CROP RESIDUES AS DRY SEASON FEED

FOR RUMINANT LIVESTOCK

EXTENSION BULLETIN No 43

BY

A. E. R. L. S., ABU, ZARIA

Published September 1987.
CONTENTS

Acknowledgement 3

Introduction 4

Estimating the yield of crop residues 4

Factors affecting the nutritional value of crop residues 7

Feeding and enhancing the nutritive value of crop residues 9

Major crops cultivated and potential residue yield 16
ACKNOWLEDGEMENT

The materials for the production of this bulletin were mainly drawn from research results at the National Animal Production Research Institute (N.A.P.R.I.). I appreciate the valuable comments by Drs: A. Adamu of the Department of Cattle Production, N.A.P.R.I; S. Aliyu, I. I. Dafwang, M. Umaru and J. Y. Odiba, all of the Extension Livestock Department of A.E.R.I.S.

I. E. J. IWUANYANWU
Introduction

Crop residues are post harvest roughage materials. These include sorghum, millet, and maize stovers (stem with leaves); maize cob, maize husk; groundnut, cowpea, cotton and soyabean haulms; groundnut and cowpea shells. Generally crop residues are characterised by low nutrient contents, low digestibility and poor voluntary consumption by ruminant animals. These poor characteristics notwithstanding, investigations show that the ability of ruminant animals (Cattle, Sheep and Goats) to survive during the long dry season in the Savanna is facilitated by the consumption of these farm residues. Besides the major ruminant livestock producing areas of the Savanna are located within the largest grain growing zones. Thus several million metric tonnes of crop residues, capable of feeding millions of Cattle, Sheep and Goats are produced annually in the Northern States. A proper utilization of the post-harvest farm residues will greatly assist in providing adequate ruminant feed needs during the dry season. This bulletin discusses economically feasible recommendations on how to improve the feeding value of crop residues and how to estimate the amount of the resulting residues, harvesting as well as factors that affect the nutritive value of the residues.

Estimating the Yield of Crop Residues

A farmer can estimate the amount of crop residue obtainable from his farm. He can do this from the amount of grain harvested. Such an estimate can assist him to know the quantity of residue available for his animals. It can also enable the farmer to calculate the amount of revenue he can derive from the sale of the residues. For instance the farmer can allow a cattle owner grazing rights on maize, guinea corn or millet residues on his farms and charge the cattle owner accordingly. On the other hand haulms of groundnut, cowpea, soyabean and cotton are sold on per bale units to livestock owners.

In calculating residue yield of maize, guinea corn or millet, it should be noted that the resulting stover is about two (2) times the weight of grain (see Table at the back). In the case of guinea corn, research has shown that the leaves usually comprise more than 22% of the material useful to livestock. About half of this leaf material is lost through shattering, termites attack and decay, while the remaining half is available for feeding livestock.
Fig 1. Groundnut Harawa

Fig 2. Maize stover
Fig 3 Maize Cobs

Worked Example

Investigations in 1981 showed that the estimated amount of guinea corn stovers produced in Nigeria was 11.8 million metric tonnes (11,800,000 kg) obtained from 5.9 million metric tonnes of sorghum grain.

(i) Suppose only 22% of the stovers were leaves. Therefore 22 x 11,800,000 = 2,596,000,000 kg (2.6 million metric tonnes) leaf materials.

(ii) If 50% \((\frac{1}{2})\) of 2,596,000,000 is taken away as loss to the environment therefore 2,596,000,000 is \(\div 2 = 1,298,000\) kg (1.3 million metric tonnes) leaf materials.

(iii) Suppose cattle is fed the leaf materials at 5 kg per animal per day for say 6 months (180 days) during dry season, therefore the number of cattle fed:
\[
= \frac{1,298,000,000}{5 \times 180}
\]
\[
= 1,442,222 \text{ cattle}
\]
Thus over one million cattle can be fed with sorghum stovers alone. If similar calculations are made for millet and maize, it is clear that cereal crop residues alone can supply enough roughage for a large percentage of the cattle population. Generally straw yield for maize and millet is put at 3.2 and 2.8 metric tonnes per hectare respectively.

The amount of farm residues obtainable from legume crops such as groundnuts and cowpea is calculated as one (1) part by weight of seed (shelled) to 3 and 5 parts by weight of groundnut and cowpea haulms respectively. The residue yield for groundnut and cowpea is estimated to be 3.7 and 3.2 metric tonnes per hectare respectively.

Factors affecting the nutritional value of crop residues

Two major factors affecting the nutritive value of crop residues. These are the soil conditions, the time of harvesting and storage method.

I) Soil Conditions

Soils of low inherent fertility or soils depleted of nutrients due to cropping require the application of fertilizers to further improve crop production. Application of nitrogen fertilizers to cereals can improve the nitrogen content of the resulting residue.

In maize and sorghum trials the application of nitrogen fertilizer such as calcium ammonium nitrate (CAN) at between 90 to 240 kg nitrogen per hectare has resulted in 3.5 to 5.8% increase in nitrogen content of the residues. Compound fertilizers such as N.P.K. with high percentage of nitrogen can also be used.

Farmers should therefore note the importance of nitrogen fertilizer application to maize, sorghum and millet and the need to pursue this practice more vigorously.

(II) Time of Harvesting and Storage Method

The straw of maize, millet and sorghum will start loosing its nutritional quality from 28 days after harvest on the farm.
Ensure early grazing and or gathering of the residues on the farm and proper storage in order to prevent decline in quality. You can erect shade over the heap of maize stovers in the photograph above in order to help preserve its feeding value for livestock. Cowpea, groundnut, cotton, potato, and soybean haulms could be tied in small units to facilitate their storage.

Heavy rains do not favour the continued stay of groundnut residues on the farm after harvest. Heavy rains do leach out soluble nutrients and lower digestibility.

Mouldiness due to high humidity can decrease animal acceptability of the haulms as well as decrease fermentable carbohydrate content. High humidity can also induce leaf spot in groundnut haulms, since groundnut is harvested in the wet season.
Leaf spot is a fungal disease and its incidence is low in areas with low humidity. Research has shown that the nutritive value of groundnut haulms produced in Katsina is higher than that of haulms in Zaria. To minimise the incidence of leaf spot in areas with high humidity, the harvested groundnut plant with pods could be gathered up in small cone-shaped piles on raised floors in shades preferably on the farm such that the roots and kernel are on the outside and the leaves protected from the weather. The kernels could be removed later with minimum loss of leaves.

It is important to harvest or graze the crop residues on time and to handle the harvested material well as any mistake will affect the nutritive value of the residues.

**Feeding and Enhancing the Nutritive value of Crop Residues**

Because of the low nutrient contents of residues of maize, millet and sorghum, they should be fed to cattle, sheep and goats free choice or fed at the rate of 5kg per cattle daily. Invariably the ruminant animal will eat between 2.5 to 3% of its body weight daily, but the low nutrient status of residues will limit the animal from eating up to the above percentage. Thus to improve the nutritive value and increase intake, these residues should be supplemented with oil seed cakes, bloodmeal, urea-molasses, or legumes.

1) **Supplementation with oil seed cakes or bloodmeal**

You can feed cotton seed cake, groundnut cake, soyabean meal palm kernel cake or bloodmeal at the rate of 200g, 160-180g and 1000g per day to sheep, goats and cattle respectively, in addition to residues of maize, guinea corn or millet or combinations of the residues.
In the absence of a weighing scale, the following containers can be used: small sized Bournvita and Ovaltine, medium sized Blue Band margarine tin or similar tin filled to the brim with cake or bloodmeal for sheep, or filled to three quarters \((\frac{3}{4})\) for goat and fully measured five \((5)\) times for cattle. These supplements when correctly fed will prevent weight loss in ruminants during the dry season. In addition, beef cattle fed these residues with oil seed cakes in particular performed better than similar animals fed gamba hay supplemented with the same cake.

II) Treatment with Urea

Fertilizer grade urea also can be used as the only source of nitrogenous supplement to cattle, sheep and goats fed crop residues of maize guinea corn or millet.

One method of offering these animals the urea nitrogen is by ensiling the residues with urea. This method of treating crop residues is called cruprocess, and is practiced at the Kano State Agricultural and Rural Development Programme (K.N.A.R.D.A).
The technique involves placing a known quantity of these crop residues in a pit and spraying the residues with the urea solution made from a known quantity of urea. The pit is sealed for 20 days preferably with polythene material in order to induce good fermentation of the residues. After 20 days the treated residue is fed to animals.

For instance you can dissolve 1.0kg of Urea in 10 litres of water and spray the solution on 20kg residue of maize, guinea corn or millet or their combination. The stovers are chopped into pieces with a small cottage machine. At a feeding rate of 5kg per cattle per day the 20kg ensiled material can feed 4 cattle in a day or one in 4 days. It can also feed more than 20 goats or sheep in one day or more than 5 in 4 days.
(III) Supplementation with Urea-Molasses Block

Urea-molasses block is a lick comprising urea, molasses and other components bound together by a suitable binder such as calcium oxide (CaO). The block is one of the simplest methods of supplying nitrogenous fertilizer grade urea or feed grade urea to ruminants. Animals lick the block on free choice basis and at the same time they are fed or allowed to graze crop residues. Depending on the age of the animals, investigation shows that cattle can lick between 51g to 376g of the block daily.
(IV) Supplementation with Urea-molasses-Straw Mixture

A mixture of a solution of urea, molasses and the cereal residue is also another method of feeding urea-molasses to ruminants. Where molasses is available, this approach could be of help to livestock owners who cannot purchase the urea-molasses block.

![Fig. 9 Covers for use as measure](image)

With the cover (in the photograph above) of a small sized Vaseline bottle or the cover of any body cream bottle of the same size, you can measure out (once) to the brim 60-80g of urea. Also 160 ml of water is measured out by filling empty medium sized peak milk tin or a similar milk tin. Both the urea and water are placed in an empty medium sized tin of Ovaltine, Milo, Bournvita or similar tin. Gently shake the tin with the contents several times until the urea is dissolved.

![Fig 10. Mixing urea, molasses and straw](image)
Take two handfuls (about 500g) of maize stover (stalk with leaves) or guinea corn or millet residue (leaves only since the stems are hard).

Squeeze the residue (with both hands) into a basin or a half drum to reduce the residue to smaller pieces. Again with the milk tin (half filled with molasses) measure out 200g of molasses, or fill the tin to half its size with molasses.

Pour the urea solution and the molasses on the residue and mix the whole material thoroughly until the urea solution is completely absorbed in the mixture. Give the mixture to cattle, first thing in the morning before the animal is allowed to go out to graze or consume its full daily ration of the residues. Giving the animal the mixture first in the morning ensures that it consumes the supplement to stimulate good rumen (stomach) environment necessary for increased consumption of the residues.

Experiment has shown that animals fed in this manner in the dry season did not only overcome body weight loss but also satisfactorily gained weight.

(V) Supplementation with Legumes

Legume hay such as of cowpea, stylo or groundnut could be fed at between 0.9 - 2kg per head per day depending on body weight of cattle consuming residues of maize, guinea corn or millet.

On the other hand cereal crops could be oversown or interplanted with legumes such as cowpea, or stylo so that the resulting residues could be grazed together.

This practice enhances the nitrogen status of the cereals residue as well as enables the animal to consume more of the residues.

From the above discussions, it is clear that crop residues have the potential of assisting farmers achieve reduction in weight loss in cattle, sheep and goats. If these animals consuming these residues are correctly supplemented, their productivity will be greatly improved. The amount of residues obtainable from crop farms can be estimated and such estimate could help a farmer make provision for his stock and also determine revenue from sale of the residues. Loss of nutritive value of crop residues can be minimised by early harvest or grazing on the farm and proper handling including storage after harvest.
Fig 11. Cereal legume crop mixture
HECTARES CULTIVATED AND POTENTIAL RESIDUES YIELD FOR MAJOR CROPS OF CATTLE-PRODUCING AREAS OF NIGERIA: IN 7000 HECTARES AND 7000 (KILOGRAMS)

<table>
<thead>
<tr>
<th>State</th>
<th>Millet</th>
<th>Sorghum</th>
<th>Groundnut</th>
<th>Cowpeas</th>
<th>Maize</th>
<th>Rice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bauchi</td>
<td>327</td>
<td>501</td>
<td>66</td>
<td>163</td>
<td>46</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>(762)</td>
<td>(1,169)</td>
<td>(154)</td>
<td>(380)</td>
<td>(107)</td>
<td>(21)</td>
</tr>
<tr>
<td>Benue</td>
<td>48</td>
<td>252</td>
<td>25</td>
<td>26</td>
<td>39</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>(112)</td>
<td>(587)</td>
<td>(58)</td>
<td>(61)</td>
<td>(91)</td>
<td>(68)</td>
</tr>
<tr>
<td>Borno</td>
<td>480</td>
<td>184</td>
<td>69</td>
<td>172</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>(1,118)</td>
<td>(429)</td>
<td>(161)</td>
<td>(401)</td>
<td>(2.33)</td>
<td>(117)</td>
</tr>
<tr>
<td>Gongola</td>
<td>41</td>
<td>324</td>
<td>85</td>
<td>13</td>
<td>39</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>(96)</td>
<td>(755)</td>
<td>(198)</td>
<td>(30)</td>
<td>(91)</td>
<td>(65)</td>
</tr>
<tr>
<td>Kaduna</td>
<td>492</td>
<td>513</td>
<td>168</td>
<td>69</td>
<td>66</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>(1,146)</td>
<td>(1,196)</td>
<td>(391)</td>
<td>(161)</td>
<td>(154)</td>
<td>(123)</td>
</tr>
<tr>
<td>Kano</td>
<td>640</td>
<td>676</td>
<td>152</td>
<td>656</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>(1,491)</td>
<td>(1,575)</td>
<td>(554)</td>
<td>(1,528)</td>
<td>(7)</td>
<td>(12)</td>
</tr>
<tr>
<td>Niger</td>
<td>40</td>
<td>147</td>
<td>24</td>
<td>20</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>(93)</td>
<td>(342)</td>
<td>(56)</td>
<td>(47)</td>
<td>(42)</td>
<td>(33)</td>
</tr>
<tr>
<td>Plateau</td>
<td>57</td>
<td>220</td>
<td>23</td>
<td>41</td>
<td>72</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>(139)</td>
<td>(513)</td>
<td>(54)</td>
<td>(96)</td>
<td>(168)</td>
<td>(37)</td>
</tr>
<tr>
<td>Sokoto</td>
<td>933</td>
<td>698</td>
<td>126</td>
<td>364</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>(2,174)</td>
<td>(1,626)</td>
<td>(294)</td>
<td>(848)</td>
<td>(12)</td>
<td>(7)</td>
</tr>
<tr>
<td>Zonal Total</td>
<td>3,058</td>
<td>3,515</td>
<td>738</td>
<td>1,524</td>
<td>287</td>
<td>207</td>
</tr>
<tr>
<td></td>
<td>(7,125)</td>
<td>(8,190)</td>
<td>(1,729)</td>
<td>(3,551)</td>
<td>(669)</td>
<td>(482)</td>
</tr>
</tbody>
</table>

Compiled from: Federal Office of Statistics, Agricultural Survey Unit, using average DM yield per ha. as 2.33 kg.
Produced and Distributed by:-
Agricultural Extension and Research Liaison Services.
Ahmadu Bello University
P.M.B. 1067
Zaria-Nigeria
Published September 1987.

Printed by Merry-Time Associated Press, Kaduna.