



How *Prosopis juliflora* can be economically rewarding to pastoral communities in Kenya's rangelands

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Abstract

Pastoralism is the main economic activity of most rural communities in Baringo county, but current aggressive invasion of *Prosopis juliflora* on the main grazing areas and elimination of pasture-lands is becoming a big threat to rural livelihoods. If unchecked, *Prosopis* species have the potential to wipe out pastoralism in the near future. The under-utilization of *prosopis* in Kenya arid and semi-arid lands (ASALs) has led to the reduction of grazing land, formation of impenetrable thickets, and poisoning of livestock. This has led to the local communities calling upon the government to eradicate *prosopis*—which is not easy. However, in the countries from which *prosopis* was introduced, there are natural forests and plantations which are harnessed for timber, charcoal, honey, gum, human and animal feed. Similar benefits can be replicated in Kenyan communities in the ASALs invaded by *prosopis*. Therefore, technologies and management strategies for sustainable utilization of *prosopis* should be developed and employed as soon as possible. This will lead to the economic empowerment and income diversification of these communities. Therefore, harvesting, processing, value addition and marketing of *prosopis* products as animal feed is a viable option to exploit this noxious weed. Strategic supplementation with energy, protein, minerals and vitamins in the form of balanced animal feed supplements, fortified with anthelmintics to control gastro-intestinal parasites, would offer an important approach in enhancing pastoral livestock productivity and rural livelihoods. The current study was designed to minimize the negative effects of *Prosopis* species, while increasing utilization of its benefits in the livestock feed industry value-chains as a management and control strategy of invasive species in Kenya. 🐄

Prosopis tree species is an asset, not a liability

The role of P. juliflora-based feed supplements on livestock productivity in dry lands

With funding from Feed the Future Innovation Lab for livestock, EATIRI researchers tested *P. juliflora*-based fortified feed block supplements in comparison to the farmer practice of not supplementing their livestock to supply the deficient nutrients. The study found that *prosopis* feed blocks had great effect on average daily weight gains of weaner lambs, as compared to the control groups fed solely *C. ciliaris* grass hay as a basal diet. The relatively higher dry matter intake (DMI (kg-1d)) of the basal diet of the animals on *prosopis* block supplementation was attributed to improvements in rumen environment due to higher crude protein (CP) content (22%) in the *prosopis* pod meal (Kyuma 2013). Microorganisms in the rumen require nitrogen for their cell synthesis and multiplication. They in turn improve the degradability of ingested feeds in the rumen, as they also form microbial proteins, a high value protein which is digested and absorbed by the ruminant host in the lower gut. However, there was a significantly higher DMI in the medicated *prosopis* feed blocks as compared to the non-medicated. The relatively higher DMI in the medicated blocks could be due to the boosted anthelmintic drug (Nilzan Plus at a rate of 25 to 50 ml per animal depending on their weights at that time). Generally, *prosopis* plants have natural anthelmintic effects against certain worms due to anti-nutritional factors, mainly, tannins present in the pods, leaves and the bark (Koech et al 2011).



Figure 1: *Prosopis* thicket.
(Photo credit: Margaret Syomiti)



Figure 2: *Prosopis* pods.
(Photo credit: Margaret Syomiti)



Thus the variation between the two prosopis blocks (medicated and non-medicated) was due to the boosted antihelmintic activity with Nilzan Plus as a dewormer. It is worth noting that the prosopis pod has two main parts: the outer part, relatively with high sugar content (13 MJ/kg) and the inner part, mainly the seed with high protein content of approximately 40% (Kyuma 2013). The animal only utilizes the outer part of the pod (with high sugars), and eliminates the high valued seed with high protein, which passes through the gut undigested. This passage through the gut undigested de-scalarizes the seed, making it more aggressive and easy to grow after defecation in the dung. The ingested sugars from the pods are responsible for decaying teeth in livestock which causes the animal to starve and later it might die of malnutrition (Kyoge et al 2002). Therefore value addition of prosopis pods by crushing and/or grinding has an added advantage of improved CP availability and utilization.

On the other hand, fortifying prosopis feed blocks with a dewormer substantially inhibited the production of eggs by gastro-intestinal nematode parasites. However, it was also evident from the study that non-fortified prosopis blocks also had positive effects in controlling the gut nematodes as compared to the control groups. A recent survey study (Syomiti, unpublished data) revealed that a greater percentage of pastoral farmers around Baringo County were not de-worming their livestock as part of routine management. Instead, the animals dependent on indigenous knowledge of phytotherapy, where certain tree species including prosopis plant were believed to have some anti-helmintic activity against some nematodes. This is evidenced by massive tree bark stripping of some tree species by livestock, in an attempt to de-worm themselves, or to meet some nutrient deficiencies in the dry lands.



Figure 3: Preparation of experimental prosopis species multi-nutrient feed blocks. (Photo credit: Margaret Syomiti)



Figure 4: Scholar demonstrating how to operate various machineries for value-addition of prosopis as livestock feed. (Photo credit: Margaret Syomiti)

Development of *Prosopis juliflora*-based Livestock feed Agribusiness Value Chains with Lokasacha farmer group-Baringo County

Feeding trials in India on livestock using rations containing up to 45% of prosopis spp components yielded a 1.5% increase in cattle body weight with acceptable live weight gains (Tewari et al, 2000). Collection of prosopis pods is an important source of income, with earnings of up to US\$ 50 per day with collection of about 150 kg per person per day. The same approach can be replicated elsewhere—such as in Kenya—to improve livestock production and rural incomes. The EATIRI scholars initiated a community-owned prosopis feed agribusiness unit with Lokasacha farmers group in Lobo division of Baringo County. The group has approximately 200 members. The EATIRI project provided the group with two feed pulverizers, one feed blocking machine, and initial capital to start purchasing locally available raw feed materials. Capacity building for the group was mainly done by teaching drought resilient livestock feeding practices. Mapping of locally available feed resources for the Lobo division was done, with an aim of formulating total mixed rations (balanced feeds) for the area. The identified feeds included: *Prosopis juliflora* pods and leaves, *Balanites aegyptica*, *Banana pseudo-stems*, maize stovers and cobs from perkerra irrigation scheme, Ground nut and cowpeas straws, cactus spp and soil mineral lick from certain rivers in the area. Using these feeds resources, various feed concentrates were formulated using Spartan Dairy Evaluator computer software for feed formulation. The EATIRI researchers trained the group members on how to make home-made livestock feed concentrates.

From the on-going collection of locally available feed resources for processing and subsequent marketing (Table 2), all the household members are involved in the prosopis feed industry including the children. Poverty levels are higher in the rural dry lands (Aboud et al,

2005), and as such, the small-scale feed industry will enable the vulnerable household members to improve their livelihoods and at the same time improve livestock which is the mainstay in these regions.

Enhancing Production, Value Addition and Marketing-value chains of *Prosopis juliflora*-based feed supplements among Pastoral farmers in Baringo County

Under EATIRI Project, KALRO researchers have successfully developed a value chain for value added products involving pastoral farmers, NGOs (Lokasacha farmer group) and industry. Technologies for processing concentrate ration, multi-nutrient feed blocks and supplemental feed blocks using *P. juliflora* pods have been initiated and capacity building for the community done.

Development of *Prosopis* species commercial product value-chain Approach:



Figure 5: Demonstrations on how to operate prosopis pods grinding machine. (Photo credit: Margaret Syomiti)

The commercial product value-chain approach involves connecting local farmers to retailers and end users to foster economic development. Pastoral farmers collect raw prosopis material (pods and leaf meals) which are then delivered to processors from the NGO Lokasacha farmer group. These processed products are then sent to retailers and end users, agro-veterinarians, and farmers for marketing and utilization. The aim of this approach is to develop supplier-buyer databases.

This value chain is providing a win-win situation to all the stakeholders. Sustainability of this value chain will change the prevailing perception of *P. juliflora* as a noxious weed of no use to a multipurpose woody species of economic value for rural population of arid and semi-arid tropics of Kenya.

WAY FORWARD

- Encourage a wider scope of local processing of prosopis pods
- Production of balanced animal feeds to be produced locally
- Manufacturing and packaging of several types of blocks and pellets for different classes of livestock
- Develop appropriate hammer mill, hydraulic blocker, and a pellet mill
- Development of innovative packaging and packing systems
- Capacity building for more community based farmer groups
- Development of a distribution network
- Marketing of the products
- Strengthen prosopis product value chains
- Involve feed manufacturers 



Figure 6: Experimental prosopis species feed blocks, weight: 3 kg. (Photo credit: Margaret Syomiti)

Further Reading

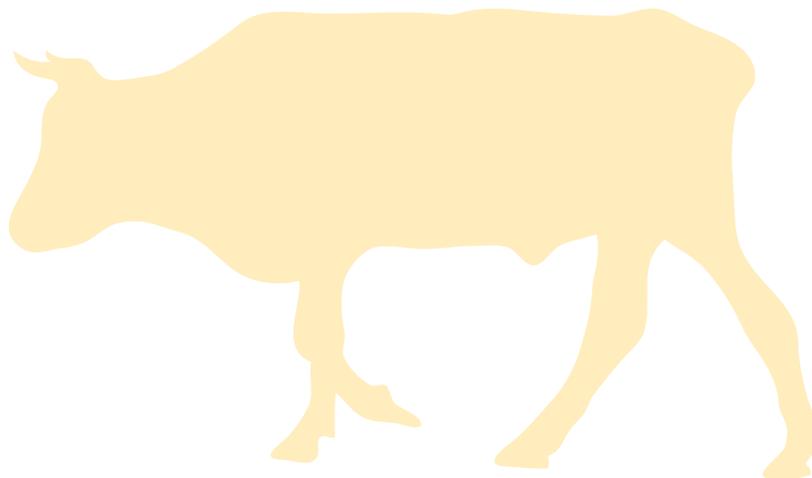
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TIRI, Targeted Investment for Research Impact, identifies early-career researchers who are interested in tackling livestock production problems through innovative approaches and fresh perspectives. This small-grant program is open to early-career researchers (five or fewer years into research career) in any discipline, from student to professor, and from any organization that is engaged in applied research on livestock production in South Asia and East Africa — colleges and universities, government research centers or laboratories, or non-profit organizations.

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.

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