Feeding crop residues for improved draft power

by

V L Prasad[1], C T Khombe[2] and P Nyathi[3]

[1] *Chief Research Officer, Makoholi Experimental Station, Private Bag 9182, Masvingo, Zimbabwe*
[2] *Research Officer, Makoholi Experimental Station, Private Bag 9182, Masvingo, Zimbabwe*
[3] *Assistant Director, Department of Research, Ministry of Agriculture, Harare, Zimbabwe*

Abstract

A short-term feeding trial was conducted to study the effect of crop residues as diet supplements for draft animals. Twenty-four 35-month-old Mashona steers (average weight 275 kg) were allocated to three feeding treatments (eight animals each). All animals were grazed during the day at a set stocking rate of one livestock unit (500 kg) to 2.5 ha and fed at night in pens. Group 1 steers received 2 kg maize stover per animal. Steers in group 2 received 1.5 kg maize stover plus 0.5 kg groundnut haulms per steer. Group 3 steers were not fed any supplement. Body weight changes at the end of a 90-day feeding period were –12.6, –5.6 and –16.9 kg for groups 1, 2 and 3, respectively. During a one-hour plowing test, the walking speed, area plowed and work done by a span of four animals were higher for the two supplemented groups than for the control group. It is concluded that regular dry season supplementation with crop residues is appropriate.

Introduction

Communal farmers in Zimbabwe keep cattle mainly for the draft power use (Shumba, 1984; Eckert and Mombeshora, 1989). The critical role of cattle as an input for crop productivity was illustrated by survey results comparing farmers who were cattle owners with those who did not own cattle (Shumba, 1985). Cattle owners were shown to have relatively larger arable holdings and better and more timely seedbed preparation and weed control than non-cattle-owners. They also applied more manure and achieved higher yields.

The five- to eight-month dry season which precedes the crop cultivation season leaves animals weak, and farmers are faced with the problem of having inadequate draft power (Mombeshora, Agyemang and Wilson, 1985; Shumba and Whingwiri, 1988). The dry season is characterised by a decline in the quality of grazing. Crude protein content of grasses declines from 15% in November and December to 3% by the end of May (Elliot, 1967). The grazing situation is exacerbated by the high density of cattle, with stocking rates of four times the recommended levels being reported in certain areas (Christensen and Zindi, 1991). The end of the dry season is the critical time of underfeeding, but also the time when animals need to be in good condition to pull the plow (Soller, Reed and Butterworth, 1986).

Most farmers feed crop residues, mostly maize and sorghum stover and groundnut haulms, to ameliorate the nutritional stress during this period (Mombeshora, Agyemang and Wilson, 1985; Sibanda, 1986). This paper reports on a study of the effect of dry season supplementation on the liveweight and draft output of steers.

Materials and methods

Twenty four 35-month-old Mashona steers (oxen) with an average weight of 275 kg were used for a period of 90 days during the late dry season of 1988. All steers were grazed during the day at a set stocking rate of one livestock unit (500 kg) to 2.5 ha. The animals were penned in three different feeding groups between 1630 and 0700 hours. Each group had eight animals.

The feeding treatments were:

- group 1: 2 kg maize stover per steer per day
- group 2: 1.5 kg maize stover plus 0.5 kg groundnut haulms per steer per day
- group 3: No supplementary feeding (control).

The maize stover was milled through a 25 mm screen and the groundnut haulms were fed whole. Individual feed intake was monitored.

Starved liveweight (taken after 24 hours fasting with the last 12 hours without water) was measured at the beginning of the feeding period and after 90 days.

At the end of 90 days the animals were put to a one-hour plowing test. A uniform piece of land with granite-derived sandy soil was divided into 15 plots of 70 x 30 m. Animals from each feeding group were used in spans of four with one span per feeding group used each day. By interchanging animals within the groups, five spans per group were used. Implement draft was measured using a spring dynamometer. Five draft readings per team were taken during the first 15 minutes and five during the last 15 minutes of the test. The distance travelled and area plowed were measured using

Table 1: Liveweight changes of steers from each experimental group

	Group 1 (maize)	*Group 2 (maize/groundnut)*	*Group 3 (control)*
Initial liveweight (kg)	276 ± 20	275 ± 19	276 ± 28
Final liveweight (kg)	263 ± 21	270 ± 19	259 ± 26
Change in liveweight (kg)	−12.6 ± 9.2	−5.62 ± 4.4	−16.9 ± 7.4
Change in liveweight (g/day)	−140 ± 102	−62.4 ± 49	−188 ± 82

All figures are means ± standard deviation

Table 2: Plowing performance of spans of four steers across treatment groups

	Group 1 (maize)	*Group 2 (maize/groundnut)*	*Group 3 (control)*
Area plowed (m^2)	1090 ± 16	1180 ± 210	841 ± 85
Rate of plowing (m/s)	1.18 ± 0.19	1.28 ± 0.21	0.916 ± 0.16
Distance covered (m)	2198 ± 380	3066 ± 500	1828 ± 460
Draft (N)	1465 ± 85	1480 ± 81	1400 ± 80

All figures are means ± standard deviation

tapes. From the measurements of time, distance, area and draft, the work output and power generated were calculated.

Results

The liveweight changes of steers during the 90-day feeding period are presented in Table 1. The control group lost more body weight ($P<0.05$) than the group supplemented with maize stover and groundnut haulms (188 versus 62 grams per day). Steers supplemented with maize stover alone lost 140 grams per day.

The area plowed in one hour was significantly ($P<0.05$) greater for the supplemented groups than for the control group (Table 2). Similarly steers from groups 1 and 2 plowed faster and covered a greater distance ($P<0.05$) than steers from the control group. Across groups, the recorded draft was approximately 14% of liveweight and did not differ significantly ($P>0.05$) between treatments. Figure 1 shows the calculated work and power outputs per span of the three groups of steers.

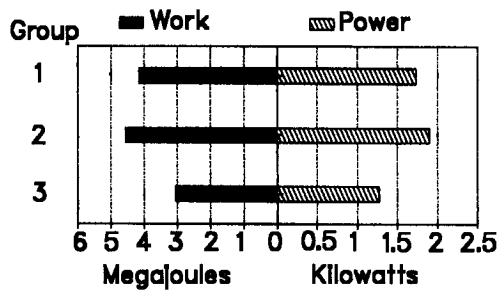
Discussion

The results seem to support the general proposition that feeding crop residues may improve the draft power output in communal areas. However, the data obtained in the present study should be treated with some caution as the experimental animals were only subjected to a one-hour test. The main difference between the groups was the speed of walking, and this is reflected in the calculated work and power outputs, which were higher for the supplemented animals. The differences may have been due to the feeding regimes, but the effect of the operators on animal speed and implement draft cannot be ruled out.

In the present study the supplementation was restricted to 2 kg per steer because it is unlikely that communal farmers would be able to feed more than that amount. Feeding a limited amount of crop residues throughout the dry season seems to be a more sound nutritional proposition than feeding a large amount in the late dry season. The efficiency of utilisation of low quality feeds (such as crop residues) is higher for maintaining a particular liveweight than for growth (Pearson, 1986).

Further comparative studies on supplemented animals, with more comprehensive traction tests, are underway.

Figure 1: Work and power output of experimental teams



References

Christensen C and Zindi C, 1991. *Patterns of livestock ownership and distribution in Zimbabwe's communal areas.* Working Paper 4/91. Department of Agricultural Economics and Extension, University of Zimbabwe, Harare, Zimbabwe. pp 4–6.

Eckert M V and Mombeshora B, 1989. Farmer objectives and livestock functions. pp. 213–252 in: Cousins B (ed), *People, land and livestock.* Proceedings of a workshop on the socio-economic dimensions of livestock production in communal lands of Zimbabwe, held 12–14 September 1988, Masvingo, Zimbabwe. Centre for Applied Social Science, Harare, Zimbabwe.

Elliot H C, 1967. Voluntary intake of low protein diets by ruminants: intake of food by cattle. *Journal of Agricultural Science, Cambridge* 69:375–383.

Mombeshora B, Agyemang K and Wilson R T, 1985. *Livestock ownership and management in Chibi and Mangwande communal areas of Zimbabwe.* Small Ruminant and Camel Group Document 2. International Livestock Centre For Africa (ILCA), Addis Ababa, Ethiopia. 14p.

Pearson A. 1986, Feeding and management of draught animals. *Indian Journal of Animal Production* 2:48–69.

Shumba E M, 1984. Animals and croping system in communal areas of Zimbabwe. *Zimbabwe Science News* 18:7–8.

Shumba E M, 1985. On-farm research priorities resulting from a diagnosis of the farming systems in Mangwande, a high potential area in Zimbabwe. *Zimbabwe Agricultural Journal* 5:38–59.

Shumba E M and Whingwiri E E, 1988. Prospects for increased livestock production in communal areas: an agronomist's perspective. pp. 134–138 in: McLaren G G (ed), *Committee for on-farm research and extension.* Proceedings of a workshop on livestock research and extension for communal area farming systems held 16–18 February 1988 at Henderson Research Station, Mazowe, Zimbabwe. Ministry of Lands, Agriculture and Rural Resettlement, Harare, Zimbabwe.

Sibanda S, 1986. The use of crop residues in livestock production systems in the communal areas of Zimbabwe. pp. 140–144 in: Preston T R and Nuwanyakpa M Y (eds), *Towards optimal feeding of agricultural byproducts to livestock in Africa.* Proceedings of a workshop held at University of Alexandria, Egypt, October 1985. African Research Network for Agricultural Byproducts (ARNAB). International Livestock Centre for Africa (ILCA), Addis Ababa, Ethiopia.

Soller H, Reed J D and Butterworth H M, 1986. Intake and utilisation of feed by work oxen. *ILCA Newsletter* 5(2):5. International Livestock Centre for Africa (ILCA), Addis Ababa, Ethiopia.

Photograph opposite
Weeding maize with oxen at Magoye, Zambia, during the ATNESA workshop field visits