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COMPOSITION AND MANAGEMENT STUDIES OF NATIVE PASTURES IN THE U. S. VIRGIN ISLANDS

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ABSTRACT

Native pastures that are dominated by the local guinea grass are common throughout St. Croix. This is a highly productive grass, well adapted to St. Croix conditions and should, therefore, be considered as a valuable resource to the island's livestock industry. Through mismanagement, however, many pastures have deteriorated to the point where hurricane grass has taken over. If the remaining pastures are to be maintained in a productive state, management criteria must be established. Cutting heights and frequencies are being studied to help maintain the integrity of these high producing swards, while surveys are being conducted to monitor changes in species composition.

INTRODUCTION

St. Croix, the largest of the U.S. Virgin Islands, has a livestock industry that includes approximately 5,000 cattle and 5,000 sheep and goats raised on a total of 6,000 hectares of pasture (U.S. Dept. of Commerce, 1983). Though some pastures have been reseeded with exotic grasses and legumes, the majority of the animals are supported by unimproved native pastures.

Despite their importance to the livestock industry, little is known about the species composition, growth rates and nutritional qualities of the native pastures. In order for the livestock producers to fully utilize this resource, the pastures need to be characterized and management schemes investigated. Such work would help maximize yields, maintain pasture integrity and increase the potential profits of the producers.

MATERIALS AND METHODS

Pasture Composition Surveys

Pasture surveys were conducted using a step-point procedure modified from that described by Evans and Love (1957). Points were taken by walking along transect lines evenly distributed throughout the pasture. Every five steps, which equalled approximately 3 meters, a thin, pointed rod was pushed into the ground using the tip of the foot as a guide. A maximum of 200 points, were taken in each pasture. Those plants that the rod touched at ground level were recorded as 'hits' and the species noted accordingly. If the rod touched bare ground, both bare ground and the closest plant within a forward 180 radius were recorded.

The pasture size surveyed was limited to 8 hectares. Pastures larger than this were divided into smaller units to improve the accuracy of the

procedure. If distinct sward types were noted within a pasture, then each were dealt with separately.

This procedure measured per cent species composition and bare ground. Since measurements were taken at ground level, results obtained from this survey procedure were independent of the grazed status of the pasture. There is, however, an apparent bias in the technique against species such as viny legumes that occupy a small area at ground level in comparison to the space they occupy and dry matter they produce in the aerial portion of the sward. Correct interpretation of the results, though, can be made with a knowledge of the species' growth habits.

The larger woody shrubs such as *Leucaena leucocephala* and *Acacia* sp. were not included in the step-point procedure. Instead, those shrubs whose main stalk fell within 0.5 meters on either side of the transects were counted. In addition, height and canopy diameter were measured.

Cutting Frequency

Six sites, located within the various rainfall regimes of St. Croix, were chosen to study the effect of cutting frequencies on dry matter production of guinea grass swards. Three cutting frequencies were imposed on the swards: 6-week, 12-week and 24-week. Within a particular site each treatment was replicated twice in a randomized complete block design. In all cases a mature sward composed of at least 85% guinea grass was used. The plots were 12 x 3 meters within which a harvest strip of 10.5 x 1.0 was taken. The grass was cut with a sickle-bar mower at an 8-cm cutting height. No fertilizer was applied in any of the locations. The study started in March 1986, and has been in progress for 24 weeks.

Cutting Height

Tillers of native guinea grass were rooted in flats and transplanted to the field. At transplanting, overhead irrigation was performed to ensure establishment of the plants. Ten months elapsed before the trial was initiated in February 1986.

Every eight weeks the plots were cut at one of four heights: 100, 200, 300, and 400 mm. Each cutting height was replicated three times in a randomized block design. To cut each tuft of guinea grass, a hand-held hedge cutter and four wooden frames, built to the appropriate height, were used. The frames, which are three-sided and can be placed around the guinea grass plants, act as a guide for the hedge cutter to ensure that the cut is made at the desired height. After each cut was made plant material was collected and dried for yield determinations.

RESULTS AND DISCUSSION

Pasture composition: Presently twenty-eight surveys have been conducted. These surveys are representative of the different types of native pastures on St. Croix.

The surveys identified two important grasses that constitute native pastures: guinea grass (*Panicum maximum*) and hurricane grass (*Bothriochloa*

pertusa). These two were found to some degree in 70% and 73% of the pastures, respectively (Table 1). In addition, each species was dominant, i.e., constituted 50% or more of the pasture's composition, in a quarter of the pastures, respectively.

Table 1. Grasses in the native pastures of St. Croix, U.S. Virgin Islands

Species	% Pastures in which species present ^{1/}	% Pastures in which species dominant ^{2/}
<i>Bothriochloa pertusa</i>	73	25
<i>Panicum maximum</i>	70	25
<i>Chloris inflata</i>	37	4
<i>Digitaria decumbens</i>	27	0
<i>Brachiaria</i> sp.	23	0
<i>Sporobolus indicus</i>	20	0

^{1/} Total is greater than 100 as more than one grass was recorded in each pasture.

^{2/} Total is less than 100 as some pastures had no dominating grass species or were dominated by non-grass species.

The only other grass that was a dominant species in any of the native pastures surveyed was *Chloris inflata*, which was dominant in just one sheep and goat pasture. The other pastures had no dominating grass species or were dominated by non-grass species.

Legumes were found in nearly every pasture surveyed. The two legumes most frequently recorded were *Teramnus labialis* and *Desmanthus virgatus* (Table 2). These appeared to be highly competitive and compatible with both guinea grass and hurricane grass. They both have a high seed production rate and their seedling were commonly observed in the pastures, indicating an ability to persist in the sward.

Table 2. Most frequently occurring leguems in a survey of St. Croix pastures

Species	% Pastures in which species present ^{1/}
<i>Desmanthus virgatus</i>	83
<i>Teramnus labialis</i>	77
<i>Rhynchosia minima</i>)	30
<i>Desmodium</i> sp.)	
<i>Stylosanthes hamata</i>	17
<i>Alysicarpus vaginalis</i>	10

^{1/} Total is greater than 100 as more than one legume was often recorded in each pasture.

Woody shrubs had a significant presence in the native swards. For example, *Leucaena leucocephala* was found in almost 66% of the pastures, while *Acacia* sp. were present in almost 90% of the pastures surveyed (Table 3). The most common pasture species is *Acacia tortuosa*, although *A. macracantha* and *A. farnesiana* do occur to some extent. In some of the surveyed pastures the shrubs covered up to 30% of the land. Due to the *Acacia*'s thorns the sward under the shrubs were inaccessible to the grazing livestock.

Table 3. The number and area covered by *Acacia* sp. in the native pastures surveyed in St. Croix, U.S. Virgin Islands

Frequency of occurrence (%)	90
Number of shrubs/hectare: Mean	658
Range	0-5755
% land covered by shrubs: Mean	5
Range	0-29

Of all the grasses recorded in the native pastures, perhaps the most desirable and versatile species for livestock production is guinea grass. Some of its attributes have been identified as the following:

- Well adapted to St. Croix conditions. Grows throughout the island under varying rainfall and soil regimes.
- High dry matter yields.
- Compatible with the local legumes.
- Performs well under low input farming systems common in St. Croix.
- Performs well under multi-use systems:
 - Grazing
 - Cut and carry
 - Hay making
- Survives drought.
- Will often colonize cleared land from seed present in the soil.

Hurricane grass is considered to be a particularly undesirable pasture plant. It produces very little, poor quality dry matter. It is also aggressive and will invade any guinea grass pasture that is overgrazed. The large number of pastures dominated by hurricane grass is an indication of the extent of the overgrazing problem in St. Croix.

The process by which hurricane grass invades an overgrazed guinea grass pasture is related to the growth habits of the two species. Guinea grass grows in tufts, and a typical pasture may have between 70-85% bare ground. In a well managed guinea grass pasture this bare ground is shaded by the tall canopy which, for the majority of the time, is so complete that little else can grow. However, when defoliations are severe and frequent, full light

reaches the ground more often and for longer periods of time, allowing the aggressive, spreading hurricane grass a chance to compete. It is also likely that the overgrazing actually weakens the guinea grass plants causing their death and disappearance from the sward.

The influence of management on species composition is illustrated in Table 4. The two pastures shown have been managed under a light and a heavy stocking rate for the last ten years. At the time of the survey the stocking rates were 5.5 and 15.2 sheep and goats per hectare. Originally both pastures were guinea grass dominated (the farmers, personal communication). The pasture with the lighter stocking rate is still a healthy guinea grass pasture containing a high percentage of legumes. In contrast, the second pasture is now almost entirely hurricane grass.

Table 4. Comparison between two sheep and goat pastures surveyed in St. Croix, U.S. Virgin Islands

	Pasture	
	1	2
Stocking rate (animals/ha)	5.5	15.2
Grasses:		
<i>Panicum maximum</i>	67.5	-
<i>Bothriochloa pertusa</i>	2.0	87.3
Legumes	26.0	3.5
Other	4.5	9.2

Cutting Frequency: Plots at Annaly and Castle Nugent were grazed by cattle. The data collected from these sites are not included in the interpretation of the results.

The yield results showed differences from site to site due to average annual rainfall (Tables 5 and 6). The lowest yields were harvested in the drier east end. When averaged over the three harvest frequencies they were equivalent to 2,794 kg/ha. The highest yields, when averaged over the three cutting frequencies, were 7,315 kg/ha, recorded in the wetter north west section of Little La Grange.

At the four sites not grazed by animals, dry matter yields tended to increase as cutting interval was lengthened. Results, however, are too preliminary to make any more concrete conclusions than this.

During the current harvest period, water stress was commonly observed, even in the highest yielding west end site (Little La Grange). Despite this, the yield potential of the native guinea grass pastures were well demonstrated. Yields are expected to significantly increase during the wet season, further illustrating the value of these unimproved swards.

Table 5. The annual average rainfall at the six sites used in the guinea grass cutting frequency trial, St. Croix, U.S. Virgin Islands (Jordon, 1975)

Location	Estate	Rainfall (mm)
South-east	Castle Nugent	< 900
East	Sight	1020 - 1140
Mid-island	Diamond	900 - 1020
North	Bethlehem	1140 - 1260
North-west	Annaly	> 1260
West	Little La Grange	> 1260

Table 6. Dry matter yield of *Panicum maximum*, (kg/ha). March-August, 1986. St. Croix, U.S. Virgin Islands.

Site	Cutting date				Total
	14 Apr	26 May	7 Jul	18 Aug	
Estate Sight					
6-week	291	990	976	315	571
12-week		1,677		1,418	3,095
24-week				2,715	2,715
Estate Diamond					
6-week	549	1,761	804	39	3,153
12-week		3,273		893	4,166
24-week				5,885	5,885
Estate Bethlehem					
6-week	621	1,614	1,360	582	4,177
12-week		3,082		2,024	5,106
24-week				7,284	7,284
Estate Little La Grange					
6-week	1,976	2,370	1,329	1,015	6,690
12-week		4,495		2,408	6,903
24-week				8,352	8,352

Cutting Height: The dry matter yields of each cut are given in Table 7. There were differences in production between the cutting dates due to variation in rainfall. Cutting heights also influenced yields with the lower ones producing the greatest amount of dry matter.

It seems, from the few cuts that have been done, that a shorter cutting or grazing may be preferable to a taller one. Shorter heights, however, will leave the bare ground more exposed to sunlight permitting the ingress of hurricane grass. Continued short cutting may also have adverse effects

on productivity over the long term, and may interact with cutting frequency. Consequently, the study must be conducted over a longer period of time and should include a number of cutting intervals.

Table 7. Dry matter yield of *Panicum maximum* under four cutting heights, kg/ha. February-July, 1986.

Cutting Height (mm)	Cutting Date			Total
	31 March	24 May	21 July	
100	208	1,330	962	2,500
200	173	1,216	1,032	2,421
300	94	984	739	1,817
400	31	763	698	1,492

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