

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

By

**Meriem Boussaid El Hadj**

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**IN**

**CROP AND SOIL ENVIRONMENTAL SCIENCES**

Dr. A. Ozzie Abaye  
Dr. Joseph P. Fontenot  
Dr. Ray Smith Jr.  
Dr. Greg Mullins  
Dr. Charlene Brewster

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Blacksburg, VA

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Meriem B. El Hadj

A. Ozzie Abaye

Crop and Soil Environmental sciences

## 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 palludifusca*, *Eragrostis turgida*, *Eragrostis tremula*, *Zornia glauchildiata*, *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<sup>-1</sup>). 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<sup>-1</sup> 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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## TABLE OF CONTENTS

Title .....	i
DISSERTATION ABSTRACT .....	ii
AUTHOR S ACKNOWLEDGEMENTS .....	vi
TABLE OF CONTENTS .....	vii
LIST OF TABLES .....	x
LIST OF FIGURES .....	xii
CHAPTER ONE .....	1
INTRODUCTION .....	1
OBJECTIVES .....	4
CHAPTER TWO LITTERARTURE REVIEW .....	5
About the Sahel .....	5
Climate of the Sahel .....	6
Pedology of the Sahel .....	6
Vegetation of the Sahel .....	7
Dynamic of Sahelian pastures .....	8
Pasture management and Sahelian pastures .....	11
The potential role of <i>Cassia tora</i> .....	16
Identification and distribution .....	16
Biological significance of <i>Cassia tora</i> .....	17
Cassia as forage .....	28
Soil fertility .....	21
LITERATURE CITED .....	25
CHAPTER THREE. The influence of tethered sheep grazing on botanical composition, forage production, and animal performance .....	36
ABSTRACT .....	36
INTRODUCTION .....	36
MATERIALS AND METHODS .....	41
RESULTS AND DISCUSSION .....	43
Weather data for the Madiama commune .....	43
Forage ground cover, species diversity, biomass, and quality assessments, Nerekoro location .....	44
Siragourou location .....	46
Animal performance, Nerekoro and Siragourou locations .....	49

Summary .....	50
REFERENCES .....	53
CHAPTER FOUR. Dry feed supplement: The potential role of <i>Cassia tora</i> .....	78
ABSTRACT .....	78
INTRODUCTION .....	82
MATERIALS AND METHODS .....	82
Summer 2002 .....	82
Summer 2003 .....	84
Laboratory analysis .....	84
Statistical Analysis .....	85
RESULTS AND DISCUSSION .....	85
Crude protein .....	85
Neutral detergent fiber and acid detergent fiber (ADF, NDF) .....	86
In vitro dry matter digestibility (IVDMD) and total digestible nutrients (TDN) .....	87
Summary .....	88
REFERENCES .....	90
CHAPTER FIVE. Influence of phosphorus sources and rates on uptake by <i>Cassia tora</i> L .....	103
ABSTRACT .....	103
INTRODUCTION .....	103
MATERIALS AND METHODS .....	107
Fertilizers .....	108
Greenhouse .....	108
Sampling and sample preparation .....	109
Plant analysis .....	109
Soil analysis .....	110
Statistical analysis .....	110
RESULTS AND DISCUSSION .....	111
Plant characteristics	
Dry matter yield .....	111
P Uptake .....	112
Soil characteristics	
Mehlich1 .....	113
Water extractable P .....	114
Summary .....	115

REFERENCES .....116  
CHAPTER SIX. CONCLUSIONS  
The ecological, economical and social implication of alternative feed resources  
and the role of *Cassia tora* .....141  
Recommendations for future research .....145  
REFERENCES .....146  
Vita .....147

## LIST OF TABLES

Table 3.1. Plant height taken prior to initiation of the grazing experiment for the Nérékoro and Siragourou locations, Mali (West Africa), August, 2003 .....	55
Table 3.2. Initial visual evaluation (1 <sup>st</sup> paddock) of botanical composition for the Nérékoro location, Mali (West Africa), August 2003 .....	56
Table 3.3 Final visual evaluation of botanical composition of the grazed area; Nérékoro location, Mali (West Africa) November 2003 .....	57
Table 3.4a. Final visual evaluation of botanical composition of the ungrazed area; the Nérékoro location, Mali (West Africa), November 2003 .....	59
Table 3.4b. Final visual evaluation of botanical composition of the ungrazed area; the Nérékoro location, Mali (West Africa), November 2003 (Cont) .....	60
Table 3.5. Initial visual evaluation (1 <sup>st</sup> paddock) of botanical composition for the Siragourou location, Mali (West Africa), August 2003 .....	61
Table 3.6a. Final visual evaluation of botanical composition of the grazed area; for the Siragourou location, Mali (West Africa), November 2003 .....	62
Table 3.6b. Final visual evaluation of botanical composition, for the Siragourou location, Mali (West Africa), November 2003 (cont.) .....	63
Table 3.7a. Final visual evaluation of botanical composition of the ungrazed area; the Siragourou location, Mali (West Africa), November 2003 .....	64
Table 3.7b. Final visual evaluation of botanical composition of the ungrazed area the Siragourou location, Mali (West Africa), November 2003 .....	65
Table 3.8. The influence of sheep grazing tethered at 3 and 6 cm residual canopy height on animal performance, Nérékoro location Mali, (West Africa) .....	66
Table 3.9. The influence of sheep grazing tethered at 3 and 6 cm residual canopy height on animal performance, Siragourou location Mali (West Africa) .....	66

Table 3.10. Soil test results obtained from sites with different vegetations in pastures at two locations (Siragourou and Nerekoro) within the Madiama Commune, Mali (West Africa) .....67

Table 4.1 Percent chemical composition of Chakunda (*C. tora*) hay as compared to Chakunda silage (Ranjhan et al., 1971) .....93

Table 4.2 Digestibility coefficients of various nutrients in Chakunda (Ranjhan et al., 1971) .....93

Table 5.1 Correlation coefficient (r) between dry-matter yields, P uptake of *Cassia tora*, and P extracted by Mehlich 1 and Water .....120

## LIST OF FIGURES

Fig.2.1 Map of the Sahelian zone in West Africa (Ridder et al, 1982) .....	32
Fig.2.2 Annual rainfall of the West African Sahel (Ridder et al, 1982) .....	33
Fig.2.3 Potential evapotranspiration for two Sahelian zones (Cocheme and Franquin, 1967 as cited by Ridder et al, 1982) .....	33
Fig.2.4 Vegetation zones of Mali (according to “Map of African Vegetation South of the Tropic cancer” UNESCO, 1959; Diarra, 1971) .....	34
Fig.2.5 The influence of drought and grazing on the herb layer of a pasture in the transition zone from savanna to Sahel (Breman and Cisse, 1977) .....	35
Fig. 3.1 Experimental layout of sheep grazing tethered for both Nerekoro and Siragourou locations, Mali (West Africa) .....	68
Fig.3.2 Sheep grazing tethered at the Nérékoro location within the Madiama Commune, Mali (West Africa) .....	69
Fig. 3.3 Annual precipitation (mm) recorded for Madiama Commune, Mali (West Africa) from 1999-2003 .....	69
Fig.3.4 Effect of treatment on percent ground cover of initial, grazed and ungrazed areas, Nérékoro location, Mali (West Africa), 2003 .....	70
Fig. 3.5 Dry matter yield of forage harvested from the un-grazed area, Nérékoro location, Mali (West Africa), 2003 .....	71
Fig. 3.6 Percent protein of forage harvested from the un-grazed area, Nérékoro location, Mali (West Africa) .....	72
Fig. 3.7 Percent Acid detergent fiber (ADF) of forage harvested from the un-grazed area, Nérékoro location, Mali (West Africa) .....	73
Fig. 3.8 Effect of treatment on percent ground cover of initial, grazed and ungrazed areas, Siragourou location, Mali (West Africa), 2003 .....	74

Fig. 3.9 Accumulated dry matter yield of forage harvested from ungrazed area, Siragourou location, Mali (West Africa), 2003 .....	75
Fig. 3.10 Percent protein of forage harvested from ungrazed area, Siragourou location, Mali (West Africa), 2003 .....	76
Fig. 3.11 Percent Acid detergent fiber (ADF) of forage harvested from the un-grazed area, Siragourou location, Mali (West Africa), 2003 .....	77
Fig. 4.1 <i>Cassia tora</i> observed in the field, Nerekoro location, Madiama Commune of Mali (West Africa), October 2002 .....	94
Fig. 4.2 Women from the village of Nerekoro chopping <i>Cassia tora</i> prior to ensiling, Madiama commune of Mali (West Africa), August 2003 .....	95
Fig. 4.3 Treated and untreated <i>Cassia tora</i> ensiled in a 31 X 51 cm, 4-mil polyethylene bag, Madiama Commune of Mali (West Africa), October 2002 .....	95
Fig. 4.4 Percent crude protein (CP) in fresh vs ensiled <i>Cassia tora</i> , Madiama Commune of Mali (West Africa), October 2002 .....	96
Fig. 4.5 Percent crude protein (CP) in fresh vs ensiled <i>Cassia tora</i> , Madiama Commune of Mali (West Africa), August 2003 .....	97
Fig. 4.6 Percent acid detergent fiber (ADF) in fresh vs ensiled <i>Cassia tora</i> , Madiama Commune of Mali (West Africa), October 2002 .....	98
Fig. 4.7 Percent acid detergent fiber (ADF) in fresh vs ensiled <i>Cassia tora</i> , Madiama Commune of Mali (West Africa), August 2003 .....	99
Fig. 4.8 Percent Neutral detergent fiber (NDF) in fresh vs ensiled <i>Cassia tora</i> , Madiama Commune of Mali (West Africa), October 2002 .....	100
Fig. 4.9 Percent Invitro dry matter digestibility (IVDMD) in fresh vs ensiled <i>Cassia tora</i> , Madiama Commune of Mali (West Africa), October 2002 .....	101
Fig. 4.10 Percent total digestible nutrients (TDN) in fresh vs ensiled <i>Cassia tora</i> , Madiama Commune of Mali (West Africa), August 2003 .....	102
Fig. 5.1 <i>Cassia tora</i> grown in a greenhouse under various sources and rates of P fertilizer, Blacksburg, Virginia 2004 .....	121

Fig. 5.2 A five week old <i>Cassia tora</i> plant grown in a greenhouse, showing recovery from insect/disease damages, Blacksburg, Virginia 2004 .....	122
Fig. 5.3 The effect of triple superphosphate (TSP) treatment on <i>Cassia tora</i> dry matter yield response curve, greenhouse 2004 .....	123
Fig. 5.4 Effects of sources of soil applied P at a rate of 40-mg kg <sup>-1</sup> on <i>Cassia tora</i> dry matter yield, greenhouse 2004 .....	124
Fig. 5.5 Effects of sources of soil applied P at a rate of 60-mg kg <sup>-1</sup> on <i>Cassia tora</i> dry matter yield, greenhouse 2004 .....	125
Fig. 5.6 Effects of sources of soil applied P at a rate of 20-mg kg <sup>-1</sup> on <i>Cassia tora</i> dry matter yield, greenhouse 2004 .....	126
Fig. 5.7 Effect of soil applied P on dry matter yield of <i>Cassia tora</i> , averaged over all P levels, greenhouse 2004 .....	127
Figure 5.8 Effect of soil applied P on root to shoot ratios of <i>Cassia tora</i> , averaged over all P levels, greenhouse 2004 .....	128
Figure 5.9 Effect of soil applied P on <i>Cassia tora</i> root dry matter yield, averaged over all P levels, greenhouse 2004 .....	129
Fig. 5.10 The effect of triple superphosphate (TSP) treatment on P uptake by <i>Cassia tora</i> , greenhouse 2004 .....	130
Fig. 5.11 Relationship between total P concentration in <i>Cassia tora</i> and P levels, greenhouse 2004 .....	131
Fig. 5.12 Effects of various soil applied P sources at a rate of 20 mg kg <sup>-1</sup> on P uptake by <i>Cassia tora</i> , greenhouse 2004 .....	132
Fig. 5.13 Effects of various soil applied P sources at a rate of 40 mg kg <sup>-1</sup> on P uptake by <i>Cassia tora</i> , greenhouse 2004 .....	133
Fig. 5.14 Effects of various soil applied P sources at a rate of 60 mg kg <sup>-1</sup> on P uptake by <i>Cassia tora</i> , greenhouse 2004 .....	134
Fig. 5.15 Extractable P as measured by Mehlich I extraction for soil samples treated with triple superphosphate (TSP) under <i>C. tora</i> growth, greenhouse 2004 .....	135

Fig. 5.16 Extractable P as measured by Mehlich I extraction for soil samples treated with all sources of P under *C. tora* growth, averaged over all P levels, greenhouse 2004 ...136

Fig. 5.17 Water extractable P for all P sources applied at 40-mg kg<sup>-1</sup> level, under *Cassia tora* growth, greenhouse 2004 .....137

Fig. 5.18 Levels of water extractable P treated with all sources of P under *Cassia tora* growth averaged over all P levels of applications, greenhouse 2004 .....138

Fig. 5.19 Relationship between dry-matter yield of *Cassia tora* and extractable P for various P sources as measured by Water Extractable P (**A**) and Mehlich 1 (**B**) methods, greenhouse 2004 .....139

Fig. 20 Relationship between P uptake of *Cassia tora* and extractable P for various P sources as measured by Water Etractable P (**A**) and Mehlich 1 (**B**) methods, greenhouse 2004 .....140