14%), 0M (86.86%) and NFE (73.11%) while the value of Ca, Mg, K, Na, Mn, Fe, Cu, Zn were 5.15%, 1.38%, 1.15%, 0.95%, 0.18 %, 0.36 %, 2.68 mg/kg, and 2.41 mg/kg respectively.

**Table 4: Proximate composition and mineral content of the bulked forages grazed by Semi-intensively managed Maradi goats**

| Proximate composition Parameters (%) | | Minerals Parameters | |
|---|---|---|---|
| Dry matter | 93.15±0.87 | Ca (%) | 5.15±0.02 |
| Crude protein | 15.21±1.02 | Mg (%) | 1.38±0.01 |
| Ether extract | 31.20±0.28 | K% | 1.15±0.01 |
| Crude fiber | 21.17±0.12 | Mn (%) | 0.18±0.01 |
| Ash | 13.14±0.03 | Fe (%) | 0.36±0.01 |
| Organic matter | 86.86±1.27 | Cu | 2.68±0.01 |
| Nitrogen free extract | 73.11±0.66 | Zn | 2.41±0.00 |

Table 5 shows the average metrological condition of the study area during the experimental period. The temperature has a value of 34.0ºC (max) and 26.53ºC (min). Humidity has a value of 60.1%, the wind direction NE, rain fall 3.48mm, sunrise 6.22 am and the sunset 18.25pm

**Table 5: Average metrological condition of the study area during experimental period.**

| Climatic factors | Value/ Description |
|---|---|
| Temperature (ºC) Max | 34.0 |
| Min | 26.53 |
| Humidity (%) | 60.1 |
| Wind Direction | NE |
| Rainfall (mm) | 3.48 |
| Sunrise (am) | 6.22 |
| Sunset (pm) | 18.25 |

Source: Department of Geography and Environment Management Weather Observatory

Table 6 depicts the performances of semi-intensively managed Maradi goat placed on PKC and Poultry dropping concentrate. There was a significant ($P<0.05$) difference in the weight gain of the goats, Maradi goats supplemented with fed T4 had the highest ($P<0.05$) value of 5.50kg followed by T1, T2 and T3 with values of 4.60kg, 4.00kg, and 1.40kg respectively. Goats supplemented with T1 and T4 had higher and similar ($P<0.05$) feed intake, followed by goats supplemented with diet T2, the least significant ($P<0.05$) feed intake was observed in Maradi goats on T3. Animals supplemented with T1 had highest significant ($P<0.05$) water consumption compared with animals on T2, T3 and T4 which had similar ($P>0.05$) water consumption. There is a significant ($P<0.05$) difference in the FCR of the experimental animals, with T4 having the best FCR.

**Table 6: The average performance of semi - intensively managed Maradi goats supplemented with Palm Kernel Cake and Poultry Dropping Concentrates**

| | Treatments | | | |
|---|---|---|---|---|
| Parameters | 1 | 2 | 3 | 4 |
| Final weight (kg) | 19.6 | 17.5 | 15.4 | 19.5 |
| Initial weight (kg) | 15.0 | 13.5 | 14.0 | 14.0 |
| Weight gain (kg) | 4.60±0.08$^{b}$ | 4.00±0.05$^{c}$ | 1.40±0.03$^{d}$ | 5.50±0.06$^{a}$ |
| Feed intake (kg) | 2.24±0.09$^{a}$ | 1.61±0.25$^{b}$ | 1.11±0.43$^{c}$ | 1.76±0.57$^{a}$ |
| Water consumption (l/day) | 2.25±0.11$^{a}$ | 1.80±0.14$^{b}$ | 1.80±0.13$^{b}$ | 2.13±0.12$^{b}$ |
| Feed Conversion Ratio (FRC) | 0.49±0.06$^{c}$ | 0.40±0.03$^{b}$ | 0.79±0.01$^{a}$ | 0.32±0.01$^{d}$ |

a, b, c. d means with different subscripts on a row are significantly differently ($P<0.05$)

Table 7 shows the grazing pattern of semi-intensively managed goats placed on PKC and Poultry dropping concentrates. There was no significant ($P>0.05$) difference in the grazing patterns of the experimental animals. The FGT ranged between 403.50 - 427.00 minutes. Active grazing time value ranged between 304.20 - 337.77 minutes, NAGT and GDT were within 88.30 - 103.97 (minutes) and 404.28 - 495.56 (meters) respectively.

**Table 7: Grazing pattern of semi -intensively managed Maradi goats supplemented with Palm Kernel Cake and Poultry Dropping Concentrates**

| | Treatments | | | |
|---|---|---|---|---|
| Parameters | 1 | 2 | 3 | 4 |
| Final grazing time (minutes.) | 427.00±13.22 | 409.97±14.18 | 409.07±11.41 | 403.50±76.21 |
| Active grazing time (minutes.) | 337.77±10.01 | 312.07±13.89 | 304.20±9.46 | 304.33±10.50 |
| Non grazing time (minutes) | 88.30±5.78 | 96.23±25.28 | 103.97±5.33 | 97.47±29.23 |
| Grazing distance travelled (meters) | 468.15±43.30 | 429.85±33.65 | 404.28±37.77 | 495.56±49.51 |

## Discussions

The DM of the experimental treatments of this study can be compared favorably with other experimental feed used by (7) to feed goat, also the values were within the range of 93.26 and 96.56% reported by (8) and (9) respectively. The CP value (9.45-17.50%) of the experimental diets of this study contains the required CP for microbial fermentation. MacDonald *et al.* (10) suggested threshold of about 7 to 8% CP to guarantee sufficient utilization of feed. Therefore, the experimental treatments would provide adequate nitrogen requirement by rumen micro-organism to maximally digest the main components of dietary fibre leading to the production of volatile fatty acids (11; 12) which in turn facilitates microbial protein synthesis (13). The higher level of ash recorded in the experimental treatments especially T4 was as a result of 20% inclusion of PDM. The high level of ash content is an indicative of high mineral content inherent in the experimental treatments, which are essential in the formation and function of blood and bones. (14). Meanwhile, these elements function in cellular metabolism, have important roles in osmoregulation and acid-base balance and serve as structural components of

tissues (15).

The higher level of Ca and other minerals in T2-T4 against T1 was as a result of inclusion of PDM at different proportion in the treatments. This finding is in line with the reports of (16) that poultry manure contributes significant amounts of Ca, P, K, and numerous trace minerals to the diets and (17) also reported that if a diet consists of at least 20% poultry manure, no additional mineral supplementation is needed. However, the Ca levels of the experimental treatments (1.95 - 10.85) were higher and could meet the requirements of the animal's nutrient without mineral fortification. NRC (18) recommended 0.18 - 0.34 for Ca, 0.16 - 0.37 for P for ruminant animal. The organic composition and mineral content of the grazed forages were within the range of those of Nigerian forages reported by (19), (20) and (13).

The Maradi goats supplemented with T4 had highest weight gain compared to other animals, this can be attributed to higher feed intake, which was due to the 20% inclusion of PDM. Poultry drooping meal has been reported as a source of nitrogen in ruminant diets and have the potentially digestible nitrogenous compounds that are very soluble and rapidly degraded to ammonia in the rumen. This might facilitated the higher feed intake in the goats. The water consumption were significantly similar in the treatments with the inclusion of PDM while T1 which has no inclusion of PDM and higher composition of PKC (30%) had higher water consumption, this might be as a result of higher inclusion (30%) of PKC in the treatment (T1). The experimental treatment was best utilized by the animal in T4 because it has lower FCR, this implies that the goats supplemented with diet T4 utilized the supplied feed with highest efficiency because the nutrients are more readily released for utilization than the others.

Weather and climate data play very significant role in weather forecasting, and in socio economic activities throughout Nigeria (21). The average metrological data during the experimental period were similar to **(22)** for Port Harcourt city. Though (23) indicated that thermal neutral zone of 15 – 25$^{0}$C for body temperature maintenance of cattle which invariable affected the performance of animal. The relative humidity and other weather conditions monitored were still favorable for grazing of animal.

The insignificant difference observed in the grazing pattern of the Maradi goats might be attributed to the quality of the grazing paddock in related to protein and other nutrients contents (Table 4), despite the fact that the CP contents of the supplemented diets varied significantly with the hope that the animals will spend more time in consuming more forage from the grazing paddock to satisfy its nutrients needs. George *et al,* (24) reported that the time spent for grazing depends on forage quality, thermal balance and forage availability as livestock are attributed to vegetation patches and plant communities where they can fill their rumen with high quality forage.Tarawali *et al* (25) observed that animals showed a relationship between forage density and grazing time suggesting that, where the density of forage are high, there is a tendency to find more forages desired by the

ruminants and so animal will spend more time in feeding them. All these justify the quality of the forages from the grazing paddock vis-à-vis the insignificant differences observed in the grazing pattern of the goats.

**Conclusions and Applications**

1. Maradi goats fed with 20% poultry dropping meal had the best feed intake, weight gain and FCR.
2. Poultry dropping meal is valuable feed resources which can be incorporated into the diets of semi-intensively managed Maradi goats which can inversely increase the protein intake of the populace in terms of meat, milk and income generation of the farmers.
3. Ruminant farmers especially goat farmers should be encouraged to incorporate palm kernel cake into goat's diets/ration thereby reducing the menace of poultry dropping to the environment to minimum level.

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