Growth performance and cost-benefits of feeding West African dwarf goats groundnut haulms and cowpea husk supplemented with brewers’ dried grains

Abstract

The objective of this work was to evaluate the growth performance and cost-benefits of feeding West African Dwarf goats’ groundnut haulms and cowpea husk supplemented with brewers’ dried grains. Twelve West African Dwarf bucks were assigned to four diets (treatments) consisting of groundnut haulms fed at 10, 30, 70 and 90% combined with cowpea husk at 90, 70, 30 and 10% respectively designated as treatments T4, T3, T2 and T1 with Brewers dried grain (BDG) fed at 150g across treatments as supplement. Parameters measured were daily feed consumption, daily weight changes, daily running costs in form of man hour labor charges, drugs, revenue, transportation and other charges. Data obtained were subjected to analysis of variance (ANOVA) and net farm income (NFI) to carry out the cost-benefit analysis. Results of the research showed average daily dry matter intake (DMI) varying from T4 (377.71g) to T1 (417.08g) the highest with significant difference (P<0.05) across treatments. While dry matter intake as percentage of live weight (DMI%LVW) obtained were T4 (3.23) the highest followed by T3 (3.17), T2 (3.03) and T1 (2.91), mean average daily weight gains (ADG) of 62.5g for T1 being highest, followed by T4 (61.42g), T3 (60.17g) and T2 (60.0g) were obtained respectively with significant difference (P<0.05) across treatments. Apparent digestibility results obtained were T4 (69.22%) being the highest, followed by T3 (68.9%), T2 (67.82%) and T1 (67.75%) the lowest. There was no significant (P>0.05) difference across treatments. Costs-benefits analysis showed that T1 had the highest revenue (N7110.00) followed by T4 (N7040.00), T3 (N6560.00) and T2 (N6436.67) in that order. Gross margin obtained were T4 (N1090.00) the highest followed by T3 (N1073.33) and T2 (N1070.00). With profits per Naira invested N0.18 for T4 and T3 and N0.20 for T2 and T1, cost per kilogram weight gained were N1795.60, N1704.76, N1592.48 and N1590.12 for treatments T4, T3, T2 and T1 respectively. It is concluded that higher inclusion of groundnut haulms in combination with cowpea husk brings more efficient nutrients utilization, higher rate of weight gain and hence higher profit in goat fattening.

Keywords: growth performance, cost-benefits, goats, cowpea husk, groundnut haulms

Introduction

Nigeria is faced with perennial problem of inadequate quality and quantity of ruminant feed resources. This has resulted in the low productivity of these animals. The natural vegetation which forms the bulk of the primary feed resources is of low nutritive value especially during the dry season. Heavy losses are usually recorded among ruminant animals that depend on natural vegetation for their sustenance during this period. The use of conventional feedstuffs which can salvage the situation is rather unsustainable due to their high costs. Okoruwu, et al.2 reported that contemporary ruminant feeding development in Nigeria is now geared towards searching for inexpensive and readily available feed resources which can partially or wholly substitute the scarce expensive feedstuffs and inadequate forages.

In Nigeria, large quantities of crop residues are generated at the end of each harvest annually. These residues are of no utilizable or consumable value for man. These crop residues if properly harnessed can meet the nutritional needs of these animals as well as eliminate environmental nuisance associated when left unattended to. It is further reported that most of these crop residues are highly fibrous, tough textured, of low digestibility and deficient in nutrients.3 The use of forage legumes in livestock production systems in the tropics as alternative to highly expensive oil seed cakes has increased in recent years.

Cowpea (Vigna unguiculata) husk is a potential supplementary feed for ruminants in the dry season. About 82,000 tones of Cowpea husk and straws are produced in Nigeria annually. It has been found to have a depressing effect on feed intake in goats but readily accepted by the animals.4 Nigeria is the leading producer of groundnuts in Africa with an annual estimated output of 2 million metric tones.5 Thus vast quantities of groundnut haulms are available annually for livestock feeding. The availability of this crop residue and variation in results obtained from ruminants fed on it underscore the need for more studies on how best its potential as animal feed can be exploited. Brewers’ dried grains are the solid residues left after the processing or extraction of local beer from grains. Once the sugar content of the grains is extracted, the remaining product is a concentrate of protein and fiber that is suitable for animal feeding particularly ruminants.6 This residue has a long history in animal feeding.
Growth is a complex biological process that is induced by differential development rates of body tissues. In practice, external measurements of the body have been used to estimate the development of the skeleton and/or soft tissues of the body. In Nigeria most recently, in response to consumer demands, more goat meat is being produced. This is beneficial to the farmer in that there is quick turnover on investment and production of desirable carcass. Goats can be successfully fed a variety of feedstuffs and can be marketed at various weights, ages and body conditions. Profitability is influenced by season, year, genetics and management. Ram fattening for instance, is a profit motivated farming business aimed at maximizing profit.

Kemo reported that feeding is the most important part of commercial goat production and maximum profit is mostly dependent on high quality fresh and nutritious feed. Farming for profit requires that a farmer grows crops or livestock that can be sold on market. Farmer must understand market. He/she should know what leads to profit and what leads to loss. The goals of the farmer should among other things be profit maximization, risk reduction, food security and education for children. Costs-benefits analysis provides ways of analyzing and comparing the profitability of crop or livestock under different circumstances. Therefore economic analysis is a valuable tool in the planning and management of animal production enterprise. Livestock enterprise entails resource allocation (money, land and labour (etc.) which are scarce with the aim of making profit. Most of these economic benefits can be expressed in monetary terms. Information on growth performance and cost-benefits of feeding West African dwarf goats’ groundnut haulms and cowpea husk supplemented with brewers' dried grains in this region is scanty.

The research was carried out in the small ruminants’ unit of Adamawa State University Livestock Teaching and Research farm, Mubi, Adamawa State, Nigeria. Mubi region lies on Latitude 9°11’ east of the Greenwich Meridian at an altitude of 696m above sea level. It is bounded in the South and East by Republic of Cameroun. With land area of 4,728.77m² and population of 245,460, it is situated in the Sudan Savanna zone of Nigeria. The vegetation type is best described as Combretacious woodland savanna which consists of grasses or weeds and shrubs collectively making 70% of the entire vegetation. Some of these grasses, weeds and shrubs are used as animal feeds. The area has two distinct seasons. Rainy season lasts for four (4) months and dry season that lasts for eight (8) months. Annual rainfall ranges from 700-900mm with peak in August. The area has minimum temperature of 12.7°C in January and maximum of 37°C in April.

Materials and methods

Experimental site

The research was carried out in the small ruminants’ unit of Adamawa State University Livestock Teaching and Research farm, Mubi, Adamawa State, Nigeria. Twelve male West African Dwarf goats of about one year old and 12Kg initial weights were individually housed in wooden pens. The pens were randomly divided into four groups (treatments) of 3 pens each in a randomized complete block design (RCBD). The treatments were T1, T2, T3 and T4 that received groundnut haulms at 10, 30, 70 and 90% combined with cowpea husks at 90, 70, 30 and 10% basal diet which was supplemented with 150grammes of brewers’ dried grains in treatments 1, 2, 3 and 4 respectively. The basal diets were fed ad libitum throughout the experimental period of 70 days. Clean drinking water was provided ad libitum in all these pens.

Parameters determined

Parameters measured were daily feed consumption, daily weight changes, daily running costs in form of man hour labor charges, drugs, revenue, transportation and other charges. Other parameters determined were revenues generated from the sales of fattened animals, used equipment and manure. Proximate composition of the experimental diets was determined by using the method of analysis as described by Association of Official Analytical Chemists. Nutrients determined were dry matter (DM), crude protein (CP), crude fiber (CF), Ether extract (EE), nitrogen free extract (NFE) and total ash.

Results and discussion

Data obtained were subjected to analysis of variance (ANOVA) and net farm income (NFI) analysis as described by Jabo et al. and Mohammed to carry out the cost-benefit analysis which is specified by Aderinola & Akinrinola as cited by Mohammed as follows.

Where NI, Net Income (Profit of the product in Naira/Kg; TR, Total Revenue of the ith product in Naira/Kg; TVC, Total Variable Costs of the ith product in Naira/Kg; TFC, Total Fixed Costs of the ith product in Naira/Kg.

Some economic indicators were also applied to ascertain the economic viability of the study. Hence Operating ratio, gross ratio and fixed ratios were calculated following Olukosi & Erhabor as below;

Where OR, operating ratio; TOC, Total operating cost; GI, Gross income; GR, TFC/GI

Where GR, Gross ratio; TFC, Total fixed expenses; GI, Gross income

FR=TFC/GI

Where FR, Fixed ratio; TFC, Total fixed cost; GI, Gross income

Feed conversion ratio, being total feed intake per unit weight gain was also calculated for each goat in each treatment.

Results and discussion

In Table 1, are presented the experimental diets with groundnut haulms and cowpea husk combined at different levels. The efficiency is measured by the dry matter intakes, dry matter intake as percentage of live weight, daily weight changes, feed efficiencies, cost per weight gain, net return on investment and return per Naira investment. Results of the experiment on growth performance and costs-benefits are presented in Table 2 & 3. Results of the research showed average daily dry matter intake (DMI) varying from T1 (377.71g) to T4 (417.08g) the highest with
significant difference (P<0.05) across treatments. This is lower than that (668.4g) of Mohammad & Ramli\textsuperscript{16} when they fed goats Napier grass and oil palm frond supplemented with Soy waste. However, Mtenga et al.\textsuperscript{15} had earlier obtained dry matter intake of 794g which is similar to that of Mohammad & Ramli\textsuperscript{16} when they fed Saanen goats high energy diets. They concluded that goats fed high energy diets grow faster and utilize feed more efficiently than those on low energy diets. While dry matter intake as percentage of live weight (DMI\%LVW) obtained were T\textsubscript{4} (3.23) the highest followed by T\textsubscript{3} (3.17), T\textsubscript{2} (3.03) and T\textsubscript{1} (2.91), they were lower than 3.7% obtained by Mohammad & Ramli.\textsuperscript{16} Mean average daily weight gains (ADG) of 62.5g for T\textsubscript{4} being highest, followed by T\textsubscript{3} (61.42g), T\textsubscript{2} (60.17g) and T\textsubscript{1} (60.0g) were obtained respectively with significant difference (P<0.05) across treatments. This was lower than 185g of Mtenga et al.\textsuperscript{6} but similar to 66.07g obtained by Nyako.\textsuperscript{21} Apparent digestibility results obtained were T\textsubscript{3} (69.22%) being the highest, followed by T\textsubscript{1} (68.9%), T\textsubscript{2} (67.82%) and T\textsubscript{4} (67.75%) the lowest. There was no significant (P>0.05) difference across treatments. Result obtained was similar to 68% reported by Mtenga et al.\textsuperscript{6}

Feed Conversion efficiency varied from 0.147 (T\textsubscript{4}) to 0.163 (T\textsubscript{3}) as against 0.065\textsuperscript{18} and 0.08.\textsuperscript{22} with feed conversion ratios of 6.12 (T\textsubscript{4}) to 6.81 (T\textsubscript{3}) obtained. Feed conversion efficiency is a function of feed intake and weight gain. Nutrients intake in a feed is a function of amount of feed eaten and the nutrients levels in the diet. Growth rate (weight gain) requires extra feed intake above what is required for maintenance. Faster growth rate means better feed conversion efficiency, because it makes more use of feed available for production (NRC, 1994).

Babale et al.\textsuperscript{21} on feeding West African Dwarf goats varying levels of maize bran with groundnut haulms basal diets obtained 664g DMI, 3.4% DMI\%LVW, 75.70g average daily gain, 75% digestibility with feed efficiency of 9.78. The authors concluded that groundnut haulms being a legume forage rich in crude protein and maize bran rich in energy, could be economically used in formulating diets for dry season feeding of small ruminants. Costs-benefits analysis (Table 3), showed that T\textsubscript{3} had the highest revenue (N7110.00) followed by T\textsubscript{1} (6109.00) the highest followed by T\textsubscript{4} (5010.00) and T\textsubscript{2} (2910.00) respectively. The economic analysis of the research showed a gross farm income of N1080.00 per head of the animals which implies that the experiment was a profitable venture. The highest turnover of N1090.00 was obtained with treatment T\textsubscript{3} (70% groundnut haulms and 30% cowpea husk) diet. However, economic efficiency of production was found to decrease with increase in the level of cowpea husk inclusion in the diet. This is because groundnut haulms is of higher nutritive value than cowpea husk.\textsuperscript{20}

**Acknowledgments**

None.

**Conflicts of interest**

Author declares that there is none of the conflicts.

**References**


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