

## Dry season crop residue feeding for improved draft power in Zambia

by

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### Abstract

*Farmers in Zambia indicated that the poor condition of draft animals at the onset of the rains is a constraint to early and timely planting. They suggested the inadequate grazing of the animals during the dry season is the main cause. Farmers explained that they did not conserve any roughage during the dry season. Together with farmers, the Palabana Animal Draught Power Development Programme scrutinised local feed resources for supplementation of dry season grazing and browsing. Leguminous crop residues received first priority. In an on-farm trial in six districts with 10 farmers each, groundnut stover was collected, stored and rationed to a pair of oxen for 3–4 months from August. During the cultivation period the trial was evaluated in a group discussion with the participating farmers. Farmers were enthusiastic about the performance of the animals. The main input was labour, which was not a constraint. The construction of a proper storage shed was the crucial input for a successful result. Extension materials based on these experiences have been developed to boost the message to more farms and increase the collection of residues within farms. During the harvesting season, field days were organised at farms of participating farmers to demonstrate to other farmers the construction of storage sheds and feeding practices. In the second year over 500 farmers in nine districts adopted the message and included collection of other crop residues such as cowpea and maize and sorghum stovers.*

### Introduction

Nobody will deny that an animal in proper condition will perform better than a hungry skeleton. Of course poor animals may be forced to plow a field, but these animals are slow, disobedient and may later refuse to work at all. If feeding is neglected, work oxen can lose 20% of

their body weight during the dry season (Bartholomew et al, 1993). At the onset of the rains when animals are needed for plowing, feed intake is often below maintenance level because time for grazing and availability of grass are limited. However, during the working period total estimated energy expenditures will often be 1.3–1.8 times maintenance (Lawrence, 1987). If an animal is in proper condition it will have fat reserves which may be mobilised during the working period. Research has been done by many people to identify an effective strategy to feed animals in an efficient way for a satisfactory work output. Many feeds have been reviewed and trials or programmes implemented to improve the utilisation of the feed resource, eg rangeland renovation, fodder production and conservation, agroforestry with fodder trees and preservation of crop residues.

In The Gambia, the feeding of crop residues, being a very under-utilised resource, was most successful. Farmers were encouraged to save and store cereal and groundnut stovers and feed restricted quantities to specific animals. In the same programme rangeland management with high inputs like fencing, seeds and herbicides, seemed unsustainable (Russo, 1990).

The period of supplementation has been examined by several researchers. Chikura (1994) supplemented draft oxen in a 90-day on-farm trial during the cultivation period with on average 3.9–4.2 hours plowing during 10–22 working days. The control group, as well as the supplemented animals, showed comparable weight gain, indicating that the animals did receive enough time for grazing the succulent young grass available during that time of the year. It was concluded that under these circumstances, supplementary feeding was not required. It was suggested, however, that

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in areas of lower potential, or in more severe years, it could be effective. Supplementation throughout the dry season was thought to be more appropriate. This strategy was examined by Prasad, Khombe and Nyathi (1994). They found less weight loss and a better performance (area plowed, rate of plowing and distance covered) for oxen supplemented with maize stover (1.5 kg per day) and groundnut halm (0.5 kg per day). They concluded that the feeding of a limited amount of crop residues throughout the dry season seems to be a sounder nutritional proposition than feeding a large amount in the late dry season.

Dry season supplementation was also studied by Francis and Ndlovu (1993). They demonstrated that cob-sheath and groundnut stover can offset dry season weight losses of draft oxen, especially if fed for a longer period during the dry season.

Bartholomew et al (1993) compared the work capacity of supplemented and non-supplemented oxen and found an increase of 28%, but indicated that this increase was obtained with a considerable cost in feed energy input. This increase was thought to be too costly if animals were used for less than three weeks in a year.

### The Zambian situation

In Zambia, the use of draft animals has been intensified during the last decade. More farm operations (tillage, planting, weeding and harvesting) as well as transport are being done with animals. In Southern Province the number of draft cattle decreased because of high mortality caused by East Coast Fever and drought (Sinyangwe, 1995). In this important animal draft power province smaller numbers of animals have to do more work. For the near future it is foreseen that the use of draft animals in Zambia will intensify further.

The Palabana Animal Draught Power Development Programme found enough ground in the above experiences and opinions to discuss the issue with field extension staff and farmers. General complaints concerning poor condition and low work output were regularly brought forward by extension staff. In the past, extension messages on supplementary feeding (eg fodder banks, crop residues) were disseminated but seemed not to interest the farmers. Informal discussions were held with the parties concerned in Southern and

Eastern Provinces, which have high cattle populations and a long dry season of seven months. Farmers declared that they do feed crop residues to their animals. When probing the issues, however, they admitted that residues are only fed in the field after harvesting and that much is trampled and wasted or eaten by animals other than their own. Remaining crop residues and standing hay are widely burned as early as August to clear the fields. Between then and December very little feed is left for the cattle. Many animals from the villages go to the *dambos* often far away for longer periods. Some of the draft animals joined the herd and were not available for work. Others stayed behind for regular transport jobs without feed.

After discussing the special quality of groundnut stover farmers became interested, saying that they did not know its feeding value was high. Many farmers growing groundnuts regretted that they had never used the stover.

### On-farm supplementation trial

Extension staff and farmers in six districts decided to start an on-farm trial with 10 farmers in each district. Farmers would collect, store and ration groundnut stover as a supplement to one pair of oxen during August to December. In a formal one-week residential course at Palabana the extension staff concerned were invited to discuss the field programme. Practicals were conducted on collection and conservation of stovers, construction of storage sheds and rationing of the feed. A three-day intake experiment with different treatments was part of the practicals which clarified the increased intake from groundnut stover compared to standing hay. It was recommended to start feeding 2 kg of groundnut stover per day in August and increase this quantity gradually to 10 kg per day in December depending on the availability of grass and browse. For the total period of about 100 days the farmers would need about 600 kg of groundnut stover per animal. During the training it was learned by measurement that a reasonable stand of groundnuts would produce 2000 kg of stover per ha.

For the participating farmers a one-day field training exercise was organised by the extension staff. Timely collection and proper storage for protection of the stover against termites, sun and

stray animals were discussed as prerequisites for successful preservation. The feeding of the stover to draft animals received only good support during the discussions. Many farmers suggested that it was not a problem to harvest the quantity of stover recommended for one pair of oxen.

### First-year experiences

In each trial area the extension worker organised a group discussion among the farmers to exchange experiences and evaluate the results. A total of 60 farmers participated in eight discussions during the cultivation period. During the discussions a checklist was used to cover the issues systematically. The majority of farmers had never supplemented the animals before. The trial was implemented by the farmers as planned. In Eastern Province the groundnuts produced well. However, in Southern Province many fields did not produce any nuts because of drought. In the past these fields were left for grazing by the village herds. Collecting the groundnut plants for dry season feeding gave the farmers the good feeling that they were not planted in vain.

Storage sheds were constructed but some were of poor quality. Herds of stray animals broke these structures early in the season and finished the stover rapidly. Roofs were often absent but maize stover was used to cover the more valuable groundnut stover. Most oxen were fed after grazing in the late afternoon. Farmers did not ration the feed very well so the stover was finished by early November. Some farmers fed all remaining stover after the first rains as the stover became wet and they expected regrowth of the grass very soon. Unfortunately, the first rains were only a few showers and afterwards a dry spell of over six weeks was experienced. Draft cattle were separated during feeding and some farmers even constructed separate kraals for the draft cattle. As animals got used to supplementation in the evening they came home by themselves which was appreciated as an advantage by the farmers. Farmers who also supplemented early in the morning found the animals stayed around the farm the whole day which was an advantage if the farmers had regular transport jobs to do. It was the farmers' opinion that the condition as well as the performance of the animals was definitely better

compared to not-supplemented animals. Some of the comments were:

- animals moved faster
- animals were hard working
- animals worked longer without getting tired
- animals plowed more hectares in a week.

All farmers indicated that they would continue with this programme with some improvements on storage: the shed needs to be strong and constructed with a proper tin roof. The bin used for storing maize cobs was suggested as a proper alternative. Many farmers indicated that they would grow more groundnuts the following year to collect more stover.

### Second-year experiences

In the second year (1995) it was expected that the programme would spread, with only little guidance, in areas where the trial was done the year before. The 'first-year' farmers were mobilised during field days to inform other farmers in the community. In general the majority of farmers participating in the first-year trial improved well on collection, storage and feeding. The group collected more stover, constructed more permanent sheds and improved on rationing.

Hay and other stovers (eg maize, cowpea) were collected in large quantities. Also new farmers picked up the message very well. In some villages all groundnut growers started to collect the stover even though it had never been practised before.

A number of new extension staff within the participating districts showed interest in starting the same trial in their area. Central Province and Copperbelt Province became involved as well. New extension staff were advised again to start with just 10 farmers. Starting in the first year with a total of about 80 farmers, in the second year over 500 farmers were collecting stover.

A setback in groundnut stover collection was experienced where over 70% of the groundnut fields were affected by the rosette virus. Groundnuts were not harvested at all and the stover was also destroyed in most fields. Farmers, however, collected maize and cowpea stover instead, indicating an adaptation of the message.

Extension staff showed great interest and enthusiasm by organising field days and developing extension material to educate farmers.

The preparation of a set of posters and a leaflet to be used in farmers' meetings and field days was initiated.

## Discussion

On-farm research and extension programmes very often create enthusiasm within the target group when new concepts are tried with (often free) inputs like improved seed, 'modern' implements, chemicals etc. Frequently, enthusiasm changes gradually into realism with criticism from farmers on the risk and high investments involved. Identifying solutions to problems, risk and costs need to be considered first, especially in small-scale farming.

In solving the problem of poor performance of draft animals during the times they are needed most, we concentrated on a low-input solution. Inputs should be available within or around the farm. It was assumed that labour would not be a constraint. With such an approach you have to realise that you have only ideas to offer. The implementation is completely in the hands of the farmers themselves investing their labour to collect and store the stover. We did not expect much enthusiasm among the majority of farmers as long as the message had not been proven in the community. This was the main reason to start with just 10 farmers per extension worker to be able to encourage farmers regularly and individually. Once the message has been proven it should be possible to change the approach and disseminate the message to larger numbers of farmers. Also extensionists might have the feeling that they do not have much to offer farmers other than ideas. This was why extension staff had to come forward themselves before the Palabana Animal Draft Power Programme offered support by means of training and provision of extension materials. Using this strategy we experienced much enthusiasm in the field with farmers as well as extension staff. The result of more than 500 farmers implementing the idea within two years is encouraging and supports continued dissemination of the message.

## Conclusions

We may conclude that the approach of involving farmers and extension staff from the beginning, discussing together the problem and its solutions, and the implementation and evaluation, provide a base for success. However, the best indicator of success will be an increasing adoption level during the next few years.

## References

- Bartholomew P W, Khibe T, Little D A and Ba S, 1993. Effect of change in body weight and condition during the dry season on capacity for work of draft oxen. *Tropical Animal Health and Production* **25**(1): 50–58.
- Chikura S, 1994. Improving the management of feed resources for draft animals in Mangwende, Zimbabwe. pp 162–163 in: Starkey P, Mwenya E and Stares J (eds), 1994. *Improving animal traction technology*. Proceedings of the first workshop of the Animal Traction Network for Eastern and Southern Africa (ATNESA) held 18–23 January 1992, Lusaka, Zambia. Technical Centre for Agricultural and Rural Cooperation (CTA), Wageningen, The Netherlands. 490p. ISBN 92-9081-127-7
- Francis J and Ndlovu L R, 1993. Improving work performance of Mashona oxen through strategic supplementation with locally produced feeds. *Draught Animal News* **19**.
- Lawrence P R, 1987. Nutrient requirements of working ruminants pp 61–79 in: Farley J L (ed) *An introduction to working animals*. MPW Australia, Melbourne, Australia, 198p.
- Prasad V L, Khombe C T and Nyathi P, 1994. Feeding crop residue for improved draft power. pp 164–166 in: Starkey P, Mwenya E and Stares J (eds), 1994. *Improving animal traction technology*. Proceedings of the first workshop of the Animal Traction Network for Eastern and Southern Africa (ATNESA) held 18–23 January 1992, Lusaka, Zambia. Technical Centre for Agricultural and Rural Cooperation (CTA), Wageningen, The Netherlands. 490p. ISBN 92-9081-127-7
- Russo S L, 1990. The use of crop residues for livestock feed by small farmers in The Gambia. pp 165–185 in: Dzowela B H, Asrat Woldem-Agenehu and Ketegile J A (eds). *Utilisation of research results on forage and agricultural by-product materials as animal feed resources in Africa*. Proceedings of the first joint workshop, held 5–9 December 1988, Lilongwe, Malawi. PANESA/ARNAB, International Livestock Centre for Africa, Addis Ababa, Ethiopia. 824p.
- Sinyangwe P, 1995. Cattle distribution and supply for draft purposes. pp 43–45 in: Meinderts J H, Bwalya M and Chibango M (eds). *Livestock concerns in animal traction*. Proceedings of the fourth annual animal traction workshop held 31 August–2 September 1994, Lusaka, Zambia. Palabana Animal Draft Power Development Programme, Lusaka, Zambia. 76p.

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