

FEEDS AND FORAGES FED TO RABBITS IN THE COASTAL SAVANNAH ECOLOGICAL ZONE OF GHANA

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ABSTRACT

A survey was undertaken in the Coastal Savannah ecological zone of Ghana to solicit information from 132 rabbit keepers on rabbit feeds and feeding with emphasis on forages. The main feed sources for the rabbits were commercial poultry and rabbit feed, on-farm prepared feed and forage. About half the rabbitries used on-farm prepared feed, comprising cereal brans, oyster shell, fishmeal, soymeal and groundnut haulm as the main ingredients, purposely to cut down on feed cost while aiming at achieving balanced diets. Plants providing forages as rabbit feed comprised six trees, eight forbs, five shrubs and three graminoids. Some forages, though readily available during the rainy season, were scarce in the dry season. The four highest ranked forages in terms of availability and perceived acceptability to rabbits were Brassica oleracea, Stylosanthes guianensis, Musa paradisiaca and Panicum maximum for forbs, shrubs, trees and graminoids respectively. Half of the rabbitries fed chopped forages directly to rabbits without any further processing, while the rest washed, wilted or salted forages before feeding. Basic processing of forages such as wilting is necessary prior to feeding, particularly for leguminous forages, to reduce or eliminate some anti-nutrients that may be present and could be detrimental to the health of the animals. The intake of the identified forages by rabbits in the zone in acceptable quantities suggests that forages could be used successfully in feed or as supplements for rabbit production.

Keywords: Rabbit, plant, feed, forage, processing, availability, acceptability

INTRODUCTION

Rabbit farming is a highly profitable venture and has the potential of contributing significantly to nutritional and food security as well as poverty alleviation in Ghana. A major constraint to rabbit rearing in the country is poor nutrition and without proper feeding rabbit farming will experience low productivity, high mortality and financial loss (Osei *et al.*, 2012). Forages, comprising tree leaves, forbs, shrubs and graminoids

are dependable source of protein feed for herbivorous animals in the country. The rabbit, though a lagomorph, is herbivorous and can therefore survive on an all forage diet. However, optimum performance of rabbits can be ensured only in a mixed feeding regime involving forage and concentrate (Iyeghe-Erakpotobor and Muhammad, 2008). When appropriate balance of nutrients is available in forages, they can replace most of the grain in rabbit diets thereby reducing

concentrate needs of the animals (Adeyemi and Akanji, 2012), leading to reduced production cost. There is inadequate information on forages used as rabbit feed in Ghana. *Cajanus cajan*, *Leucaena leucocephala*, *Tridax procumbens*, *Panicum maximum*, *Pennisetum purpureum*, *Brachiaria ruziziensis*, *Pueraria spp.*, *Gliricidia sepium*, *Stylosanthes spp.*, *Musa spp.*, *Ipomeas batatas*, *Manihot esculenta* and *Moringa oleifera* were identified as major plants providing forages for feeding rabbits in Southern Ghana (Osei et al., 2012), an area covering the southern sector of the Forest and the entire Coastal Savannah ecological zone of the country. The current study identified types of feed and forages fed to rabbits, and assessed their availability and perceived acceptability to rabbits in the Coastal Savannah ecological zone of Ghana.

MATERIALS AND METHODS

Study area

The study was undertaken in 132 communities in the administrative assembly areas of Komen-da-Edina-Eguafo Abirem, Efutu, Agona West and Cape Coast in the Central Region, Adentan, La-Kwantanang-Medina, Ga South, Ga East and Ga West in the Greater Accra Region, and Ketu, Keta, South Tongu and Akatsi in the Volta Region all falling within the Coastal Savannah agro-ecological zone of Ghana. The climatic conditions in the study area is of the tropical type where average temperatures are usually high with very little variation throughout the year. The mean monthly temperature ranges from 24.0°C in August to 29°C in March with an annual average of 26.8°C. The bimodal rainfall pattern in the zone gives rise to major and minor rainy and growing seasons with a mean annual rainfall of 800 mm. The first raining season begins in May and ends in mid-July, and the second begins in mid-August and ends in October, and relative humidity is generally high in the zone and varies from 65% in the mid-afternoon to 95% at night. High wind gusts occur with thunderstorm activity along the coastal areas (AMA, 2006; SRID, 2017).

Questionnaire administration and data analysis

The survey employed a structured questionnaire in soliciting information on rabbit production with emphasis on feeds and feeding. The questionnaire was pre-tested with 10 rabbit keepers, and out of the 140 questionnaires administered those of eight respondents were rejected due to unreliable information provided leaving 132 questionnaires for analysis. The rabbitries were categorized according to the number of animals kept. Table 1 shows the ranking of forages used as rabbit feed based on availability and keepers' perceived acceptability to rabbit using a three-point scale. The data collected were analyzed by means of descriptive statistics using Microsoft Excel 2010.

Table 1: Forage availability and keeper's perceived acceptability

Ranking	Forage availability and acceptability
1	Highly available or acceptable,
2	Moderately available or acceptable
3	Slightly available or acceptable

RESULTS AND DISCUSSION

Distribution of rabbitries according to regions

Table 2 shows the distribution of rabbitries according to Regions. Half of the rabbitries were from the Greater Accra Region, 34.8% from the Central Region and the rest from the Volta Region of Ghana.

Rabbit feeds

Table 3 shows the main sources of rabbit feed

Table 2: Distribution of rabbitries according to regions

Region	Frequency	Percentage
Central	46	34.8
Greater Accra	66	50.0
Volta	20	15.2

categorized as commercial poultry and rabbit feed, on-farm prepared feed and forages. About 48% of the rabbitries used on-farm prepared feed. Commercial poultry feed, mainly in the form of grower mash further mixed with wheat or rice bran, brewers spent grains, cassava meal, and corn chaff were used mainly by medium and large-scale rabbitries. Such feeds were frequently and carefully sprinkled with a little amount of water to reduce feed dustiness and wastage (Abu *et al.*, 2008). Commercially prepared rabbit feed, mostly in the form of pellets, was scarcely used as it was not readily available. Though pellet feed is known to provide better performance for rabbits than flour concentrate (Kpodekon *et al.* as cited in Aboha *et al.*, 2012) the low patronage of commercial rabbit feed in the study area, discourages commercial livestock feed producers from producing rabbit feed or at best produce minimally, or produce on request as was the case in Nigeria (Abu *et al.*, 2008).

Table 3: Rabbit feeds

Feed type	Frequency	¹ Percentage
Commercial poultry	50	30.6
Commercial rabbit	12	12.9
On-farm prepared	59	48.2
² Forage as sole feed or supplement	78	52.9

¹Percentage refers to rabbitries using a specific type of feed either as sole feed or in combination with other feeds,

²Forage used as supplement at least once a week

Forages were used by all the rabbitries at varying levels. However, about 53% of the rabbitries used forages as sole feed or as supplement to other feeds at least once a week. Medium and large-scale rabbitries occasionally used forages as supplement to concentrate particularly during times of feed shortage. All the ultra small-scale rabbitries as reported by Osei *et al.* (2012) relied mostly on forages in addition to kitchen scraps comprising vegetables, plantain peels, and tubers

in the feeding of rabbits. The importance of forages in rabbit nutrition was manifested in a trial where skipping concentrate feeding up to two days per week in the presence of *ad libitum* forage feeding had no adverse effect on performance and carcass characteristics (Adeyemi and Akanji, 2012).

Ingredients used for on-farm prepared feeds

The major ingredients used in the preparation of on-farm feed are presented in Table 4. Only a few of the keepers ensured that on-farm prepared feed contained all the major nutrient groups of protein, carbohydrates, minerals and vitamins in the right proportions for optimum stock performance. Maize grain and chaff, wheat and rice bran, fish meal and soymeal were the major ingredients in on-farm prepared feed.

Table 4: Major ingredients used in on-farm prepared feeds

Ingredient	Frequency	Percentage
Wheat/Rice bran	75	56.8
Fish meal	26	19.7
Maize grain/chaff	34	25.8
Cassava meal	6	4.5
Groundnut haulm	28	21.2
Oyster shell	12	9.1
Brewers spent grains	5	3.8
Soymeal	8	6.1
Others	22	16.7

Feed Supplements

Table 5 shows the feed supplements used by the rabbitries. About half the feed had vitamins as additives, while 20.5 and 14.4% had salt and minerals respectively included in the feed. Inclusion of probiotics in feed as replacement for antibiotics and for enhancement of immune system of rabbits was a new measure adopted by less than 5% of the rabbitries preparing their own feed.

Table 5: Feed supplements

Ingredient	Frequency	Percentage
Salt	27	20.5
Minerals	19	14.4
Vitamins	67	50.8
Antibiotics	12	9.1
Probiotics	6	4.5

Forages fed to rabbits

The category of plants providing forages as rabbit feed is shown in Table 6. A large variety of forages from four plant life-forms or growth-forms, comprising trees, shrubs, forbs and graminoids (<https://en.m.wikipedia.org>) were used as rabbit feed. *Leucaena leucocephala*, considered as a shrub in this study in view of the stage of growth of the plant when used as feed, could also be classified as a tree ([https://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Leucaena_leucocephala_\(Leucaena\).htm](https://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Leucaena_leucocephala_(Leucaena).htm)). In addition to the forages, plant parts such as peels and rinds of fruits were fed by a few of the ultra small and small-scale rabbitries in the study area. The mostly fed forages comprised 6 trees leaves, 8 forbs, 5 shrubs and 3 graminoids. Shrubs were used by 33.1%, forbs by 33.3%, graminoids by 32.6% and tree leaves by 36.4% of the rabbitries. Forage from two plant classes were used by 39.3 rabbitries, 3 plant classes by 16.7% rabbitries, and the four classes by 12.8%. The main part of trees fed to rabbits were leaves, however, in the case of shrubs and forbs both leaves and tender stems were fed. *Moringa oleifera* forage was popular among keepers of ultra-small and small-scale rabbitries who also used it for human consumption in view of its medicinal properties (Osei *et al.*, 2012). However, the tree loses most of its leaves at the beginning of the dry season, and can therefore not sustain rabbits during the dry season.

Most of the rabbitries used both young and mature forages (68.2%), while 14.4% of them used only mature forages and 17.4% used only young

forages. The part of the plant offered to rabbits did not necessarily reflect feeding behavior of the rabbits but rather the keepers' choice based primarily on forage availability. However, rabbits are known to be very selective in their feeding behavior and in the wild will select and nibble specific plant parts. They generally select leaves rather than stems, young plant materials rather than old and green rather than dry materials, resulting in a diet that is higher in protein and digestible energy and lower in fiber than the available total plant material (McNitt *et al.* as cited in Safwat *et al.*, 2014).

Table 6: Category of Plants Fed to Rabbits

Category of plants	Freq.	%
Tree leaf only	1	1.3
Tree leaf, forb	8	10.3
Tree leaf, shrub	9	11.5
Tree leaf, graminoid	7	9.0
Forb, shrub	13	16.7
Forb, graminoid	6	7.7
Shrub, graminoid	11	14.1
Tree leaf, forb, shrub	7	9.0
Tree leaf, shrub, graminoid	6	7.7
Tree leaf, forb, shrub, graminoid	10	12.8

Note: Number of rabbitries using forages is 78.

Availability and perceived acceptability of forages by rabbits

Table 7 shows the ranking of forages based on availability and keepers' perceived acceptability by rabbits. All the forages were available and acceptable to rabbits, albeit to varying degrees. *Musa paradisiaca*, *Brassica oleracea*, *Stylosanthes guianensis* and *Panicum maximum* ranked first among trees, forbs, shrubs and graminoids respectively as providing the most available and acceptable forages to rabbits.

Most forbs and graminoids, though available during the rainy season, were generally scarce

during the dry season except in areas near water bodies and valleys. The higher availability of forage from trees and shrubs during the dry season could be attributed to their deep root system which enabled tapping of water and nutrients from deep soil profile for the plants to withstand

extended periods of water stress (Aganga and Tshwenyane, 2003).

Ipomoea aquatica, which was available near water bodies throughout the zone, though not in appreciable quantities, is a common vegetable used for rabbit feeding as a basal diet and in

Table 7: Plants providing forage as rabbit feed and their ranking according to availability and perceived rabbit acceptability

Plant	Common name	Availability	Acceptability	Mean	Ranking
Tree leaves					
<i>Moringa oleifera</i>	Moringa	3	2	2.5	3
<i>Mangifera indica</i>	Mango	3	1	2.0	2
<i>Musa paradisiaca</i>	Plantain	1	2	1.5	1
<i>Gliricidia sepium</i>	Gliricidia	3	3	3	4
<i>Carica papaya</i>	Pawpaw	2	2	2.0	2
<i>Manihot esculenta</i>	Cassava	3	2	2.5	3
Forbs					
<i>Brassica oleracea</i>	Cabbage	2	1	1.5	1
<i>Talinum triangulare</i>	Water leaf	1	3	2.0	2
<i>Ipomoea batata</i>	Sweet potato	2	2	2.0	2
<i>Ipomoea aquatica</i>	Water lettuce	2	3	2.5	3
<i>Lactuca taraxacifolia</i>	Wild lettuce	3	3	3.0	4
<i>Euphorbia hitalium</i>	Garden spurge	2	2	2.0	2
<i>Phyllanthus amarus</i>	Stonebreaker	3	3	3.0	4
<i>E. heterophylla</i> *	Milk weed	3	2	2.0	2
Shrubs					
<i>Centrosema pubescens</i>	Centrosema	3	3	2.5	3
<i>L. leucocephala</i> *	Cotton bush	3	2	2.5	3
<i>S. guianensis</i> *	Stylo	2	1	1.5	1
<i>Tridax procumbens</i>	Coatbuttons	2	2	2.0	2
<i>Urticacaea tropical</i>	Nettleweed	3	3	3	4
Graminoids					
<i>Zea mays</i>	Maize	3	1	2.0	2
<i>Panicum maximum</i>	Guinea grass	1	2	1.5	1
<i>Cynodon fuensis</i>	Giant star grass	2	3	2.5	3

**L. leucocephala* = *Leuceana leucocephala*, *S. guianensis* = *Stylosanthes guianensis*,
E. heterophylla = *Euphorbia heterophylla*

some cases as an only diet in some tropical countries such as Vietnam (Luyen and Preston, 2012). Usage of *Ipomoea aquatic* could be optimized for rabbit production in the Coastal Savannah zone in view of its high nutritive value and fibre content as well as health benefits as a source of vitamins, minerals, dietary fibre, antioxidants and many related benefits as reported by Enriquez *et al.* (2017).

Processing of forages

Majority of the rabbit keepers fed forages directly to rabbits without any post-harvest processing as in Uganda (Kabirizi as cited in Buyinza *et al.*, 2015) apart from chopping. Similarly, in the present study over half the rabbitries using forages fed them to the animals without any processing. The rest subjected forages to minimal processing in the form of washing, wilting or salting, and in some cases to a combination of washing and salting prior to being fed. Wilting reduced moisture content of forages and extended shelf life making them suitable for feeding rabbits over longer periods.

CONCLUSION

The large number of rabbitries using forages as supplement or sole feed confirms the importance of forages in rabbit nutrition in the Coastal Savannah zone of Ghana. The indication by the rabbit keepers that all the forages were eaten in acceptable quantities suggests high potential in the successful usage of feeds containing forages or forages fed as supplements for rabbit production. However, simple and inexpensive processing of forages, such as wilting, will be necessary to, *inter alia*, reduce or eliminate anti-nutritional factors that may be present in them for direct feeding or incorporation into composite rabbit feed.

ACKNOWLEDGEMENT

The authors are grateful to Mr. Adotei Brown of Farmer Brown Rabbitry, Mr. K. Fynn, Director of Agriculture, Adentan Municipal, and the Regional Animal Production Officers of Greater Accra, Volta and Central Regions of Ghana for

providing the contact details of rabbit farmers. Dr. Kwame Opong-Anane, Former Director of Animal Production, Ministry of Food and Agriculture, Ghana, is acknowledged for technical advice.

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