

DRY SEASON FEEDS AND FEEDING: A THREAT TO SUSTAINABLE RUMINANT ANIMAL PRODUCTION IN NIGERIA

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ABSTRACT

Review of dry season feeds and feeding as a threat to sustainable production of ruminant animal production in Nigeria. The concept of dry season nutrition and challenges posed on ruminant production such as reduction in general performance of animal, increased susceptibility to diseases, reduction in palatability and acceptability of available forage, reduction in digestibility of forage consumed, migration of flock and herd's men, overcrowding of available graze land, sales of animals at loss and increased cost of production were critically dealt with. strategies such as Forage conservation, utilization of crop residue, agro industrial by products, cultivated fodder crops, culling and sales of unproductive animals in the flock, utilization of browse plants, uses of concentrate feed, integration of ruminant production with crop production, improved pasture yield through fertilizer/manure application and supplementation of poor forages with nutrient supplements as means of ameliorating the adverse effects of dry season feed and feedings. Conclusively dry season feeds and feeding pose a great threat to ruminant animal production and for the sustainable production of ruminant animal products (wool, milk, meat, meat, hide and skin) and by-products (blood meal, bone meal and manure) efforts should be geared towards adoption of strategy recommend in the paper.

Key words: Ruminant animal, production, sustainable, dry season, feeds and feeding

INTRODUCTION

Ruminant animals refer to all animals that possess four stomach compartments and have the ability to ruminate, they perform different functions from food production (meat and milk) to various miscellaneous benefits such as security, draught power, manure production (dung and urine), bio fuel production, social values and recreation (Devendra, 1993). Ruminant animals are herbivorous in nature meaning that the largest part of their nutrition comes from grazing on natural pasture, fallow land and crop lands. Most commonly reared ruminants in Nigeria include cattle, sheep and goat. Meanwhile, accurate statistical data on the Nigerian livestock population are very scarce and are as varied as the human population figures. Various figures have been given by different sources and at different times. However, the estimated domestic ruminant population in Nigeria has been put at 13.9 million cattle, forming 60% of the livestock population, 34.5 million goats, 22.0 million sheep (both accounting for 35.2% of the total population of the world's small ruminants) equine and camels account for 3.6% and 0.6% of the livestock population respectively (RIMS, 1992).

Ruminant animal farmers in Nigeria are mostly nomadic, semi nomadic and pastoral farmer's therefore ruminant production is based on natural pasture as the major feed source (Horne *et al*, 1998). Ruminants in the tropics in general, are raised predominantly on grass which are inherently poor in digestibility, nutritive value and unavailability in off season (Babayemi *et al.*, 2009).

There is a seasonal in variation availability of natural pasture, pasture tends to be more succulent, highly nutritious and more abundant in the rainy season (around May - November) as opposed to the dry season (around November - April) where they become fibrous, scarce and devoid of most essential nutrients such as protein, energy, minerals and vitamins which are required for increased rumen microbial fermentation that will results into production of volatile fatty acid and consequently performances of the host animal in the area of maintenance, production and reproduction(Sowande,2004; Lamidi, 2009). At this period, the performance of ruminant animals which is dependent on the native pasture is seriously impaired; the quality is associated with the fibrous and lignified nature of the pasture which limits intake, digestibility and utilization (Olafadehan *et al.*, 2009).

The problem of dry season feed and feeding has been recognised as a limiting factor to a successful ruminant production enterprise in Nigeria due to poor nourishment of the animals during the dry season which eventually results to a drop in animal performance in terms of growth, work, maintenance, production and reproduction (Darrag ,1995).

The challenges of dry season feeds and feeding in ruminant animal production in Nigeria

Dry season feed and feeding poses so many challenges to ruminant animal production, some of the major challenges include;

- i) Reduction in general performance of animal
- ii) Increased susceptibility to diseases
- iii) Reduction in palatability and acceptability of available forage
- iv) Reduction in digestibility of forage consumed
- v) Migration of flock and herd's men
- vi) Overcrowding of available graze land
- vii) Sales of animals at loss
- viii) Increased cost of production

i) Reduction in general performances of the animal

During the rainy season, forages tend to flourish in abundance while during the dry season there is scarcity of fresh forages for the animals to graze on. This may lead to poor nourishment which eventually results in poor performance of the animals in terms of reduction in growth rate, draught ability, production and reproduction (Darrag, 1995). Animals must be fed to meet their most basic requirements which include growth, work, maintenance, production and reproduction.

a) Reduction in growth rate:

The level of nutrition largely determines the growth rate of animals especially in young ruminants; young ruminants have higher nutritional needs especially with regards to protein than older ruminants. Reduced growth rate therefore has a higher effect on growing ruminants (calves, lambs and kids) (Darrag, 1995). Since forages are less nutritious during the dry season, they lack so many of the basic nutrient that are responsible for growth e.g. the nutrients in succulent legumes. This therefore results in reduced growth rate of the animal since the animal is being malnourished. Post weaning losses may also occur as a result of unavailability of succulent and highly nutritious forage since the nutrients in the dry fibrous forages cannot meet the nutrient requirement of the newly weaned ruminants (McDonald *et al.* 1998). Mature animals may also lose weight due to malnutrition during the dry season.

b) Reduced production rate: This problem affects mainly the mature ruminants that produce milk, meat and wool. During the dry season, the rate of production in ruminants tends to decrease; this is because of the deficiency of some essential nutrients in the available forage (Bredo and Dugmore, 1999). Nutrient deficiency such as calcium and phosphorous can reduce milk production, protein and energy deficiency can reduce meat and/ or wool production as the case may be (Bredo and Dugmore, 1999). Malnourished animals may fail to exhibit their full genetic potentials as high producers irrespective of the environments or improved management practices adopted by the farmers.

c) Reduction in draught power: Agile, strong and healthy mature animals' e.g. bulls are used for work purposes on farms. These draught animals are used to pull heavy machinery such as ploughs and harrows and also to carry farm products from place to place. Draught animals require lots of energy to do their work efficiently therefore, when their energy requirement is not met their energy level reduces and thus their draught ability in terms of type of work and duration of work (Ffoulkes *et al*, 1988).

d) Reduction in the rate of reproduction: Dry season forage is devoid of most essential vitamins and minerals which are important in animal reproduction, when these nutrients are lacking the animal's ability to reproduce drops rapidly. Deficiency of some macro elements such as calcium, phosphorous and sodium may cause reduced conception rate or calving percentage (Bredo and Dugmore, 1999; Lamidi, 2004).

ii) Increased susceptibility to diseases: Animals receiving inadequate diets and nutrients are more prone to diseases than nourished animals, this is because malnutrition reduces or lowers the immunity of the animal therefore the animals tend to be more susceptible to diseases during the dry season when forage is lacking and the available forage is of low nutritive value. General performance in ruminant is obviously dependent on the health and well being of the animals and therefore any metabolic disturbance will interfere with the performance of the animal. In other words, deficiencies, excesses and imbalance of vitamins and minerals in forages as a result of dry season may lead to various health problems (Bredo and Dugmore, 1999).

iii) Reduced palatability and acceptability of available forage: Fresh succulent grasses and legumes are more palatable and acceptable to livestock than dry fibrous grasses. A mature grass in dry season is both unpalatable and unacceptable to animals due to its high lignin content therefore animals tend to consume less during this period due to unavailability of fresh and succulent pasture which is highly acceptable and palatable (Adegbola, 2002). This therefore reduces the growth and performance of the animals as a result of reduced forage intake in the dry season.

iv) Reduction in digestibility of forage consumed: Digestibility is a major factor that influences animal performance. The quality of pasture affects the enzymatic activities of the micro-organisms in the rumen meaning that the higher the quality of nutrients in the forage the faster the digestion of the forage thus the higher the digestibility while the lower the quality of nutrients in the forage the longer the digestion process and thus the lower the digestibility (Adegbola, 2002). When mature forages are consumed by ruminants during the dry season, they tend to stay in the rumen of the animals about twice as long as high quality forage due to their high lignin content which enables them to slow down microbial enzymatic attack of the forage in the rumen (Fondevila *et al*, 1995). Dry grasses which is abundant in the dry season e.g. hay is highly fibrous in nature and therefore has a lower digestibility than fresh succulent grasses which is abundant in the rainy season.

v) Migration of flock and herd's men: During the dry season especially in the northern areas (where the largest population of ruminant animals and the largest number of

commercial ruminant animal producers are located) herd's men together with their flock migrate to the south, east and west in search of greener pasture for their flock (Folakemi, 2009). Stress as a result of long distant trekking during the cause of migration may lead to depreciation in weight of animals, reduction in general performance and productivity of the animals and even exposure of animals to enzootic zones where certain disease are endemic therefore leading to disease outbreak (Minson, 1982). Communal conflict between the rural settlers of the community and the herd's men may occur; an example is the usual conflict between the Tiv's and the Fulani herd's men in Benue, Nasarawa and Taraba States.

Tenuche and Ifatimehim (2009) revealed that major sources of conflict in the Benue Valley revealed that land matter accounted for the highest percentage (42.9) of conflicts followed by political (32.08%) and chieftaincy matters (28.3%) respectively. A high percentage of conflicts arising from land disputes have to do with land matters and conflict between Fulani herdsmen and farmers over grazing land. The various conflicts that ensued between Fulani herdsmen and farmers arose from the destruction of farm lands by herds of cattle.

vi) Overcrowding and overgrazing of available graze land: Due to migration of herd's men and their flock, there is high demand and competition for available graze land. Farmers from different localities may migrate towards the same direction in search for greener pasture and may end up overcrowding and overgrazing the available pasture. This may also increase the spread of disease since there is more interaction among animals from different farms and localities. This therefore poses as a challenge in ruminant animal production in Nigeria.

vii) Sales of animals at loss: Due to heavy demand of livestock for available forage and the competition between animals for available forage during dry season, farmers may be forced to sell out some of the animals in their herd. As a result of desperation they may sell the animals at loss in order to reduce the rate of competition and demand of animals on available forage.

viii) Increased cost of production: As a result of the strategies and other means in which farmers adopt in order to satisfy the nutritional needs of animals during the dry season, they may incur extra cost of production in terms of cost of supplementing available forage, cost of feeding concentrate feed, cost of conserving forage in preparation for dry season etc. this extra cost increases the cost of production of farmers and therefore poses a challenge to farmers with limited resources (Roy, 1999). This might eventually reduce the demand of the animal and the entire marginal return of the enterprise.

Ameliorating the Challenges of dry season feeds and feeding in ruminant animal production

In order to remain in production cycle the following means or strategies can be adopted in order to sustain the production of ruminant animal at this crucial period;

- i) Forage conservation
- ii) Utilization of crop residue
- iii) Utilization of agro industrial by products
- iv) Utilization of cultivated fodder crops
- v) Culling and sales of unproductive animals in the flock
- vi) Utilization of browse plants
- vii) The use of concentrate feed
- viii) Integration of ruminant production with crop production
- ix) Improved pasture yield through fertilizer/manure application
- x) Supplementation of poor forages with nutrient supplements

i) Forage Conservation: Forage conservation is an avenue for ensuring continuity in ruminant feed availability. It ensures sustainability of ruminant animal at the crucial period of dry season (Aina, 2012). Although the nutritive qualities differ from those of fresh materials, adequate levels of nutrients are retained in conserved feed to merit the use in dry season (McCullough, 1988). Forage conservation is basically aimed at producing at low cost staple products that are suitable for ruminant animal feeds and feeding with minimum loss of nutritive value.

During the rainy season when there is abundant supply of fresh, succulent and highly nutritious forages, it is advised that ruminant animal producers should cut up a mixture of grasses and legumes and conserve them. Forage can be conserved in form of hay (dry fodder) or silage to provide to the animals during the period of scarcity (dry season) (Adegbola 1998).

ii) Utilization of crop residues: Crop residues are post-harvest roughage materials or plant materials left after the removal of the primary food from the crop plant (Kallah *et al*, 1992). Though sometimes referred to as “farm waste”, crop residues are distinct from agro-industrial by-products (AIBPs) which are products arising from factory or household processing of the harvested crop (Alhassan, 1989). In most commercial industries, crop residues such as maize husks, corncobs, cassava peels, etc. are considered as products of no nutritive value and constitute a nuisance to the environment.

Almost all crops cultivated for human consumption contain residual materials which can be consumed and converted to valuable products such as milk, meat, wool, hide and skin by ruminant animals. Some of these waste materials have been discovered to be potential good feed resources, which degrade readily in the rumen (Belewu, 2001). Other crop residues have shown poor degradability so that they require some treatment before they can contribute to animal nutrition (Smith *et al.*, 1988).

It can be observed that most of the crop residues are abundant during the months of September to November (at the end of the rains). They find their greatest utilization between December and April (during the dry season) when the available pasture is low in quantity and quality (Borogo *et al*, 2006)

High responses in terms of weight gain have been registered with small ruminants fed with crop residue such as the stems of cereal crops, sugar cane, pods and seeds of crops, leaves and other plant parts (Horne *et al*, 1998).

iii) Uses of Agro-Industrial By-Product: Agro-industrial by products (AIBPs) is waste products arising from the processing of crop or animal products usually by an agricultural firm. (Alhassan *et al*, 1989). These resultant products were considered as waste since they were of little or no nutritional importance to man. Agro-industrial by-products are highly abundant in the tropics and they represent a substantial resource for increasing animal production. The use of these by-products for supplementary livestock feeding is justified when the forage supply is inadequate for animal needs either in terms of quantity or quality (Preston and Leng, 1987; Aina, 2012).

Agro-industrial by-products in Nigeria which can be used as livestock feed include brewer's dry grain, palm kernel cake, maize offal's, wheat offal's, citrus pulp, citrus molasses, citrus seed meal, root and tuber by products, ground nut cake, cotton seed cake to mention but few. All these by-products can be utilized by ruminants during the dry season when forage is lacking (Gohl, 1988). These materials can be fed solely or combined with other AIBPs or crop residue(s). Below is a table of common AIBPs used for dry season feeds and feeding of ruminant animal in Nigeria.

Table 1: Common Agro-Industrial By-products used as dry season feeds and their chemical composition

AIBPs	Parameters						
	DM	CP	EE	CF	NFE	ASH	ME(kcal/kg)
Rice offal	92.60	6.00	5.30	40.1	26.30	20.40	1300
Rice hull	92.00	3.00	21.0	27.0	18.00	19.00	-
Rice bran	91.00	13.20	13.0	11.5	42.80	9.50	2100
Maize offal	89.50	10.60	4.60	3.5	77.00	4.10	2700
Maize bran	83.20	9.42	15.0	11.85	-	2.50	-
Wheat offal	89.88	12.38	3.04	17.96	54.72	11.92	3100
Brewers dried grains	-	27.90	7.40	11.70	-	4.80	1900
Sugarcane scrapping	90.67	8.25	3.36	36.48	67.40	9.98	2970

Sources: Olomu, 1995., Aduku, 2004., Maikano, 2005., Vantsawa, 2006., Lamidi 2009., Istifaus, 2009., Lamidi *et al.*, (2013) and Alu *et al.*, (2013)

iv) Use of Cultivated Fodder Crops: Fodder crops refer to grasses or legumes that are consumed by animals as forage; it is advised that ruminant animal producers grow fodder crops purposefully in preparation for dry season. This purposeful act ensures the availability of forage for the animals during dry season (Preston and Leng, 1987). In cultivating fodder crops, both leguminous plants such as *Cajanus cajan*, mucuna, centrocema, etc. and non-leguminous plants such as guinea grass, elephant grass, *Andropogon* spp etc. should be cultivated in other to boost the nutrient value of forage, (Mohamed Saleem, 1985), this is because legume/grass pasture produces higher dry matter yields and better nutritional value than sole grass swards.

v) Culling and Sales of Unproductive Animals in the Herd: Farmers with large number of animals are advised to sell the unproductive animals in their herd in order to reduce the competition among animals for available forage during the dry season. This ensures that there is enough forage for the remaining animals in the herd. Unproductive animals such as dry cows and ewes, unproductive males or females, deformed animals etc should be sold off to ensure availability of forage for the young ruminants and productive animals in the herd (Roy, 1999).

vi) Utilization of Browse Plants: Browse plants refer to potential food from woody perennials, trees, shrubs and dwarf shrubs that small ruminants (goat and sheep) feed on; it is therefore an important qualitative component of the livestock diet (Le Houérou, 1988). Browsers can consume various parts of woody plants; leaves, twigs, thorns, bark, wood, bulbs, tubers, roots, flowers, seedpods and fruits, (Le Houérou, 1988; Lamidi, 2004).

Otsyina and McKell (1984) indicated that browse, especially in the savannah vegetation types, contributes a large amount of available forage as a complementary source of feed for livestock, particularly during the dry season when herbaceous forage is in short supply, this is because being perennial plants, browse plants are not susceptible to sudden climatic changes and therefore continue to produce higher quality fodder in terms of quality and quantity even during dry seasons.

Le Houérou (1988) reported that compared to tropical grasses, browse is richer in energy, protein and some minerals in the dry season. At this time, browse plants are the most valuable feed utilized by livestock. Browse could therefore supplement the low energy and protein content of grass forage if used effectively during dry periods. Arigbede *et al.*, (2007) reported that trees are more reliable than herbaceous legumes and grass in providing high quality protein supplement in dry season.

Aina (2012) reported the uses of *Margaritaria dicoidea* leaf as a basal supplement in the diet of WAD goats recorded a satisfactory growth performance over time and completely eliminates the cost of concentrate diets in goat production. In related study Lamidi (2009) used *Gliricidia sepium* and *Gmelina arborea* successfully. Common examples of available browse plant that have been identified as potential feed resources for ruminant animals in Nigeria include the following; *Ficus exersperata*, *Newboulotia leavis*, *Asphilia africana*, *Calapogonium muconoides*, *Leucaena leucocephala*, *Centrosema pubesens*, *Cyclicodiscus gabunensis*, (Alokan, 2008). The table below indicated the list of common browse plants used for dry season feed and their nutrient profile.

Table 2: List of common browse plants and their nutrients composition (g/100g DM) used for dry season feed in Nigeria.

Species	Parameters					
	DM	CP	CF	EE	ASH	NFE
<i>Centrosema pubesens</i>	92.49	20.44	19.43	3.83	9.36	46.95
<i>Glyricidia sepium</i>	86.37	21.92	16.08	3.32	8.36	50.32
<i>Leucaena leucocephala</i>	90.63	25.27	18.28	5.89	7.64	42.92
<i>Cajanus cajan</i>	93.05	18.56	19.23	7.06	8.47	46.70
<i>Spondia mombia</i>	89.50	17.84	16.76	3.21	5.59	56.60
<i>Albizia zygia</i>	86.00	24.21	20.10	2.93	4.68	48.08
<i>Treoulia Africana</i>	98.00	19.75	12.00	3.67	12.50	52.08
<i>Elaesi guineensis</i>	93.21	14.10	20.48	3.10	6.10	49.82

Source: Alokan, 2008

DM- Dry matter; CP- Crude protein; CF- Crude fibre; EE- Esther extract; NFE- Nitrogen ether extract

vii) Use of Concentrate Feeds: Concentrates are ready made feeds that contain a high density of nutrients; they are usually low in crude fibre and high in total digestible nutrients (FAO, 1983). Energy concentrates and protein concentrates are high in energy and protein respectively. Concentrate feeds can be used to supplement roughage based diets during the dry season, when pasture for livestock consumption is in low supply, and the conserved forage or available forage is of low nutritive value. Concentrate feed can therefore be used to promote better utilization of roughage feed during the dry season. The use of concentrate feed is however, mainly practised by commercial ruminant animal producers due to high cost of maintaining a large number of animals on concentrate feed (FAO, 1983)

viii) Integration of Ruminants in Crop Production: Ruminant production could be integrated with crop production. Crops may contribute to livestock feed resources through use of their by-products and crop residue. If these by-products and crop residue could be collected properly and processed, they could offer alternatives to costly concentrates. (Wan Mohamed, 1987). Cover crops can serve as forage for small ruminants. Natural herbage growing under plantation trees may be collected and conserved in the form of hay for ruminant animal consumption. Where possible; controlled grazing underneath tree canopies may be practiced on a rotational basis. Fodder cultivation under plantation crops can also be practiced. Wan Mohamed (1987)

ix) Use of fertiliser and/ or manure to improve pasture yields: Soils with low fertility, fertiliser application can increase dry-matter production per unit area. For centuries, the use of farm manure has been synonymous with the test of time as asserted by Brandy (1990).

Superphosphate and nitrogen fertilisers like urea and ammonium sulphate are most widely used. Usually, fertiliser application is adopted in intensive management systems in which high value products can justify the economic cost. The smallholder in most cases cannot afford the cost of using fertiliser, but farmyard manure from goat and sheep pens may be used in promoting higher pasture yields for a cut-and-carry intensive system of small ruminant production. Farmers, especially in the northern part of Nigeria use kraal manure and droppings from roaming animals (Obigbesan, 1999). However, apart from being a source of plant nutrients, animal manure is valued as source of nitrogen where chemical fertilizer are expensive or unavailable (Russels, 1988). Common fodder grasses that may be exploited in such a system include *Tripsacum laxum*, *Pennisetum purpureum* and *Panicum maximum*.

x) Supplementation of Poor Quality Forage with Nutrient Supplement: Nutrient supplements could be used to improve the utilization of poor quality forage; the nutrient supplements enhance the intake and digestibility of poor quality forage by promoting the activities of rumen micro organisms. Hay and silage could be supplemented with molasses/urea mixture, whole cotton seed groundnut cakes or other suitable supplements such as mineral supplements, protein supplements, non protein nitrogen e.g. urea in order boost up its nutritional content so as to increase animal productivity and efficiency (Fajemisin *et al.*, 2011)

The digestibility of crop residue can be improved by alkali treatment, ammonia treatment, and treatment with poultry manure and/or feeding with green forage legumes (Preston and Leng, 1987). Small holder farmers can use locally made mineral blocks to supplement forage.

The use of urea or ammonia and other alkalis to upgrade corncobs and other low quality feeds has spread worldwide in the last three decades. Urea, the most commonly used and an inexpensive non protein nitrogen (NPN) source is an attractive protein replacement compared with present tremendously expensive natural proteins (Ojai *et al.*, 2007).

xi) Uses of sawdust and poultry litter to feed ruminant animals: Sawdust is constantly burnt off in the sawmill industries and poultry drooping evacuation from the farm is a serious problem, most of these materials could be harvested and harnessed into a dry season feed for ruminant, feed challenges would be alleviated (Aina, 2012). Various studies has been conducted on sawdust, poultry manure and cassava peels (Bhattacharrya, 1964; Drake *et al.*, 1965; and Bokanga, 1989) to determine proximate composition, the processing techniques suitable for each material that will make it to be maximally utilized and levels of inclusion in the diet for different animals. Considerable information therefore exist on the nutritive value of these materials which can be in the feed either formulated for maintaining weight during the dry season, for zero grazing or fattening stock.

There was a trial carried out by Oladotun *et al.* (2003) designed to evaluate the utilization of inclusions of inclusions of dry cassava peels, poultry dropping and sawdust ash as supplement in the dry season ration of rams compared with the animals on free range. Sowande, (2004) successfully used poultry dropping, cassava peels and sawdust for feeding ram in the dry seasons. The significant of these studies is that the use of poultry droppings and sawdust, which hitherto constitute an environmental nuisance served as a component of forage-based diets, reduces small ruminant production cost, alleviate perennial dry season feeding problems and reduced environmental menace constituted by sawmill industry (Aina, 2012).

Major limitations to the alternative feeds and feeding in dry seasons

- i) The cost of concentrate feed is high especially when a large herd is involved therefore small farm holders are not able to afford it.
- ii) Some dry season feed stuff such as hay and crop residue are low in nutrients when compared to succulent forages therefore they may only act as maintenance rations and may not be sufficient enough to boost production especially when they are not supplemented with nutrient supplements.
- iii) Sales of unproductive animals in the herd may cause the farmers to sell at a loss if the farmers are desperate to sell their products.
- iv) Some dry season feed stuff such as contain some anti nutritional factors which may be harmful to the animals. E.g. mimosine contained in *Leucaena leucocephala*, aflatoxin contained in ground nuts, gossypol contained in cotton seed, etc.

CONCLUSION

Nutrition or feeding as a factor of production is the major challenge to ruminant animal production in Nigeria. The situation is worse during the long dry season when animals are unable to meet their protein and energy needs from available low-quality herbage which consequently results in the reduction in general performance of animals, increased susceptibility of animals to diseases, reduced palatability and acceptability of available forage, reduced digestibility of consumed forage, migration of flock and herds men, overcrowding and overgrazing of available graze land, sales of ruminants at loss, increased cost of production etc. To combat these challenges, ruminant animal producers are advised to adopt strategic practices such as forage conservation, utilization of crop residue, utilization of agro industrial by products, use of cultivated fodder crops, utilization of browse plant, use of concentrate feed, integration of ruminants in crop production, use of fertilizer and manure to improve pasture yields, supplementation of poor forages with nutrient supplements, sales of unproductive animals in the herd. The alternatives to dry season feeding however have its own major limitations which include high cost of concentrate feed, poor nutritive value of conserved forages when compared to fresh succulent forages, sales of products at loss as a result of desperation and the presence of anti nutritional factors in some alternative forage source such as mimosine which could be harmful to the animals and man.

RECOMMENDATIONS

A non uniform growth pattern is observed when animals are not adequately fed during the dry season; therefore livestock farmers are facing their biggest challenge during the dry season, in other to solve this problem, a few solutions are recommended below;

Supplementary feed should be provided on the farm by establishing grass/legume pastures example, mixed grass/legume pastures which are of higher dry matter yields and of better nutritive value than sole grass swards. As grasses and legumes decline in quality and quantity during the dry season, forages should be conserved in form of hay and silage to ensure adequate forage supply during scarcity in the dry season.

Ruminant animal producers are advised to adopt certain strategies during the dry season in order to avoid losses and productivity, these strategies include forage conservation, utilization of crop residue, utilization of agro industrial by products, use of cultivated fodder crops, utilization of browse plant, use of concentrate feed, integration of ruminants in crop production, use of fertilizer and manure to improve pasture yields, supplementation of poor forages with nutrient supplements, sales of unproductive animals in the herd.

Ruminant livestock producers in the rural areas should be educated on the importance of adopting one or more of these strategies in order to combat the effect of dry season feed and feeding on the well being of their animals so as to reduce mortality of livestock during the dry season and thus increase productivity. Extension services should be intensified over the dry feed and feeding, researches should also be tailored towards dry seasons feeds and feedings for ruminant animal production

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