

# Leucaena as an Alternative Forage and Concentrate Substitute for Barbadian Dairy Goats

Zachary Goldberg, Erik Hauner, and Natasha Salter  
Mentored by Arif F. Mustafa and John Vaughan

Barbados Interdisciplinary Tropical Studies  
Summer 2013

## Problems with Concentrate

The Barbadian livestock industry is highly dependent on Pinnacle concentrate feed, which imports ingredients from the United States and Mexico and is expensive compared to feed costs in North America. In Jamaica, it is estimated that 40% of the input cost for milk production is from concentrate (Lallo, 2012). Furthermore, Pinnacle is not owned by Barbadian stakeholders and does not operate in the best interest of the small island economy. Therefore, it is important to reduce the livestock industries reliance on this feed so that it will be more attractive to run a livestock operation. This would address the goal of establishing food sovereignty on the small island of Barbados.



## Dairy Goats in Barbados

The history of goats on the island has been tumultuous, but is gaining steam with the help of Greenland Livestock Research Station. The team at the station, led by John Vaughan, is slowly breeding and building a population of dairy goats on the island. They are currently using three breeds of goats: Alpine, Saanen, and Toggenburg. These breeds come from temperate environments and thus are generally not suited to the tropical climate. Thus it is even more important to find ways of improving the breeds' adaptability to production in Barbados. As ruminants, goats are equipped with a four-chambered stomach that lets them digest that humans or monogastrics cannot. This ability allows



goats to utilize a wide range of plants as a source of nutrition.

## Leucaena: A Potential Solution

Leucaena (*Leuceana leucocephala*) is a perennial tree that grows wild and in abundance around Barbados. It is not native to the country, and its rapid colonization rate mean that it is often referred to as a weed.

The plant is classified as a legume, meaning that a microbial



symbiosis in its roots allows the plant to fix its own nitrogen. As such, the plant has a high protein content for animal nutrition without the need for expensive nitrogen fertilizers. The plant has been successfully used previously as a forage and concentrate substitute for dairy goats in Venezuela (Clavero and Razz, 1997)

## Study Objectives

The overall goal of this study was to evaluate the use of leucaena as an alternative to both Pinnacle commercial concentrate and pangola, in terms of production costs, milk quantity and quality, feed intake and health of lactating goats in Barbados. This study was used to in part determine the viability of transitioning into an agroforestry system with pangola and leguminous trees in the pasture. More specifically three treatment diets were chosen to address the following:

- 1) What are the effects of replacing pangola with leucaena as forage for tropical goats (Treatment 1 vs. Treatment 2)?
- 2) What are the effects of reducing Pinnacle concentrate with leucaena as a protein source (Treatment 2 vs. Treatment 3)?

## Methods

27 goats were a part of this experiment. 9 goats of each breed were equally divided into the 3 treatment. Goats were kept indoors in well-labelled pens so that treatment diets could be easily administered. Pens were cleaned daily, and equipped with water buckets, concentrate boxes, and forage feeders.

During a preliminary observation trial, the goats seemed to prefer fresh leucaena over day-old wilted leucaena. As such, leucaena was harvested every morning so that it could be fed fresh to the goats. The amount of concentrate and forage, pangola or



leucaena, given to each pen was recorded daily in a feed log. The following day the leftovers were weighed to determine the

amount of concentrate and leucaena consumed. The volume of milk produced by each goat was recorded daily by an automated system. During the last four weeks, data on milk quality characteristics including fat, solids not fat and protein content was collected. Separate samples of parts of the leucaena forage including young leaves, old leaves, green pods and dried brown pods were sent to Canada for nutrient analysis by staff at Arif F. Mustafa's lab.

## Leucaena Works!

There was no significant difference in milk quantity or quality between the three treatments nor between breeds. As such, we can conclude that a leucaena-based diet is adequate to support the nutritional needs of a lactating goat. The results of the nutrient analysis show that overall leucaena has a lower crude protein content and mineral content than Pinnacle dairy ration. However, given the lower cost of leucaena, it is economically feasible to feed the goats more to match the nutritional value of the concentrate. Further, we observed increased leucaena



|                    | Dairy Ration Concentrate (kg) | Forage (ad lib) |
|--------------------|-------------------------------|-----------------|
| <b>Treatment 1</b> | 1.36                          | Pangola         |
| <b>Treatment 2</b> | 1.36                          | Leucaena        |
| <b>Treatment 3</b> | 0.68                          | Leucaena        |

consumption as the experiment proceeded and the goats became enthusiastic about this new forage. To feed a herd of 50 goats for one year, we estimated that the low-concentrate, leucaena-based diet (Treatment 3) costs US\$4,445.70 less than the high-concentrate, pangola diet (Treatment 1). In short, substituting concentrate for leucaena can maintain milk production and lower production costs.

## Looking to the Future

The use of leucaena is highly recommended in order to reduce the dependence on concentrate feed and lower production costs. However, the reduction in cost that we observed may not be great enough to attract farmers and to motivate the adoption of a leucaena-based diet for Barbadian milking goats. Mechanized, large scale harvesting could further reduce the cost of utilizing leucaena. Better still,



allowing the goats to freely graze leucaena could lower harvesting costs to almost nothing. Ideally, an agroforestry system with leucaena and pangola grass is advised. Additionally there are other leguminous plants and alternative forages available that could be incorporated into such

an operation, contributing to greater biodiversity and ecosystem functioning. In addition to exploring agroforestry, future studies could seek to reduce costs further by investigating the replacement value of leucaena with concentrate feed, including how much concentrate can be further reduced without ill effects on milk production and quality.

## References

- Lallo, C. H.O. (2012). Sustainable Feed Resources for Hair Sheep Production. In G.G. Editor. & W.I. Editor Eds.), *Sustainable food production practices in the Caribbean* 236-257. Kingston: Ian Randle Publishers.
- Clavero, T., & Razz, R. (1997). *Leucaena leucocephala* as a supplement for goats on tropical pastures. *Proceeding XVIII International Grass Congress, Canada*, 23-29.

### **Acknowledgements**

We would like to thank Arif F. Mustafa and John Vaughan, our mentors, and Danielle Donnelly, BITS Director, for inspiration, knowledge, and wisdom throughout this project. We would also like to extend our deepest gratitude to the Greenland Livestock Research Station Staff, without whom this project could not have succeeded.