Community Decision Making Aids for Improved Pasture Resources in the Madiama Commune of Mali

By

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CROP AND SOIL ENVIRONMENTAL SCIENCES

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ABSTRACT

The lack of forage resources in the Sahelian region of Mali is a major constraint to food production and food sufficiency. Madiama commune is located in northern Mali, in the Niger Delta region. Three separate experiments were conducted to investigate ways to improve pasture resources and productivity. The first experiment (2003) was designed to investigate the influence of sheep grazing tethered at two different residual heights on botanical composition, forage biomass and animal performance. Young sheep weighing approximately 18-24 kg were tethered for a certain period of time depending on residual canopy height. Two treatments 3 or 6 cm residual height were each replicated 4 times. Animals were rotated based on canopy height and each tethered animal followed an 8 paddock rotation. Measurements included forage biomass, plant diversity, animal performance, and botanical composition. The forage species found on these pastures were primarily *Schoenfeldia gracilis, Panicum laetum, Setaria palludefusca, Eragrostis turgida, Eragrostis tremula, Zornia glauchidiata, Tephrosia pedicellata,* and *Cynodon* spp. Accumulated seasonal forage biomass increased while forage quality declined as the growing season progressed. Treatment had only a slight effect on animal weight gains (1 to 3kg season^{-1}). These results suggest that residual height may not affect livestock gain.

The second experiment was designed to investigate the potential of *Cassia tora* (*C. tora*) which is an invasive weed in the region as a supplemental feed for livestock. *Cassia tora* was harvested within the Madiama commune and ensiled with or without additives (water and or honey/sugar) for 60 or 90 days. Harvest occurred at the vegetative stage in year 1 and mature growth stage in year 2. Prior to placing the chopped material in the bags for ensiling, sub-samples of fresh *C. tora* were obtained for dry matter (DM) and chemical analysis (NDF, ADF, CP, IVDMD and TDN). In year 1, the ensiled material/fresh material across treatments and locations had NDF varying from 48 to 56 %/ 56 to 57%, ADF from 34 to 41 %/40 to 42%, CP from 9 to 10 %/9 to 23%, and IVDMD from 53 to 64 %/52 to 54%. In year 2, CP averaged twice as much as year 1 with significantly less fiber probably due to the fact that harvest occurred at the vegetative stage. Addition of water or sugar/honey improved the nutritive values of the ensiled material. These results suggest that *C. tora* can be a reliable feed source during the dry season. A greenhouse experiment was conducted using various P sources (Tilemsi phosphate rock (TPR), North Carolina phosphate rock (NCPR), Aluminum phosphate (AlP), Iron phosphate (FeP), and Triple superphosphate (TSP) and rates (0, 20, 40, 60, and 80 mg P kg^{-1} soil). Plants were grown for 10 wks, harvested and separated into above and below ground plant parts. The root and plant material were dried, ground and analyzed for elemental P. The result showed variable P solubility and uptake by the plant. Overall, addition of P resulted in an increase in above ground biomass as well as root mass compared with the untreated control. Field and greenhouse experiments showed that in the Sahel region of Africa where feed resources are scarce 8 out of 12 months a year,

anything we can do to increase pasture resources and animal productivity while maintaining a healthy ecosystem, could improve the quality of life in the community.

Dedication

To my parents, Yamina and Messaoud Boussaid

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