RUMINANT LIVESTOCK FEED RESOURCES IN THE KUMBUNGU DISTRICT OF GHANA

Ansah, T. and Issaka, A. C.
University for Development Studies,
Faculty of Agriculture, Department of Animal Science,
P. O. Box 1882,
Tamale, Ghana

ABSTRACT

The study explored the types of ruminant livestock feed resources in the Kumbungu District of the Northern Region. Simple random sampling was used to select 100 livestock farmers from ten communities in the District. A semi-structured questionnaire was used in collecting data on the farmer's background and operational information such as types of ruminant livestock kept, crops grown, yield per acre and sources of feed for livestock. The results showed that sheep and goats were the most common ruminant livestock species kept by 88% and 86% of the respondents respectively with 43% keeping cattle. The average tropical livestock unit (TLU) per household (HH) was 13, 11 and 8 for cattle, sheep and goat respectively. With the overall average of 10.3 TLU/HH. The types of feed resources were natural unimproved pasture, browse plants, crop residues and agro by-products with natural pasture being the most dominant type throughout the year. The types of cereal-based crop residues generated were maize stover (325 kg/HH/annum), rice straw (411 kg/HH/annum) and millet (85 kg/HH/annum). The legume-based residue generated were groundnut haulm (86 kg/HH/annum), cowpea haulm (195 kg/HH/annum) and soybean haulm (133 kg/HH/annum). Agro by-products such as maize bran (216 kg/HH/annum) and rice bran (41 kg/HH/annum) were also generated in the study area. An average of 1236.3 kg of crop residues and 523.2 kg agro by-products was produced per household. With an estimated 11,592 kg DM required for the maintenance of the ruminant species per HH per annum in the dry season (180-days), crop residues and agro by-products could only provide 9.8% with the rest expected to come from natural pasture and browse plants. Without cattle, the crop residues and agro by-products can supply about 53% of the dry matter requirement for maintenance. From this study, it is clear that different types of feed resources are available for feeding ruminants within the study area and this could help address the problem of dry season feed shortage if appropriate feed preservation and feeding strategies are employed. The cultivation of improved dual-purpose (fodder and food) crops and also enhanced crop husbandry practices could increase the yield of crop residues and agro-by products.

Keywords: *Agro by-products, Crop residue, Ruminants, Tropical Livestock Unit*

INTRODUCTION

Ruminant livestock are kept worldwide for their numerous economic and social contributions to humanity. Pasture from unimproved rangelands serves as a major source of feed for ruminant livestock (Allen-Diaz, 1996) Rangelands have been reported to occupy about 54% of terrestrial ecosystem and sustains approximately 30% of the world's population (Reynolds *et al*., 2007; Estell *et al.,* 2012). With increasing human pop-

ulation coupled with increasing demand for land for purposes of estate development and other infrastructure development, these rangelands may suffer a decline in size.

Demand and consumption of meat and meat products in Ghana has been rising with an attendant increase in demand for feed resources (FAO, 2005). The Guinea and Sudan Savanna Zone of Ghana, together supply about 75% of the total cattle, 35 % each of sheep and goat in Ghana (Oppong-Anane, 2006).

The production of livestock and their productivity is however, far below the population's requirement for animal protein and this has led to a surge in the importation of meat and meat products to augment the supply (FAO, 2005).

The nutrition of ruminant livestock occupies a very important section of budgetary allocation for every livestock farmer. Documenting the indigenous sources of nutrition for ruminant livestock is key to policy formulation and overall development of the sector. The protein content of forage has been found to be low with high fibre content and low digestibility of nutrients especially in the dry season (Castillo-Caamal *et al*., 2003). In the wet season, the forages are high in nutrients but access by livestock is limited due to the cultivation of food crops.

The use of crop residues and agro by-products in various conserved forms has been identified to play an important role in the nutrition of ruminant livestock and ensure year-round availability of feed. It is also the cheapest way of reducing the rising cost of feeding ruminants in the tropics (Attoh-Kotoku, 2003).

Tolera *et al*. (2012) reported that crop residues supply about 50% of the total feed supply in Ethiopia. In the Yendi District of Ghana, it has been reported that 91% of the livestock farmers use legume crop residues for feeding in the dry season (Ansah *et al*., 2006).

Feed resource assessment is important in diagnosing feeding problems and suggest intervention measures. It will also help to design feeding alternatives especially during the dry season of the year to mitigate the livestock feed shortages in the area. Hence, this study was initiated to assess the major feed resources in the Kumbungu District of the Northern Region of Ghana.

MATERIALS AND METHOD

Study Area

The study was conducted in the Kumbungu District of the Northern Region of Ghana. The District was carved out of the then Tolon/ Kumbungu District in 2011. It was inaugurated on 28th June, 2012 with Kumbungu as its district capital. It lies on latitude 9° 24'N and longitude 1° 00'W and at an altitude of 183m above sea level in the Guinea Woodland ecological zone of Ghana (GSS, 2014). The District shares boundaries to the North with Mamprugu/Moagduri District, Tolon and North Gonja Districts to the West, Sagnerigu District to the South and Savelugu Municipal to the East. The District has 135 communities. The total land mass is approximated at about 1,599 Sq. km.

The study area has a rainfall pattern which is unimodal. The rain begins from May and end in the latter part of October with the peak occurring between July and September. The mean rainfall is 1,043 mm. The rest of the year is dry with temperature generally fluctuating between 15°C and 42°C. The mean annual day relative humidity is 54% with the harmattan occurring from November to February (GSS, 2014).

The vegetation is mainly woody Guinea savanna and it is dominated by tall grasses with shrubs and scattered trees. The land is generally undulating with a number of scattered depressions. The soil is of the sandy loam type except in the low lands where alluvial deposits are found. Among the trees found in the study area were shea (*Vitellaria paradox*a), Dawadawa (*Parkia biglobosa*), Neem (*Azadiracta indica*), Mango *(Mangifera indica*) which are economic trees and form an integral part of livelihood of the people. The grasses commonly available are guinea grass (*Panicum maximum*), buffel grass (*Cenchrus ciliaris),* gamba grass *(Andropogon gayanus)* and spear grass (*Heteropogon contortus*).

Data Collection and statistical analysis

Hundred livestock farmers were sampled from 10 communities, using simple random sampling with 10 farmers per community (Cheshegu, Gingani, Yosheli, Gupanarigu, Nwodua, Kpilo, Gbullung, Kochim, Kpalga and Cheyohi). Farmers were interviewed using semi structured questionnaire. Data was collected both from primary

and secondary sources. Secondary sources of data on climate, soil, topography and livestock production constraints were collected by reviewing different documents from the Kumbungu District Assembly. Primary data (household size, land utilization pattern, major feed resources, production of grain and crop residues, household herd size and seasonality of feed resources) were obtained from the respondents using questionnaires. Focused group discussions were organised in each community to clarify issues not well addressed through the survey and to validate some information collected during individual interview. A total of 20 individuals, 2 from each community were involved in the group discussion. The discussion focused on identifying constraints related to livestock feed and identifying the major livestock production constraints.

From the operational information particularly on food crops and yield, the following parameters were estimated using the method of Munthali and Dzowela (1985).

kernel-to-residue ratio of maize -2:1
kernel-to-residue ratio of millet -2:1,
kernel-to-residue ratio of rice -1:1
kernel-to-residue ratio of groundnut -1:1
Kernel-to-bran/cake-yield ratio of maize -1:3.1
Kernel-to-bran/cake-yield ratio of rice -1:10
Paddy rice-to-husk ratio of 4:1

Kernel-cob ratio of 4:1 (Haruna A. personal comm, 2014)

Kernel-to-haulm-ratio of soybean -1.8:1 (Denwar, N. N. personal comm. 2014)

Kernel-to-haulm-ratio cowpea - 1.5:1 (Zongo, 1997)

The number of ruminant livestock was expressed as tropical livestock unit (TLU) with 1 TLU being equivalent to a hypothetical animal with a live body weight of 250 kg (Harvest Choice, 2011). The following conversion factors were used: Cattle (0.70), sheep/goat (0.10). The estimated daily dry matter requirement for maintenance of each TLU was computed using 2.5 % of the live body weight per TLU (Jahnke, 1982).

The data was summarized into means and percentages using descriptive statistics from SPSS version 16.0.

RESULTS

Of the 100 respondents interviewed, 98% were males with only 2% being female. The majority of the respondents were above 40 years of age (Table 1). The educational background of the respondents was basic education (14%), secondary (2%), tertiary (3%) and those with no formal education were 81%. Majority of the respondents had a household size of between 3-10.

From Table 2, it is clear that the average number of cattle per household was more than that of sheep and goats. The tropical livestock unit

Table 1: Age distribution and house hold size of farmers

Age group	Percentage (%)
20-40	12
41-60	45
60>	43
Total	100
Household size	
3-10	64
11-20	30
21>	6
Total	100

Table 2: Types and total number of animals kept by respondents

Animals	Total number of animals	Mean/HH	Mean TLU/ HH	Estimated live weight (TLU x 250 kg)
Cattle (n=43)	543	12	8.4	2100
Sheep (n=88)	994	11	1.1	275
Goat (n=86)	705	8	0.8	200
Total	2242	31	10.3	2575

HH: Household, Tropical livestock unit conversion factor: Cattle (0.70), sheep/goat (0.10); 1TLU=250 kg live weight

(TLU) estimated was averagely 10.3 per household with cattle having the highest.

System of management

Majority (78%) of the farmers kept their livestock under the extensive system of management, while a few (22%) of them practice the semi-intensive system. None of the farmers kept their animals under the intensive system of livestock keeping.

From Table 3, all the respondents interviewed were involved in maize cultivation. More than half of the respondents cultivated rice and groundnuts with those involved in the cultivation of millet, cowpea and soybean being less than 20%.

Table 4 shows the estimated dry matter requirement and dry matter supplied from crop residue and AgBP. An estimated 50% losses in crop residues due to other uses, destruction by rain due to harvesting time and inadequate storage and transport facilities was used in computing the accessible and utilizable CR.

Types of browse plants farmers relied on to feed their ruminants during the wet season is shown in Table 5. The leaves of the trees were the most common botanical fraction used in feeding ruminant livestock.

Table 3: Production of crop residues and agro by-products

Crop	No. of Respondents	Avg. Area Planted (Acres)/HH	Avg. Kernel Production (kg)/HH	Avg. Crop Residue yield (kg)/HH	Avg. Bran/ Cake (kg)/HH	Avg. Husk/ cob (kg)/HH
Grasses						
Maize	100	3.3	650.0	325	216.6	162.5
Rice	77	1.9	411.6	411.6	41.2	102.9
Millet	18	1.0	158.1	85	-	-
Total		5.2	1219.7	821.6	257.8	265.4
Legumes						
Groundnut	58	2.0	86.4	86.4	-	
Cowpea	7	1.0	130.0	195.0	-	-
Soybean	15	1.1	240.0	133.3	-	-
Total		4.1	456.4	414.7		

HH: Household

Table 4: Estimated annual DM supply, DM requirement and feed balance per household

Animal	Estimated Live weight (kg) per HH	Estimated daily DM requirement (Kg) per HH	Estimated annual DM requirement (Kg) per HH in dry season	Total AgBP accessible- 100% of generated residues (kg/ HH)	*Total CR accessible- 50% of generated residues (kg/HH)	Balance of DM demand and supply (kg/HH)
Cattle	2100	52.5	9450			
Sheep	275	6.9	1242			
Goat	200	5	900			
Total	2575	64.4	11592	523.2	618.5	-10,450.6

1TLU require 2.5% DM per day; Dry season=180 days (November to April);
*CR=Crop residue; AgBP: Agro by- products, *Assume a 50% loss due to other uses and destruction*

Table 5: List of browse plants used to supplement livestock feed

Local name of browse in (Dagbani)	Common name	Scientific name
Puhuriwooni	Apple-ring acacia	*Faidherbia albida*
Kpalga	Afzelia or African Mahogany	*Afzelia africana*
Nei	African Rosewood	*Pterocarpus erinaceaus*
Bulunbugum	African *custard-apple*	*Annona senegalensis*
Kangkang	*Sycamore fig*	*Ficus gnaphalocarpa*
Solemintia	*Leucaena*	*Leuceana leucocephala*

DISCUSSION

The fewer women involvement in livestock rearing conforms to the general assertion that women participation in the enterprise is low. The low level of women involvement in livestock ownership and management could put a limitation on the income generation activities available to them and increase the poverty situation among them.

Majority of the respondents (88%) were above the age of 40. Rural urban migration is a common phenomenon in most rural communities in Northern Ghana. This phenomenon attracts a lot of the young people (below 40 years), hence, the high domination of the enterprise by the aged.

The lack of formal education among livestock farmers in this study agrees with the findings of Ansah *et al*. (2006) on the educational level of livestock farmers in some Districts of the Northern Region. This result could impact negatively on the rate of adoption of new and modern farming practices.

Household size is an important factor in the northern family system. In the Kumbungu District, the range was quite broad and spanned from 3 to 27 per household. The large family size may be attributed to the extended family system practiced within the District. Having many family members especially in the Northern sector of the country is considered as an asset for extensive farm activities.

Fewer households kept cattle compared with sheep and goat. This might be due to the relatively low cost involved in small ruminant production compared with large ruminants. The estimated total TLU reported in this study is lower than what was reported by Assefa *et al*. (2013) in some rural communities of Ethiopia.

The grazing of natural unimproved pasture was the commonest feeding practice in the study area. According to the farmers, the grazing of natural pasture is faced with the challenge of quantity and quality during the year. In the wet season, there is abundance of fresh quality forage on most grazing lands, however, the use of these lands for food crop cultivation results in the clearing of the forages and tethering of animals which denies the animals' full access to the quality forage. In the dry season, animals are given free access to these grazing lands, but the forage available is usually of poor quality in terms of crude protein, high lignin and silica content and poor digestibility (Olubajo and Oyenuga, 1970; Alhassan *et al.*, 1999).

The commonest food crop cultivated in the study area was maize from which crop residue and crop by-products were generated. The non-legume based crop residues are mostly left on the field as mulch and also for animals to graze. The practice could lead to a high feed wastage as the residue could easily be contaminated with urine and faecal matter but also enrich the soil with organic carbon, phosphorus and nitrogen. An earlier study has suggested that between 25-50 % of the crop residue generated in the humid forest and savanna zones of West Africa could be used as feed for livestock without seriously affecting crop yields (Larbi *et al*., 2002). It became apparent from the study that maize stover was used as fuel hence reducing its importance as feed for ruminants. This finding is also in line with the findings of Jaleta *et al.* (2015), who observed that there are limitations to the use of maize stover for animal feeds because some farmers may prefer to use it as fuel for cooking

so as to save on expenses on fire wood and charcoal.

The estimated crop residue and AgBP to animal dry matter requirement show a negative feed balance of -10,450.6 kg per household in the dry season. The crop residues and AgBP could only supply about 9.8% of the total dry matter requirement per household. This is lower than the 50% reported by Tolera *et al.* (2012) in Ethiopia. The difference could be due to a possible use of improved crop varieties with high potential for fodder and food yield. The relatively high dry matter requirement was due to the keeping of cattle. Without cattle, approximately 53.3% of the dry matter requirement of sheep and goats could be supplied from crop residues and AgBP sources. This might be the reason for more farmers keeping sheep and goat than cattle.

Rice straw could help solve the shortage of feed in the dry season and thus increase the number and performance of ruminants. During one of the group discussions with farmers, they indicated that they allowed their animals to feed on the rice straw without any treatment and this is in line with Sundstøl and Owen (1984) and Preston (1995) who reported that rice straw is usually fed untreated to ruminants without supplements in spite of the fact that many methods for improved utilization of straw have been developed and recommended. Unlike residues from non-leguminous crops, residues from leguminous crops were collected, stored and fed as supplement to the animals. They however, indicated that they lose a lot of the residues as a result of lack of storage facilities, poor road network and inadequate means of transport. The high negative feed balance in the dry season indicates that crop residue and AgBP alone cannot sustain the 3 main ruminant's species raised per household in the District. Contributions from the other feed resources such as natural pasture and browse plants are needed if the potentials of these animals are to be realized.

The ruminant livestock farmers relied on browse plants as important sources of feed supplement throughout the year. These are harvested and hanged on locally made hangers for the animals to feed. Browse plants maintain appreciable levels of crude protein and less fiber concentration throughout the year. The use of these browse plants as feed is usually limited by accessibility since most of these plants are in the wild with very little effort put into their cultivation (Ansah and Nagbila, 2011). In recent times, extracts from some browse plants have been found to have beneficial effects on protein digestion in the rumen, enteric methane mitigation and meat quality (Alexander *et al.,* 2008; Jakhmola, 2011). Cultivating some of these species as live fences for crop farms will help deal with the limitation cited by the farmers.

CONCLUSION

The study brought to light that most households in the Kumbungu District kept cattle, sheep and goats with an average TLU of 10.3 per household. The study indicated that the feed resources available in the area with animal feeding potentials were vast natural pasture, crop residue, agro by-products and browse plants. The crop residue and AgBP alone could only supply 9.8% of the total dry matter requirement per household for cattle, sheep and goat and 53% of the requirement of sheep and goat in the dry season.

Modern feed processing techniques such as pelleting and feed blocks could be introduced in order to reduce the storage space and wastage during feeding. The cultivation of high yielding dual purpose (fodder and crop) crop varieties and improved crop husbandry practices could enhance the crop residue yield. Cultivation of browse plants as live fences could ensure regular access to browse plants for livestock feeding.

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