DEVELOPMENT OF DUSA-DRIED FOOD LEFTOVER BASED MULTI-NUTRIENT BLOCK IN THE SEMI-ARID REGION OF NIGERIA

Modu-Kagu, H. A., Abdulraheem, A.O., *Mohammed, A., Abusufiyan, A., Allamin, H. and Mohammed, I.D.
Department of Animal Science, University of Maiduguri P.M.B 1069, Maiduguri – Nigeria, *Faculty of General Agriculture, Borno State University. P. M. B. 1122 Maiduguri, Borno State.
Corresponding author: hajjaashemodu@gmail.com Tel: 08035824041

ABSTRACT
Study on production of multi-nutrient block was conducted at the University of Maiduguri Teaching and Research Farm of the Department of Animal Science. Five formulations F1, F2, F3, F4 and F5 were developed. Locally available feed ingredients were used to develop the multi-nutrient blocks which includes *dusa*, dried food leftover, blood meal, poultry litter, urea, molasses, cement, salt and potash. The dry matter composition of the formulations ranged from 95.60% in F2 to 97.50% in F5. The crude protein content ranged from 9.30% in F3 to 15.60% in F4. The ether extract value ranged from 3.00% in F5 to 5.00% F1 and F3. However, the crude fibre values ranged from 10.50% in F4 to 15.50% in F2. The lowest value of ash was recorded in F3 (7.50%) while the highest was recorded in F2 (18.00%). The cost effectiveness of 20 kg mixture producing (10 - 20) blocks for the F1, F2, F3, F4 and F5 were ₦781.70, ₦755.95, ₦748.39, ₦754.52 and ₦766.17, respectively. The cost for each block ranged from ₦63 to ₦78.02 for the different formulations. These formulations can be afforded by smallholder farmers for feeding their livestock for improved productivity and performance in a semi-arid environment of Nigeria.
Keywords: Formulation, Multi-nutrient blocks, Dusa, Smallholder and Crude fibre.

INTRODUCTION
Ruminant diets in most developing countries are based on fibrous feeds mainly mature pasture and crop residues, particularly at the end of the wet season (Marte *et al*., 2018). These feeds are unbalanced and are deficient in energy, protein, minerals, and vitamins and are highly lignified (Leng *et al*., 1991). These characteristics kept intake, digestibility and productivity low. The principles of improving the use of these poor-quality roughages by ruminants include supplementation of fermentable Nitrogen (N) and minerals which could bypass the rumen and these could be in form of multi-nutrient blocks. According to Sansoucy (1986), the nutrient requirement to support a high level of production in livestock can be obtained in the choice of agro-industrial by-products that can be used to develop cheaper and readily available multi-nutrient block supplement rich in sources of fermentable carbohydrate, nitrogen, and minerals. They are considered a catalyst supplement, allowing a fractionated, synchronized, and balanced supply of the main nutrients (IFAD, 2000). The study's objective is to formulate and evaluate the nutrient content and cost of multi-nutrient blocks formulated using locally available feed ingredients in the study area.

MATERIALS AND METHODS
Experimental location
The experiment was carried out at the University of Maiduguri, Teaching and Research Farm. It is located on latitude 11^0 51' North and Longitude 30^0 05' East and at altitude of 354m above sea level. It falls in the Sahelian region (semi-arid zone) of west Africa, which is characterized by short duration of 3-4 months of rainfall. Rainfall varies from 300-500mm, ambient temperatures are higher by April and May, which ranges from 35-45% (Alaku, 1983).

Sample collection, block preparation, assessment and curing
Molasses was purchased from the sugar industry, *dusa*, dried food leftover, blood meal, urea, salt, potash and cement were purchased at Maiduguri Kasuwan Shanu market, while poultry litter was collected at the livestock farm and was sun dried properly. Mixing of the ingredients was done manually by hand in a 200-liter drum cut into two. The processed ingredients were mixed in batch (20 kg) as reported by Mohammed *et al.,* (2007). Salt was first dissolved in water in a separate container and allowed to dissolve completely for about (5-10 minutes). The other ingredients were being mixed in another

container before they are being poured into the drum. Thorough mixing is done in every stage to achieve homogenous mixture. The well-mixed materials were placed in wooden container molds measuring 15x15x10cm (Allen, 1992). The wooden mold was sheathed with polythene sheets to facilitate de-molding and easy cleaning of the surface. Blocks formed were removed after 1-2 minutes from the molds and all blocks were dried in the open air under shade. The blocks were taken to Civil Engineering Laboratory for testing Hardness and Compactness using Concrete crusher manufactured by Seidner © Riedlingen West Germany.

Chemical analysis

All the ingredients and blocks were analyzed for dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (EE) ash and nitrogen free extract (NFE) according to the procedure of AOAC (1999).

Cost of producing the formulations were calculated using the current prices of feed ingredients in Naira (₦) and the quantities used.

Statistical analysis

All data collected were subjected to the analysis of variance (ANOVA) using computer statistical package (Statistix 9.0). Significant differences between means were separated using least significant difference. No citation

RESULTS AND DISCUSSION

Multi nutrient block formulation

The percentage of feed ingredients used in the formulations are shown in Table 1. All the formulations contained equal amount of molasses, urea, salt, cement and potash. The levels of dried food leftover ranged from 10% in F1 to 30% in F5. The different proportion of *dusa* ranged from 13% in F5 to 30% in F1. Dried food leftover and *dusa* were used as an energy source with the quantity of dried food leftover increasing in the formulations as the level of *dusa* decreases. This was done in order to see the effect of different levels of food leftover in the formulations. This was not in line with what was reported by Sansoucy (1986) because F5 has 30% dried food leftover. The different proportion of poultry litter ranged from 11% in F5 to 21% in F2. The highest quantity of blood meal was in F5 (16%) while the lowest was in F2 and F3 (10%). Poultry litter and blood meal were varied in order to balance the protein content in each formulation. High level of blood meal in F5 was because it was the only protein source in the formulation, while the least value of 10% used in F2 and F3 was because poultry litter was high in these formulations. This was not in line with Hadjipanayiotou *et al*., (1993) who incorporated poultry litter at the level of 13% of the formulation. Similarly, Salman (1999) incorporated poultry litter at the range of 5 to 35%.

Proximate composition of formulation

The proximate composition of the different formulations is shown in Table 1. The DM content ranged from 95.60 to 97.50%. These showed that the blocks have dried very well during the two weeks period that was employed. The CP content of the formulations was moderate and ranged from 9.30% (F3) to 15.60% (F4). The highest CP recorded in F4 might be due to moderate level of poultry litter, blood meal and dried food left over. Even though the dried food leftover was used as an energy source it plays an important role in adding to the protein content (14.7% CP) in the formulation. Modu-Kagu *et al*., (2022) reported CP range of 8.22 - 25.73% when locally available feed resources were used to formulate multinutrient blocks. The EE value ranged from 3% in F5 to 5% in F3. The highest EE content recorded might be due to moderate proportion of dried food leftover and poultry litter used. However, Modu-Kagu *et al*., (2022) reported lower values of 1.00 to 1.4%. The crude fibre content ranged from 10.50% in F4 to 15.50% in F2. The highest value might be due to high level of poultry litter (21.00%) used in the formulation. Ash value ranged from 7.00 to 18.00%. The reason for this high value might be due to 10% blood meal and 21% poultry litter used, while the low value recorded could be due to high level of dried food leftover which has low ash content (1%). Moreover, the values recorded were higher than 7-8% ash reported by Onwuka *et al*. (1989).

Table 1: Proportion of ingredients used, proximate composition and cost of the formulations

Ingredients	**Formulations (%)**					**SEM**
	F1	F2	F3	F4	F5	
Dried food left over	10.00	12.00	20.0	25.0	30.0	-

Dusa	30.00	27.00	20.0	15.0	13.0	-
Poultry litter	15.00	21.00	20.0	17.0	11.0	-
Blood meal	15.00	10.00	10.0	13.0	16.0	-
Molasses	8.00	8.00	8.0	8.0	8.0	-
Urea	6.00	6.00	6.0	6.0	6.0	-
Salt	4.00	4.00	4.0	4.0	4.0	-
Cement	6.00	6.00	6.0	6.0	6.0	-
Potash	6.00	6.00	6.0	6.0	6.0	-
Total	100.0	100.0	100.0	100.0	100.0	-
Parameters	**Proximate composition (%)**					
DM	95.60	95.60	97.40	97.00	97.50	0.412^{NS}
CP	10.50^{bc}	10.20^{bc}	9.30^{c}	15.60^{a}	13.10^{ab}	0.706*
CF	14.00^{a}	15.50^{a}	13.50^{a}	10.50^{b}	12.50^{ab}	0.561*
EE	5.00	4.00	5.00	4.00	3.00	0.397^{NS}
Ash	12.00^{b}	18.00^{a}	7.50^{c}	8.00^{c}	7.00c	1.160*
NFE	58.50^{b}	52.30^{c}	64.70^{a}	61.90^{a}	64.40^{a}	1.277*
	Cost/formulations (₦)					
100 Kg	3901.00	3770.00	3742.00	3772.60	3777.30	-
20 Kg	780.22	753.94	748.38	754.51	750.06	-

Key: F1 to F5 formulations 1 to 5, DM = dry matter, CP = crude protein, CF = crude fibre, EE = ether extract and NFE = nitrogen free extract, $1 US Dollar = ₦ 129 at the time of the study.

Conclusion

It was concluded that it is possible to make or produce multinutrient blocks (MNB) of good nutritional composition, hard and compact using a variety of locally available feedstuffs such as dried food leftover, *dusa*, poultry litter and blood meal. Blocks produced can meet up to the requirement of the animals, most especially during the dry season when pasture grass or straw are of poor quality. Multinutrient blocks can therefore be used to replace the conventional supplements fed to ruminants in the semi-arid region for optimum productivity at subsidized rate by local farmers or small-scale farmers.

REFERENCES

Alaku, S.S. (1983). Body and carcass losses in goats during the advance of period of the West African Sahelian dry season. *World Review on Animal Production*, 19:49-54.

Allen, M. (1992). Making molasses urea feed block. A guide to the technique. *Asian Livestock* XVIII, 6 Pp 68-71.

Association of Official Analytical Chemists. (1999). *Official Methods of Analysis*. 14th Ed. Washington D.C.

Hadjipanayiotou, M., Verhereghe, L., Allen, M., El-Said., and Abdulkadir, A. (1996). Urea Blocks**.** In: *Methodology of block making and different formulae tested in Syria*. Pp 35-150.

International Fund for Agricultural Development (2000). *Feed Blocks*. *A Strategic Alternative Supplement For Small Ruminants Raised Within Crop-Livestock System Under Semi-Arid Conditions*. IFAD Document 2000. Pp. 2-5.

Leng, R.A., Preston, T.R., Sansoucy, R., and George Kunju, P.L. (1991). Multinutrient blocks as strategy supplement for ruminants. *World Animal Review*, 67:11-19.

Marte, A.M., Zarah, A.I., Modu-Kagu, H.A., and Mohammed, I.D. (2018). Development of multi-mineral blocks using local feed ingredients in semi-arid Nigeria. *Nigerian Journal of Animal Science and Technology*, 1 (1):48 – 53.

Modu-Kagu, H.A., Zarah, A.I., Mohammed, A., Maibe, M., and Mohammed, I.D. (2022). Development and evaluation of multi-nutrient blocks using locally available energy and protein sources in semi-arid Nigeria. *Proceedings of the 11th Animal Science Association of Nigeria (ASAN) – Nigerian Institute of Animal Science (NIAS) Joint Annual Meeting and 27th ASAN Annual Conference*. 23rd - 27th October 2022. Bauchi, Nigeria. Pp. 824 – 826.

Mohammed, I.D., Baulube, M., and Adeyinka, I.A. (2007). Multinutrient Blocks II: Formulation and production under a semi-arid environment of North-East Nigeria. *Journal of Biological Science*, 7(2):389-392.

Mohammed, I.D., and Marte, A.M. (2006). Formulation and production of multinutrient block (MMB) using local feed ingredients in semi-arid region. Pp 2-8.

Onwuka, C.F.I., Akinsoyinu, A.O., and Tewe, O.O. (1989). Feed value of some Nigerian browse species. Chemical composition and in vitro digestibility of leaves. *East African Agricultural and Forestry Journal*., 54: 157-163.

Salman, A.D. (2001). The role of multinutrient block for sheep production in integrated cereal. Livestock farming system in Iraq. IPA Agricultural Research Centre, Baghdad Iraq. Pp 1-8.

Sansoucy, R. (1986). The Sahel. Manufacture of molasses urea blocks. *World Animal Review*, 57:40-48.