USE OF NON-CONVENTIONAL FEED RESOURCES IN RUMINANTS FEED IN NIGERIA: A REVIEW

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Date received: 1st April, 2015; Date accepted: 25th June, 2015.

ABSTRACT

Feeding of ruminants is a subject of concern to all stakeholders in ruminant’s production. It has been acknowledged as the major factor in the wide gap created between supply and demand for ruminant products. There is shortage in feed supply occasioned by the seasonal fluctuations in grasses and legumes availability especially during the dry period of the year in the northern part of Nigeria where the largest percentages of the ruminants are found. Non-conventional feed resources (NCFR) which has gained prominence among researchers constitute an alternative source of feed supply. Studies have been conducted on the use of some of these NCFR in feeding ruminants with appreciable level of success. There have been solutions to the constraints to its use such as the anti-nutritional factors and some active principles that are responsible poor palatability, bad odour, poor digestibility etc., all which have made some of these NCFR unattractive to the farmers. However, despite the success recorded in rendering them attractive, many of the farmers still find it difficult to adopt the use of the NCFR. It is in the light of this that effort has been made in this paper to evaluating the use of crop-based and non-crop based NCFR. It was concluded in this study NCFR can readily fill the gap created by the shortfall in conventional feed supply.

Keywords: Feed, Non-conventional feed resources, pasture, ruminants, resources

INTRODUCTION

Nigeria is basically an agrarian society with the largest percentage of the populace living in the rural areas. A great proportion of the farming population especially in the northern part of the country depends on animal agriculture with ruminant production very predominant. Ruminants that comprise of sheep, goats and cattle are largely reared by farm families in the country’s agricultural system. The population of goat, sheep and cattle in Nigeria has been estimated at 34.5 million, 22.1 million and 13.9 million respectively (Bourn et al., 1994). They are mostly concentrated in the northern part of the country. Ruminants play significant roles in the social and economic well-being of the rural dwellers that are involved in their rearing. However, there is a huge gap between supply and demand for the ruminants’ products like meat, milk, hides, skin etc. The average Nigerian consumes only 7.9 g of animal protein per day out of the 35g recommended (FAO, 2008). Feeding both in quantity and quality has been recognized as one of the most important factors responsible for this shortage in animal protein consumption. These animals depend on natural pastures which consist of grasses, legumes, grasses and browse species. The main feed resources for small ruminants are natural pastures consisting of legumes and browse species (Mubi, 2003).
The availability of pastures is largely seasonal because of their dependent on natural rainfall which fluctuates with long period of dry season in the areas where the ruminants are predominant. This results in shortage of the feed both in quantity and quality. The farmers seek for other sources like the use of concentrates and farm remnants to meet up with feeding requirement of the animals. The resultant effect of this scenario is increased cost of feed which increases overall cost of production and reduces profit of the farmers. Non-conventional feed resources have been seen by researchers as a remedy to the lingering feeding problems. However, despite the strides taken by various researchers at ameliorating this challenge, the use of non-conventional feed resources by farmers is still very low. The main objective of this paper is to bring to the fore the potentials of non-conventional feed resources at boosting ruminants feed supply.

FEED AS A CONSTRAINT TO RUMINANT PRODUCTION IN NIGERIA

One of the major constraints to small ruminant production in Northern Nigeria is nutrition since feeding alone is reported to constitute 65-80% of the total cost of livestock production. Adebowale (1982) and Dayo (2009) reported that feeding constitutes 65% and 60% of the total cost of animal production in Nigeria respectively. The productivity of the natural range in the Sudan and Sahelian zone of the country, where sheep production is predominant, cannot support optimum performance of animals all year round. This is due to the short rainy season of about three months (between June and September). Ruthenberg (1980) reported that the productivity of the natural range cannot support optimum performance of animal all year round due to short rainy season (less than 750mm per annum). In northern Nigeria, the problem of feed shortage is more severe during the long dry season when animals subsist on very poor quality grass and crop residues, thus leading to very low level performance (Steinbach, 1997). For the greater part of the year, grasslands in the tropics do not supply sufficient nutrients in stocks for adequate productivity (Otchere et al., 1977). At this time, pastures are dry and highly lignified so that they alone cannot satisfy the maintenance requirement of livestock (Le Houero, 1980). Furthermore the competition for grains between humans and animals in Nigeria has led to a drastic drop in the annual output of feed mills which produce supplementary feeds for livestock (Alawa and Umunna, 1993). The scavenging nature of small ruminants cannot be relied upon to provide adequate nutrients for optimal livestock production.

During the wet season, these lands provide adequate forage to maintain productive animals. In the dry season however, the quantity and quality of forage greatly decreases and is generally low in nutritional value. Abil (1992) reported that feed scarcity as a result of variation in climatic conditions causes the quality and quantity of natural vegetation and other supplementary feeds to be affected. The available dry matter decreases and becomes highly indigestible. The protein level is also greatly depleted and can be as low as 3% (Williamson and Payne, 1978). Thus, animals are unable to meet both dry matter and protein requirements of their body.

In the humid zone, there are approximately 6.6million goats and 1.8million sheep and the main production methods are free range, tethering and confinement (Opasina and David-West, 2007). In this zone, where there is abundant vegetation for animal feeding, the threat of tsetse-fly is a domineering problem, thereby limiting the potential of these animals. In heavily cropped areas, nutrition has been shown to be a major constraint during the rainy season when animals have to be restricted to avoid damage to crops while under nutrition is also a limiting factor to small ruminant production in the dry season (Opasina and David West, 2007). Fluctuation in feed supply affects the reproductive performance of the animals. Nutritional factors play a vital role in the various physiological events that lead to attainment of sexual maturity (Maynard et al., 1979). The same author reported that under-nutrition delays puberty in both male and female animals and if severe, may cause regressive changes in sex organs after they are fully developed. The drain of nutrients from the body by the developing young may result in permanent damage. The death of the foetus in uterus or birth of a weak animal may occur (McDonald et al., 1988). Under nutrition in males, results to decrease in the number and vigor of sperms; and also leads to cessation of spermatogenesis. Inadequate nutrition results in retarded growth and reduced overall development of animals (Maynard et al., 1979). Thus, it is important to ensure adequate feeding in order to enhance productivity (Adebowale and Taiwo, 1996). Adequate feeding implies the provision of high quality feed all year round. However, in north-western Nigeria, the
productivity of the natural range cannot support optimum performance all year round (Maigandi, 2002).

NON-CO NVENTIONAL FEED RESOURCES (NCFR)

Non-conventional feed resources are feed sources that are not universally accepted and used as livestock feed. They are relatively new to many farmers and their use is not favoured by the farmers. NCFR generally refer to all those feeds that have not been traditionally used for feeding livestock and are not commercially used in the production of livestock feeds.

FAO (1985) highlighted the characteristics of non-conventional feed resources as follows:

1. They are the end products of production processes and consumption that have not been used, recycled or salvaged.
2. They are mostly of organic origin and can be obtained either in a solid, slurry or liquid form.
3. The economic value of these non-conventional feed resources is usually less than the cost of their collection and transformation for use and consequently, they are discharged as wastes.
4. Feed crops which generate valuable NCFR are usually excellent sources of fermentable nutrient molecules such as cassava and sweet potato and this is an advantage to livestock especially ruminants due to their ability to utilize inorganic nitrogen and non-protein nitrogenous sources.
5. Fruit wastes such as banana rejects and pineapple pulp by comparison have sugars which are energetically beneficial.
6. Some of these feeds contain anti-nutritional components which have deleterious effects on the animals and not enough is known about the nature of the activity of these components and ways of alleviating their effects.

Several known examples include palm leaf meals, palm press fiber, cassava foliage, spent brewer’s grains, sugar cane bagasse, rubber seed meal and some aquatic plants (Chadhokar, 1984). However, there are non-conventional feed resources that are relatively not popular and farmers find difficult to feed to their animals because of the following constraints. Examples of these are neem seed cake/meal, poultry litter waste, etc. Some of the constraints militating against the use of NCFR include the following:

1. The nutritive content of some NCFR is low. Amata (2014) reported that non-conventional feed sources are presently not being utilized because of their low nutritive value, seasonal availability, high moisture content (e.g. citrus pulp, tomato pulp, olive cake, etc.).
2. High cost of handling and transportation from the production site to the farm, lack of awareness by farmers about the nutritive content, presence of anti-nutritional factors (phenolic compounds mainly tannins, saponins, etc.), lack of technical knowledge on the removal of the anti-nutritional factors and the high cost of the removal, etc.
3. Production is usually scattered and in some cases, the quality produced is low especially for use in processing of feed.
4. Cost of collection can be unusually high, for example, rubber seeds.
5. Processing of NCFR is usually difficult and can be problematic e.g. treatment neem kernel cake with alkali, ensiling of rice milling waste with urea, etc.
6. Lack of managerial and technical skills in the utilization of such feeds in situ.
7. Presence of anti-nutritional factors and active principles that makes some NCFR not palatable and hazardous to animals e.g. neem kernel cake, neem seed cake, etc.

However, despite the highlighted constraints to the use of NCFR, researchers have demonstrated that these NCFR possess the ability to ameliorate the challenges posed by the shortages of feeding stuff. Non-conventional feed resources such as neem seed cake, rumen digesta, poultry litter, soya bean meal residue, rice milling waste, etc. can be used as ingredient in ruminants feed.
Rice Milling Waste (RMW)

This is an agro-industrial by product found in large quantities in rice cultivated areas of Nigeria. Muhammed (2005) reported that rice milling waste is an agro-industrial by-product found in large quantities in areas where rice is produced abundantly. Rice is principally produced for human consumption, and large amount of straw is left on the field after harvest. The production target for rice in Nigeria by the year 2010 is 11,52,000 tones (Shuaib et al., 1997). However, Nigeria recorded a tremendous increase in rice production in 2013 with 1.9 million metric tonnes while 2014 production was expected to be 2.9 million metric tonnes (Adesina, 2014).

Rice milling waste (RMW) was analysed and found to contain substantial amount of nutrients (Abubakar, 2003). Same author reported that the crude protein and energy contents of Rice Milling Waste were 11.5% and 2100 kcal/kg respectively with high amount (12.5%) of fibre. Rice Milling Waste (RMW) has a protein content of 6.2%, crude fiber of 37.0% ash content of 20.2% and energy value of 1131 kcal/kg (Obeka, 1985). In order to improve the digestibility of Rice Milling waste and enhance its utilization it could be fed in combination with legume such as soyabean meal residue.

Soyabean Meal Residue (SBMR)

This is the by-product of soyabean after all the milk has been removed. Information on the chemical composition of Soyabean Meal Residue (SBMR) is scanty. However, Garba (2010) reported that SBMR contains 92.26% DM, 17.5% CP, 26.89 % CF, 15.55 % EE, 6.99 % Ash and 33.07 % NFE. The yield of soybean meal from the whole beans amounts to about 60% (Feltwell and Fox, 1980) and the SBMR is 40%. In their raw state, soybeans are unsuitable for animal feeding because of the presence of growth-hindering factors. However, these factors can be overcome by proper processing like cooking or roasting (Feltwell and Fox, 1980).

There are other non-conventional feed resources that are not in the class of crop residues that have been demonstrated by researchers to possess enough nutrients that are able to complement the nutrient requirements of ruminant animals. However, they are subjected to various treatment procedures for them to be safe for ruminant’s consumption. Examples are neem seed meal/cake and poultry litter waste.

Neem seed cake/meal

This has been demonstrated to be safe for livestock consumption when subjected to appropriate treatment. It is readily available in the tropical and subtropical countries. The Neem tree (Azadirachta indica) is an evergreen of the tropics and subtropics. It is native to India but widely planted and naturalized throughout Asia, Africa, Australia, the Caribbean and several Central American countries (Adesina, 2003). However, its use as ruminant feed is hindered by factors such as odour, bitter taste etc. Neem seed cake (NSC) pungent odour and the bitter taste caused by the active principles isolated from different parts of the plant namely azadirachtin, meliacin, gedunin, salalin, nimbin, valassin (Paul et al., 1996) and many other derivatives of these principles constitute the hindrances to its use despite the high CP content of neem seed cake (34 to 38% (Bawa et al., 2005), 30 to 40% (Singh, 1993), 33.20% (Aruwayo, 2011)) and balanced in amino acid content (Gowda and Sastry, 2000).

The active principles have been removed by many methods such as treatment with sodium hydroxide and soaking in water. Urea ammoniated or alkali treated neem kernel cake was found to be effective in the feed of broiler chicks (Nagalakshmi, et al., 1996) and buffalo calves (Reddy, 1992). Debitterization through solvent extraction, water soaking, alkali soaking and urea ammoniation have been tried with appreciable success [Gowda and Sastry, (2000) and Aruwayo et al. (2013)]. These debitterization methods have been demonstrated to make the neem kernel cake/meal to be more palatable and results in comparable performance with the conventional feed ingredients.

Nath et al. (1989) reported that no significant variations in milk yield, milk fat content, and sensory evaluation of milk, dry matter intake and digestibility when water washed neem kernel cake (WWNKC) was incorporated at 40% level in the concentrate diet of dairy cattle for 300 days, Aruwayo et al. (2013) reported that Uda rams performed comparably in feed intake, live weight
gain and digestibility when compared with the control diet as shown in table 1.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Treatments</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>±SE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ATNKC inclusion</strong></td>
<td></td>
<td>-</td>
<td>8.5</td>
<td>16.5</td>
<td>25</td>
<td>72</td>
</tr>
<tr>
<td>Initial Weight (kg)</td>
<td></td>
<td>26.38</td>
<td>26.25</td>
<td>26.25</td>
<td>26.38</td>
<td>1.51</td>
</tr>
<tr>
<td>Final Weight (kg)</td>
<td></td>
<td>38.25</td>
<td>40.25</td>
<td>37.38</td>
<td>36.38</td>
<td>1.20</td>
</tr>
<tr>
<td>Weight Gain (kg)</td>
<td></td>
<td>11.88&lt;sup&gt;b&lt;/sup&gt;</td>
<td>14.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>11.13&lt;sup&gt;b&lt;/sup&gt;</td>
<td>10.0&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.80</td>
</tr>
<tr>
<td>Average Daily gain (g)</td>
<td></td>
<td>141.37&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>166.67&lt;sup&gt;a&lt;/sup&gt;</td>
<td>132.44&lt;sup&gt;b&lt;/sup&gt;</td>
<td>119.05&lt;sup&gt;b&lt;/sup&gt;</td>
<td>9.55</td>
</tr>
<tr>
<td>Feed Intake (g)</td>
<td></td>
<td>1320.25&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1132.75&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1057.50&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1063.75&lt;sup&gt;b&lt;/sup&gt;</td>
<td>46.30</td>
</tr>
<tr>
<td>Dry matter Intake (g)</td>
<td></td>
<td>1271.25&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1117.25&lt;sup&gt;b&lt;/sup&gt;</td>
<td>998.25&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1025.50&lt;sup&gt;b&lt;/sup&gt;</td>
<td>41.74</td>
</tr>
<tr>
<td>Crude Protein Intake (g)</td>
<td></td>
<td>165.51&lt;sup&gt;a&lt;/sup&gt;</td>
<td>145.93&lt;sup&gt;b&lt;/sup&gt;</td>
<td>130.08&lt;sup&gt;b&lt;/sup&gt;</td>
<td>130.28&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5.97</td>
</tr>
<tr>
<td>Crude Protein Digestibility</td>
<td></td>
<td>83.08&lt;sup&gt;a&lt;/sup&gt;</td>
<td>79.59&lt;sup&gt;a&lt;/sup&gt;</td>
<td>76.11&lt;sup&gt;a&lt;/sup&gt;</td>
<td>66.88&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.74</td>
</tr>
<tr>
<td>Protein Efficiency</td>
<td></td>
<td>0.86&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.14&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.02&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>0.87&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.06</td>
</tr>
<tr>
<td>Feed Gain Ratio</td>
<td></td>
<td>9.04&lt;sup&gt;a&lt;/sup&gt;</td>
<td>6.71&lt;sup&gt;b&lt;/sup&gt;</td>
<td>7.77&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>8.77&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.56</td>
</tr>
</tbody>
</table>

Means not followed not followed by the same superscripts are significantly different (P<0.05) along the row A(CSC), B(8.5% ATNKC), C(16% ATNKC), D(25% ATNKC)
Source: Aruwayo et al. (2011)

**Poultry litter waste**

Poultry litter waste comprises poultry manure, feed spilled from feeders, feathers, bedding material, and dirt from the floor of the poultry house. It is rich in nitrogen; therefore it is a good source of crude protein. However, the quality varies depending on factors such as the quality of feed offered to the birds, their age, amount of feed wasted and the type and amount of bedding. Aruwayo et al. (2007) reported poultry litter waste proximate composition of 25% crude protein, 6.7% ether extract, 12.0% crude fibre, 49.47% ash, and 6.8% nitrogen free extract while Lanyasunya et al. (2006) reported a proximate composition of dry matter (DM) 94.3%, ash 20.5%, organic matter (OM) 85.8%, crude protein (CP) 15.4%, neutral detergent fibre (NDF) 36.2%, hemicellulose 17.1%, and acid detergent fibre (ADF) of 19.2%. It is high in protein (about 25% crude protein equivalent), digestible nutrient of (TDN) of about 50% as well as minerals (Saleh et al., 2005). Fresh poultry manure is about 30% crude protein on dry matter basis, rich in minerals (INRA/FAO, 2012). It is evident from the nutrient composition reported by these authors that poultry litter waste possesses the potential of meeting the nutrient requirements of ruminants.

Ruminants have been demonstrated to perform favorably on poultry litter waste. Aruwayo et al., (2007) reported that Uda lambs fed diets that contained 10% and 20% poultry litter had average weight gain of 73.50g/day and 80.35g/day respectively which compares with the control that had 81.50g/day. It is also reported that feeding poultry litter waste has no adverse effect on haematological and biochemical parameters if they appropriately processed. Farzana et al (1994) reported that there was no significant effect of
poultry litter based silage on RBC count, PCV, erythrocyte indices, MCV, MCH and MCHC while haemoglobin concentration decreased and ESR increased at 6 weeks in the litter fed groups as compared with the control group. Total leukocytic count did not differ among different group. Aruwayo et al., (2007) also reported that feeding of poultry litter waste at 20% level of inclusion to Uda lambs did not have any significant effect on their haematological and biochemical characteristics. The implication of these results is that poultry litter waste can be safely fed ingredients of ruminants feed.

**Browse Plants**
Browse plants are another source of non-conventional feed resources for ruminants. They are important sources of high quality feed for grazing ruminants and as supplements to improve the productivity of herbivores fed on low quality feeds. Tree fodders are important in providing nutrients to grazing ruminants in arid and semi-arid environments, where inadequate feeds are a major constraint to livestock production (Aganga and Tshwenyane, 2003). Tree fodders maintain higher protein and mineral contents during growth than do grasses, which decline rapidly in quality with progress to maturity (Shelton, 2004). However, the utilization of browse plants is limited by the high lignin content and the presence of anti-nutritional factors. They may be toxic to the animals. Njidda (2010) reported the proximate composition and the anti-nutritive constituents of some browse plants as shown in the table 2 and 3. He then reported that the nutritive content of these browse plants can complement those obtained from the conventional feed resources and that anti-nutritional constituents are not harmful to the ruminants if not consumed in excess.

### Table 2: Proximate composition (% DM) of some semi-arid browses

<table>
<thead>
<tr>
<th>Browse species Forages</th>
<th>DM</th>
<th>CP</th>
<th>EE</th>
<th>Ash</th>
<th>OM</th>
<th>Ca</th>
<th>P</th>
<th>Mg</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Ficus polita</em></td>
<td>95.20</td>
<td>16.21</td>
<td>3.00</td>
<td>10.00</td>
<td>85.20</td>
<td>1.75</td>
<td>50.00</td>
<td>1.09</td>
</tr>
<tr>
<td><em>Ficus thonningii</em></td>
<td>95.20</td>
<td>16.47</td>
<td>2.00</td>
<td>18.00</td>
<td>77.20</td>
<td>0.75</td>
<td>41.25</td>
<td>0.36</td>
</tr>
<tr>
<td><em>Batryospermum paradoxum</em></td>
<td>95.80</td>
<td>14.63</td>
<td>5.00</td>
<td>18.00</td>
<td>87.80</td>
<td>1.20</td>
<td>11.25</td>
<td>0.30</td>
</tr>
<tr>
<td><em>Kigalia africana</em></td>
<td>96.40</td>
<td>13.85</td>
<td>3.00</td>
<td>18.00</td>
<td>78.40</td>
<td>0.90</td>
<td>10.00</td>
<td>0.15</td>
</tr>
<tr>
<td><em>Celris integuifolis</em></td>
<td>96.20</td>
<td>15.89</td>
<td>3.00</td>
<td>16.00</td>
<td>80.20</td>
<td>1.95</td>
<td>11.25</td>
<td>1.03</td>
</tr>
<tr>
<td><em>Khaya senegalensis</em></td>
<td>97.00</td>
<td>14.11</td>
<td>3.00</td>
<td>10.00</td>
<td>87.00</td>
<td>0.95</td>
<td>26.25</td>
<td>0.25</td>
</tr>
<tr>
<td><em>Leptadenia lancifolia</em></td>
<td>95.80</td>
<td>16.65</td>
<td>4.00</td>
<td>18.00</td>
<td>77.80</td>
<td>1.05</td>
<td>31.25</td>
<td>0.40</td>
</tr>
<tr>
<td><em>Ziciphus abyssinica</em></td>
<td>97.00</td>
<td>14.37</td>
<td>2.00</td>
<td>14.00</td>
<td>83.00</td>
<td>1.10</td>
<td>20.00</td>
<td>0.46</td>
</tr>
<tr>
<td><strong>Means</strong></td>
<td>96.07</td>
<td>15.27</td>
<td>3.13</td>
<td>14.00</td>
<td>82.08</td>
<td>1.21</td>
<td>25.16</td>
<td>0.51</td>
</tr>
<tr>
<td><strong>SEM</strong></td>
<td>0.14S</td>
<td>0.18</td>
<td>0.12</td>
<td>0.69</td>
<td>0.63</td>
<td>0.08</td>
<td>3.56</td>
<td>0.08</td>
</tr>
</tbody>
</table>

*a, b, c, means in the same column with different superscript differ significantly (P<0.05). DM=Dry matter; CP=Crude protein; EE=Ether extract; OM=Organic matter; NDF=Neutral detergent fibre; ADF=Neutral detergent fibre; Ca= Calcium; P=Phosphorus; Mg=Magnesium
Source= Njidda (2010)

### Table 3: Anti nutritive constituents (mg/g DM) of some semi-arid browses
PROCESSING OF NON-CONVENTIONAL FEED RESOURCES

Non-conventional feed resources portend danger to ruminants if they are not properly processed because of the inherent anti nutritional properties. The nutritive value is also enhanced with appropriate processing and treatment. Different methods have used. These include:

1. Chemical treatment: Chemicals such as ammonia gas or ammonia generated from urea under anaerobic conditions renders fiber more fragile and disrupts the bond between lignin and other digestible components in fibrous feedstuffs such as straws. Ammonia treatment increases crude protein content, feed intake and digestibility of treated straws thereby improving livestock productivity (Amata, 2014). Neem seed cake/meal is bitter in taste, poor in palatability and contains pungent odour due to the presence of active principles which can be removed by dissolving the cake in organic solvents like hydrocarbon, alcohols, ketones and esters (Schmutterer, 1995), alkali like sodium hydroxide (Aruwayo et al., 2010) and washing in water (Nath et al., 1983).

2. Ensiling: Ensiling has been demonstrated to possess the ability to make some non-conventional feed resources fit for ruminant consumption. Bakshi and Fontenot (1998) reported that pathogens in poultry litter are normally eliminated by deep stackling or ensiling at different moisture levels alone. Cook et al., (2008) also reported that pathogens in poultry litter waste can be destroyed through ensiling. Aruwayo et al., (2007) sun dried it for a period of four weeks before incorporating it into the diet of Uda lamb.

CONCLUSION
There is wide gap between the supply of ruminant’s product and demand. This has been majorly adduced to shortage of the feed. Reports on some non-conventional feed resources showed that they are nutritionally adequate for the nutrient requirements of ruminants. The anti-nutritional factors, contaminations and all harmful organisms that serve as impediments to its use can be removed with appropriate processing and treatment. They can be incorporated into ruminants feed without adverse effect. This will help in ameliorating the difficulties encountered by farmers in feeding the ruminants especially during dry season of the year, reduce cost of production and boost production.

REFERENCE


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