



# Use of processed *Acacia tortilis* pods and local grass as dry season feed supplements for lactating goats in the rangelands of northern Kenya

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TRB-6-2014

East Africa TIRI Research

April 2014

## Research Brief

Feed the Future Innovation Lab for Collaborative Research on Adapting Livestock Systems to Climate Change

### Abstract

Many households in northern Kenya maintain a small herd of lactating goats for milk production. However, livestock holders face major nutritional challenges during dry spells as there are inadequate supplies of natural forage and a lack of affordable supplementary feeds. To test different feed processing and storage techniques, researchers conducted an on-farm feeding trial with 20 lactating goats. In the trial, researchers set out to understand the nutritional value of processed and non-processed *Acacia tortilis* pods and local grass and the influence of these supplements on milk yield and growth rate of kids during the dry season. Researchers conducted a benefit-cost ratio, chemical analysis and digestibility study for each diet. After data analysis, researchers determined that milled and whole *Acacia tortilis* pods could alleviate nutritional constraints in the dry season, increase milk yield and sustain the body condition of pastoral goats in the arid rangelands. The benefit-cost ratio was highest for milled *Acacia tortilis* pods and long dry grass and least for whole *Acacia tortilis* pods and chopped mixed grass. In conclusion, supplementation provided net economic benefits, but processing only paid off for *Acacia tortilis* pods. 

### Forage limitations during the dry season decrease goat productivity

In pastoral systems found in some parts of Asia, the Middle East and Sub-Saharan Africa, goats are an important component of animal agriculture. In the arid and semi-arid areas of northern Kenya, goats rank second to camels in terms of drought resilience, ability to survive in hot and dry environments and year-round production of high quality animal protein. The bulk of pastoral households in small rural towns in northern Kenya maintain a small herd of lactating goats, mainly for milk supply during the dry season. However, livestock holders face major nutritional challenges during dry spells as there are inadequate supplies of natural forage and a lack of affordable supplementary feeds. In these periods, pasture supply falls and available forage is low in dry matter intake and digestible nutrients. Low forage productivity is further aggravated by high grazing pressure around rural towns and changing climatic patterns, thus leading to reduced goat productivity and an increased risk to pastoral livelihoods.



Degraded pastures in Olturot communal pastures. (Photo credit: Moses Lengarite)



However, in the pastoral areas of northern Kenya, emergency feed supplementation is increasingly being recognized as a strategy to correct nutrient deficiencies, maintain body condition and increase milk production of lactating goats. The *Acacia* riverine and mountainous zones of northern Kenya support local plant species that can be used as supplementary livestock feed. This research brief aims to review the results of an on-farm feeding trial in the Olturot area of Marsabit County to test different feed processing and storage technologies.

Left: Home based goats feeding on fallen *Acacia* flowers in Olturot. (Photo credit: Moses Lengarite)





*Pastoral woman milking a goat feeding on ground Acacia tortilis pods. (Photo credit: Moses Lengarite)*

### **Researchers observe the effects of five different diets on goat milk production**

To determine the effectiveness of different dietary supplements, researchers collected *Acacia tortilis* pods and grasses found in the study site, the Olturot area of the Marsabit District in northern Kenya. Some pods were packaged in polythene bags, while others were milled using a portable manual grinder. The bags containing milled and whole pods were stored in a cool and dry storage shed. Local grasses were harvested and baled. Dry standing grass produced in previous seasons was collected and stored in a separate storage shed with the hay.

With this collected forage, researchers set out to understand the nutritional value of processed and non-processed *Acacia tortilis* pods and local grass and the influence of these supplements on milk yield of goats and growth rate of kids during the dry season. Researchers determined five diets: chopped mixed grass hay, long mixed standing grass, milled *Acacia tortilis* pods, whole *Acacia tortilis* pods, and a control diet with no supplement. For two months, five groups of four lactating goats were fed one of the treatment diets. The chemical composition and digestibility of diets were determined. The milk yield of the lactating goats and body weight of their suckling kids were recorded weekly. At the end of the experiment, researchers assessed the body condition of the animals and computed the benefit-cost ratio of the diets.

### **All supplementary diets provide net economic benefits for livestock holders**

*Dietary intake of processed Acacia tortilis pods lower than intake of chopped grass*

Results from the on-farm trial showed that the daily intake of chopped grass hay (309.5 g) and whole *Acacia tortilis* pods (413.1g) was higher than the daily intake of long standing grass (165.4 g) and milled *Acacia tortilis* pods (186.4 g). Processing of *Acacia tortilis* pods increased feed

density, thus reducing the total feed consumed. Low consumption of long standing grass is attributed to its long length, high fiber and low crude protein content. On the other hand, chopping of grass hay increased consumption due to its short length and high quality.

The chemical analysis report supports the observed variation in diet intake by goats. Milled *Acacia tortilis* pods were richer in crude protein, macro minerals and micro minerals than whole pods and chopped grass hay, in that order. On the other hand, long standing grass was relatively poor in these nutrients but higher in crude fiber content.

The digestibility studies followed similar trends. The *Acacia tortilis*-based diets were highly degraded in the rumen, followed by chopped mixed grass and long-standing grass, respectively. However, early in the incubation period in the rumen, milled *Acacia tortilis* pods degraded faster compared to other diets due to its small particle size.

*Milk yields and body condition improved in goats fed processed Acacia tortilis pod diet*

Goats fed supplemented diets had an increased milk yield in the range of 6.3 percent to 45.3 percent. The daily milk yield was highest in goats receiving milled *Acacia tortilis* pods, followed by chopped grass hay, whole *Acacia tortilis* pods, mixed long standing grass, and a control diet with no supplement, in that order. These results are similar to those found in previous studies, which indicate that milk yield is related to nutritional status. Thus, supplementation improved nutritional status and, therefore, milk production.

Animals receiving high quality supplements of *Acacia tortilis* pods and mixed hay grass had a “fair” body condition, while those offered long standing grass or those that did not receive any supplement had a “poor” body condition. To meet bodily energy requirements during peak lactation, animals with poor quality diets are forced to use their body reserves, thus leading to degraded body conditions. Conversely,



*Pastoral woman chopping grass hay. (Photo credit: Moses Lengarite)*

improving the nutritional status of goats during lactation through high quality supplements sustains animals' body conditions.

During the two months of the feeding trial, the suckling kids showed similar daily weight gain. However, it appears that at early ages, supplementation has no benefit on kid growth. This confounding data may be attributed to the fact that in traditional management systems, kids are allowed to browse leaves after one month of being solely on their mothers' milk. With this additional feed source, kids' diets, and thus weight gain, are not dependent on the amount of milk produced by the mothers.

#### *Processed Acacia tortilis pods have a higher benefit-cost ratio*

To determine the benefits and costs of each dietary supplement, researchers calculated a benefit-cost ratio for each supplement based on feed intake, nutrition, cost and milk yield. The benefit-cost ratio was highest for milled Acacia tortilis pods and long dry grass and least for whole Acacia tortilis pods and chopped mixed grass. Milling of whole Acacia tortilis pods has the greatest net benefit because feed intake is lower, nutrition is higher, feed cost is lower, and milk yield is higher in relation to the other supplements. Thus, processing of feed supplements, such as locally available Acacia tortilis pods, would enhance the milk productivity of goats during the dry season.

#### **Supplementary diets of processed Acacia tortilis pods improve goat productivity and income generation**

All supplementation provided net economic benefits, but processing only paid off for Acacia tortilis pods. Traditional emergency feeding strategies can be strengthened through adoption of improved feed processing technologies, as demonstrated by this study. Feed processing methods, such as coarse grinding of Acacia tortilis pods, would reduce nutrient loss caused by undigested seeds, increase feed density and reduce the amount of food consumed by animals. In northern Kenya, opportunity exists for collecting ripe Acacia tortilis pods, milling the



*A man and child milling Acacia tortilis pods using manual milling machines. (Photo credit: Moses Lengarite)*

pods using commercial cereal milling machines available in most small rural towns and storing them as strategic protein concentrate feed. Acacia tortilis feed can alleviate nutritional constraints in the dry season, increase milk yield and sustain the body conditions of pastoral goats in the arid rangelands, thereby improving livestock productivity and income generation. 🐐

*“Feed processing methods, such as coarse grinding of Acacia tortilis pods, would reduce nutrient loss caused by undigested seeds, increase feed density and reduce the amount of food consumed by animals.”*



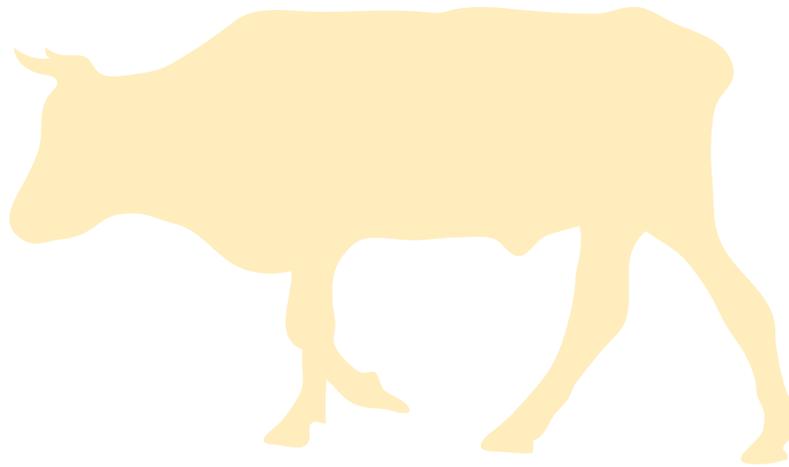
*Goats feeding on whole Acacia tortilis pods . (Photo credit: Moses Lengarite)*

Furthur Reading:

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*Proposals are selected based on their potential to make livestock production systems more resilient to increasing climate variability and severity. At the end of one year, TIRI scholars are expected to demonstrate concrete outcomes and real potential for future impact. The 10 selected East Africa TIRI scholars and the 18 selected Nepal TIRI scholars are addressing research problems on various livestock and climate research themes.*



**Feed the Future Innovation Lab for Collaborative Research on Adapting Livestock Systems to Climate Change is dedicated to catalyzing and coordinating research that improves the livelihoods of livestock producers affected by climate change by reducing vulnerability and increasing adaptive capacity.**

*This publication was made possible through support provided by the Bureau for Economic Growth, Agriculture, and Trade, U.S. Agency for International Development, under the terms of Grant No. EEM-A-00-10-00001. The opinions expressed herein are those of the authors and do not necessarily reflect the views of the U.S. Agency for International Development or the U.S. government.*

