Increasing the Productivity in Smallholder Owned Goats on Acacia Thornveld 1 Goat Feeding Strategies (R7351)

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Abstract

The current status of goat production and farmers' attitudes to feeding them *acacia* and other pods has been established. Variability in the annual production of pods, both species and quantity, was observed and will be noted for the duration of the project. Locally favoured species of pods are often decided by availability. The reasons for differences in animal performance attributable to pod species need investigating, as do methods of overcoming these constraints.

Introduction

Over the last 20 years numbers of goats have increased in Zimbabwe, particularly in the drier areas (Dept. of Veterinary Services, 1997). However, productivity is severely constrained by high kid mortality and low growth rates in young goats. Nutritional stress is greatest in the dry season, which ranges in length from five to 10 months, and during the early rains, when sudden drops in temperature and drenching rain, coupled with availability of browse only, stresses both kids and does (many livestock deaths due to poverty occur at this time).

Dry-season supplementation has long been recognised as necessary (Williamson and Payne, 1978). Does supplemented during the dry season reared more kids and lost less weight than those not supplemented (Prasad *et al.*, 1995). With grazing kapeters, supplementation supported growth during the dry season (Sikosana and Maphosa, 1997), but most farmers do not have the resources to purchase feed and must seek local alternatives. Much of the natural rangelands of the drier areas of Zimbabwe are characterized by trees of *Acacia* species and those closely allied to them. In well-managed rangeland these trees could produce between 2.5 and five tonnes of pods (whole fruits, seeds plus hull) /ha/yr (West, 1950), many of them being edible and rich in protein (Tanner *et al.*, 1988; Ncube and Mpofu, 1994). Timberlake *et al.* (1999) found that smallscale and commercial farmers regularly collect pods to use as high-protein feed in the dry season. They classify *Acacia erioloba*, A. *erubescens*, A. *nilotica* and A. *tortilis* as present in the 'greater Bulawayo area' and as 'Acacia dry woodland species'.

To assess farmers' perception of pods and to evaluate their potential to relieve dry-season feeding constraints in goats the following activities were undertaken: participatory rural appraisal (PRA) study; collection and analysis of pods; and feeding trials, that will continue for another season.

Activities

PRA Study

Two districts were selected, and within each two distinct areas comprising one or two wards: Matobo in Matabeleland South (Wards 3 and 11); and Bubi in Matabeleland North Province (Wards 3, 16 and 11, 15) (Kindness *et al.*, 1999). Sales of live animals and meat were given as the major reasons for keeping goats, with milk and manure production also considered important. Overall, feed shortages, together with disease and stockthefts, were ranked as major constraints to production. Feeding shortages occur in the dry season, between June and November, with July to October the most critical months. Grasses, the nutritive value of which falls rapidly in the early dry season (Elliott and Fokersten, 1961) are either not available or in short supply. Crop residues are available, but those that have been stored tend to be kept for the cattle.

Pods (whole fruits) are collected and fed, between August and October in both districts (fallen pods are eaten between May and August, by which time the ground is bare) (see Tables 1 and 2). Preference by goats for the pods used in this study were ranked by the participating farmers (Table 3). Of the farmers interviewed, up to 66% claimed to collect pods (one ward was exceptional, in that only 4% collected them). Marketing pods was not common in the wards surveyed, but had taken place in 1992

(severe drought). Timberlake *et al*. (1999) found that A. *tortilis* pods were sold in the Gwanda (Matabeleland South) area.

Pod Collection and Availability

The study found pods are being collected for two reasons:

1) To facilitate storage and subsequent feeding

2) To estimate pod yield.

To achieve this, six 100m^2 plots were established, four in Matobo District and two at Matopos Research Station. Each plot has five 5m wide transepts, in which specific trees have been tagged, either for pod yield measurement or for 'individual tree analysis' (V. Mlambo, unpubl. data). The assistance of A. Illius and colleagues (R6984) is acknowledged.

Casual observation suggested that pods were available, but detailed observations during the past two dry seasons reveal that the presence of a specific type of pods cannot be assumed. Heavy rains in November and December 1998, knocked flowers off early flowering species before pollination, largely destroying crops of A. *nilotica* and A. *tortilis* pods. In February 2000 the excessively heavy rain that affected Southern Africa, from Mozambique through to Botswana, completely destroyed what appeared to be a heavy crop of A. *tortilis*. More information is required on the fruiting patterns of both species and individual trees (Table 4). Within an area all the major bearers of edible fruits are considered important (if they are available they are used, Kindness, *et al*. 1999), and for these reasons this study has been extended beyond Acacias to include D*ichrostachys cinerea* and P*iliostigma thonningii* (both common to semi-arid areas of Southern Zimbabwe, with pods that are eaten by cattle and wildlife: Coates Palgrave, 1983), but varieties with dehiscent pods, e.g. A. *karroo*, have not been considered.

Feeding Trials

Between May 1999 and August 2000 two experiments were undertaken to determine intake and assess the performance of lactating goats supplemented with pods, and the growth of their progeny, the first concerned feeding supplements of pods to lactating does with access to natural grazing, the second was a metabolism trial.

Experiment One

M*aterials and methods*. Sixty indigenous female goats were divided randomly into five groups. Three groups were supplemented with crushed whole pods of either A. *erubescens*, A. *erioloba*, or D. *cinerea*; one group received cottonseed meal (CSM) as a positive control; and the fifth group was unsupplemented. Supplements were given at the rate of 200g/day /animal of air-dry feed and offered for 60 days before and 60 days after kidding.

R*esults and discussion*. Numbers of kids born were low during this season, both on-station and on-farm. The disappointing performance of the experimental group, both does and kids, is likely to be related to adverse pre-experimental conditions, resulting from a severe dry season. Kids from does fed CSM were the heaviest ($P<0.001$) (Table 5). Weaning weights of kids were highest from the group fed CSM and the non- supplemented group. The lowest weaning weights were attained by kids from the group supplemented with A. *erubescens*. Browse pods from A. *erioloba* and D. *cinerea* could be an alternative supplement for goats during the dry season. More work is needed to test these pods by giving a uniform basal diet in addition to browse under a controlled management system so as to assess the contribution of pods to the diet.

Experiment Two

M*aterials and method*. Dry matter intake was measured in 30 castrated goats, housed in metabolism crates (digestibility and nitrogen retention were also measured and analysis is in progress). There were five animals per treatment. Animals were offered either: crushed pods of A. *erioloba* (CP 14.6%), A. *erubescens* (CP 15.2%), A. *nilotica* (CP 11.5%), D. *cinerea* (CP 19.5%) or CSM (CP 40.8%). All animals were offered hay (CP %, 2.3) *ad libitum* and water was available at all times.

R*esults and discussion*. Goats receiving supplements of CSM, A. *erioloba* and D. *cinerea* had the highest ($P<0.001$) intake of supplement. Goats receiving D. *cinerea* ate most hay (661g DM/day), giving this group the highest daily intake (Table 6).

The lower intakes of A. *nilotica* compared to other pods may be due to anti-nutritional factors (Tanner *et al.* 1990). Manyuchi, Ncube and Smith (1990) found that ground A. *nilotica* pods could be used in place of maize meal as a supplement for lambs. However, the use of these pods to supplement goats has not been widely reported, most of the field evidence of their acceptability referring to cattle and wildlife (Coates Palgrave, 1983; Timberlake *et al.* 1999)

Table 1: Goat feed calendar for Matobo District in Matabeleland South Province (Kindness et al., 1999)

	J	F	M	A	M	J	J	Au	S	O	N	D
Feed shortage						*	*	*	*	*	*	
Stored pods								*	*	*		
Stored crop residues								*	*	*		
Fallen leaves/pods					*	*	*	*				
Grazed crop residues				*	*	*						
Dry leaves and grass				*	*	*						
New shoots										*	*	
Green leaves/grass	*	*	*	*	*						*	*

Table 2: Goat feed calendar Bubi District in Matabeleland North Province (Kindness et al.1999)

	J	F	M	A	M	J	J	Au	S	O	N	D
Feed shortage						*	*	*	*	*	*	
Stored pods								*	*	*		
Stored crop residues								*	*	*		
Fallen leaves/pods					*	*	*	*				
Crop residues in field				*	*	*						
Dry leaves and grass				*	*	*						
New shoots										*	*	
Green leaves/grass	*	*	*	*	*						*	*

Table 3: Preference ranking for pods of different tree species (Kindness et al., 1999)

Rank	Matobo, Ward 3	Matobo, Ward 11	Bubi , Wards 3 & 16	Bubi, Wards 11 & 15
1	*Acacia tortilis*	A. *tortilis*	A. *nilotica*	D. *cinerea*
2	*Ziziphus mucronata*	A. *nilotica*	A. *tortilis*	A. *tortilis*
3	A. *erubescens*	A. *erubescens*	D. *cinerea*	A. *karroo*
4	*Dichrostachys cinerea*	D. *cinerea*		A. *nilotica*

Table 4: Name (*local name*), *flowering* (f) *and pod ripening* (p) *time*, *pod availability* (1999 (1) *and* 2000 (2) *seasons*), *seed:pod ratio* (1 *and* 2) *and crude protein* (CP) *content of whole fruits of selected species*

Name[1] (*Latin*, local)	Flowering and pod-ripening[1]	Pod availability	Seed:pod ratio	CP %
Acacia erioloba **(iwohlo; umwhohlo; camel/giraffe thorn)**	*f*. Aug-Oct *p*. Early dry season (often stored for one year)	1. Good 2. Good	46:54	14.7
Acacia erubescens **(uguwe; gowe)**	*f*. Sept-Oct *p*. Early	1. Good 2. Limited	26:74	15.2
Acacia nilotica **(isanqawe; umtshanga)**	*f*. Oct-Jan (can flowe r twice, 2-3 months apart) *p. during dry season*	1. Good 2. Limited	44:56	11.6
Acacia tortilis **(isanqawe; umsasane; umlaladwayi; umshishene; umtshatshatsha)**	*f*. Nov-March, following rain *p*. May to July	*p*. May to July 2. None		
Dichrostachys cinerea **(ibahangali)**	*f*. Oct-Jan *p* . May- Sept	1. Good 2. Good	28:72	19.5
Piliostigma thonningii **(ihabahaba)**	*f*. Dec-Feb *p*. June-Sept	1. Limited 2. Limited	30:70	11.4

[1] *Coates Palgrave* (1983); *Timberlake et al.* (1999)

Table 5: Birth *and weaning weights* (*kg*) *of single* (s) *and twin* (t) *kids, kid mortality* (s; t) *and reconception rate of does, after supplementation for* 60 *days before and after kidding*

	Cottonseed Meal	Acacia. erubescens	A. erioloba	Dichrostachys cinerea	Un-supplemented
Kid birth weight(kg)	s. 2.8 t.	s. 1.7 t.	s. 2.0 t.	s. 2.0 t.	s. 3.0 t. 2.2
Kid weaning weight(kg)	s. 10.2 t.	s. died t.	s. 9.0 t.	s. 6.3 t.	s. 9.5 t. 11.0

Table 6: Total intake (g/DM/day) and intake per kg metabolic live-weight (gDM/kgW $^{0.75}$) of young castrated goats

	Cotton-seed meal	*Acacia erioloba*	*A. erubescens*	*A. nilotica*	*Dichrostachys. cinerea*
initial weight (kg)	26.4	26.8	26.0	24.4	26.7
Pod intake:					
gDM/d	183.0	183.2	138.4	43.7	182.0
gDM/kg$^{0.75}$	15.7	15.6	12.0	3.9	15.5
Hay intake:					
gDM/d	529.4	554.8	540.2	467.6	661.6
gDM/kg$^{0.75}$	45.4	47.1	47.1	42.6	56.3
Total intake:					
gDM/d	712.4	738.0	678.6	511.2	843.6
gDM/kg$^{0.75}$	61.2	62.6	58.9	46.6	71.8

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