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Pasture improvement in Tobago

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Pangola is the main species which has been used in the small proportion (approximately 10%) of pasture land which has been improved in Tobago. Recent attempts to introduce other grass species and to encourage the use of grass-legume mixtures have been encouraging. The species used and the methods employed are described. The potential for further pasture improvement is discussed.

Keywords: Pasture improvement; Grass legume mixtures; Tobago

Introduction

Tobago is a small (116 sq.m.) rural island with many of the 40,000 population working in non-intensive agriculture. The southwestern part of the island is flat, dry (annual rainfall 1200 mm) and formed over coral. The more hilly northwest is wetter (up to 3800 mm per year) and the soils are mainly of volcanic origin.

Soil types should not limit pasture production. Of 38 soil types described by the Land Capability Survey (Brown et al 1965) only four were considered not suitable for pasture, because of erosion of the parent material. Throughout Tobago, soils are near neutral. Those used so far for pasture improvement have varied between pH 5.5 (Studley Park) and pH 7.9 (Lowlands). Soil nutrients are generally adequate, with the occasional exception of potassium. High salinity levels in coastal areas do not appear to limit pasture production. Any limitations to land use for pasture work tend to be physical, relating to slope, shallowness of soil and management of clay soils.

Much of the northern area is under primary or secondary forest. Cultivated areas tend to be confined to the alluvial valleys and the lower altitudes of the south.

In the whole island, there are about 3,500 ha under pastures, savannahs and coconuts undersown with pasture. The naturally occurring useful grasses in these areas are mainly savannah grass, (*Axonopus compressus*) with some guinea grass (*Panicum maximum*). *Echinochloa polystachya* occurs in some wet areas.

Naturally occurring legumes include *Desmodium* species, Kudzu (*Pueraria phaseoloides*) and *Calopogonium mucunoides*. There are stands of unimproved Leucaena (*Leucaena leucocephala*) in the south and *Gliricidia sepium* has been widely used as fence posts. Of these, only Gliricidia has been exploited as a forage source. A total of 333 ha (about 9.4 percent of available grazing land) was improved under a Government Development Programme in the 1950's, mainly using pangola (*Digitaria decumbens*). Elephant grass (*Pennisetum purpureum*) for cut and carry, and para grass (*Brachiaria mutica*) for wetter areas, were also introduced under this programme. For the past thirty years any pasture improvement had relied on these species.

The CARDI/EDF pasture improvement programme

In 1984, CARDI began a pasture improvement programme in Tobago, in co-operation with the Division of Agriculture, Tobago House of Assembly, as part of an EDF-funded regional project. The overall need for such a programme was obvious, since only a small proportion of pasture had been improved. The following features of livestock production in Tobago were taken into account in the planning and implementation of the programme.

(1) The inadequacies of Pangola in the Tobago context. This grass becomes dormant and produces little forage during the long dry season. There was a feeling that 'all the eggs were in one basket' with pangola. This was potentially dangerous, even though rust is the only disease problem so far observed. Nevertheless, Pangola was the only good quality grass available.

(2) The severity of the dry season, especially in the south, is a limitation to animal production. With one notable exception, scarce irrigation facilities are not used on pasture.

(3) Hillside farming limits the possibilities for adequate cultivation but in these areas, livestock, especially small ruminants, are more economically attractive and less harmful to the environment than annual or short-term perennial crops.

(4) Nutritional limitations; It was thought to be essential to introduce, and properly manage a legume component, to improve the nutritional status of animals in the dry season.

(5) Large farmers concentrating mainly on cattle, have different requirements from small farmers who usually keep small ruminant livestock.

In the light of these considerations, the work concentrated on species selection, appropriate methods of establishment and information generation and technology transfer. In 1984, work began on one Government Station and two private farms using limited professional time. Since May, 1986, there has been full time field assistance and the programme is now working with three Government Stations, twelve farmers and two schools. Many additional farmers have expressed interest in cooperating with the project in the future.

Species selection

Tobago is fortunate in that it has an environment very similar to that of Antigua where an enormous amount of preliminary work on selection of species has been done (Keoghan, 1980). Using the Antigua recommendations as a basis, the species and varieties shown in Table 1 were introduced. All were sown in small-scale nursery or demonstration plots, while some, as shown in Table 2, were established on a field scale for commercial animal production.

Of the grasses, African Star, Coast Cross (*Cynodon spp*) and *Chrysopogon* have so far made the greatest contribution to the programme, although in nursery plots, the Guinea grass (*Panicum maximum*) and the dwarf Elephant grass (*Pennisetum purpureum*) look very promising. Amongst the legumes, Siratro and Cunningham Leucaena have shown outstanding productivity and persistence. *Canavalia* exhibits a remarkable ability to germinate even under dry conditions, but appears to be more commercially acceptable on acid soils in Trinidad rather than on more neutral areas in Tobago.

Table 1 Pasture species introduced and established in Tobago

Grasses	Legumes	Grass-legume combinations
Panicum coloratum cv Bambatsi	*Stylosanthes hamata* cv Verano	Pangola/Siratro, Tinaroo, Roja
Chrysopogon sp. CPI 52213	*Macroptilium atropurpureum* cv Siratro	Elephant with Cunninghan
Panicum maricum cv Likoni, local (Guinea)	*Neonotonia wightii* cvv Tinaroo, Cooper	Elephant with Siratro
Brachiaria decumbens cv Basilisk	*Teramnus labialis* cv Roja	Guinea with Tinaroo
Cynodon spp African Star; Coast Cross 1 and Tifton 68 Bermuda grasses	*Clitoria ternatea* *Canavalia ensiformis* (both white and brown seeded lines)	*Chrysopogon* with Tinaroo volunteer with Verano volunteer with Roja
Pennisetum purpureum N71 (dwarf elephant)	*Desmanthus virgatus*	Volunteer with Siratro, Tinaroo, Roja
Brachiaria radicans	*Leucaena leucocephala* cv Cunningham	Volunteer with Cunningham

Methods of establishment

The varying topography of Tobago, the differing demands of contrasting animal production systems and the need to make maximum use of limited seed supplies have led to the use of a number of establishment techniques. Commercial scale plantings are detailed in Table 2. On a smaller scale, sufficient planting material has been supplied to ten farmers during the course of the present project year (since October 1986) to establish small nursery areas. These will be used to plant larger areas in the future. Nursery/demonstration plots have been established at two Secondary Schools and two Government Agricultural Stations. These stations serve a double purpose. While being used for teaching purposes, they also generate information on the behavior of the species at varying sites on the island, adding to the body of knowledge relating to species adaptation in the region.

On occasions, assistance is required with pasture establishment in wetter, seasonally flooded areas. Tanner (*Brachiaria radicans*) and Antelope grass (*Echinochloa polystachya*) have been planted as vegetative material at two such sites. While these areas are of minor importance in Tobago as a whole, they cannot be ignored, since on some holdings, they represent an appreciable proportion of the area devoted to livestock production.

Information generation and technology transfer

All plots and commercial sowings are continually evaluated for productivity, persistence, vigour of regrowth and attacks by pests and diseases. The plots have been frequently used for field days. Target groups for specific sessions have included farmers, extension officers and the employees of the Government Stations. The location of the largest grass and legume demonstration area at the Kendal Farm School ensures that all graduates from that institute are well informed about improved pasture species.

Table 2 CARDI-EDF commercial scale pasture improvement in Tobago

Method of Establishment	Location	Area (ha)	Species used
1. Replanting entire pasture	Blenheim	3.3	*Stylosanthes hamata*
	Kendal	0.9	African Star/Coast Cross 1
2. Planting strips in established paddocks	Golden Grove	3.0	Siratro/Tinaroo/ Roja/in pangola
	Blenheim	1.0	
3. Planting strips in neglected pastures (flat land)	Lowlands	4.0	Siratro/Tinaroo/ Roja/and *Chrysopogon*
4. Contour planting (sloping land)	Blenheim	2.5	*Chrysopogon*
	Blenheim	1.3	Leucaena for browsing
5. Broadcast seed after minimum tillage	Lowlands	0.9	Roja in pangola
	Goldsborough	1.0	Guinea Grass in volunteer pasture
6. Cut and carry systems	Hope	2.0	Elephant grass/ Leucaena
	Mason Hall	0.2	Elephant grass/ Leucaena
	Concordia	0.2	Likoni/Leucaena
	Friendsfield	0.4	Likoni/Tinaroo
	Mason Hall	0.4	*Chrysopogon*/ Tinaroo
	Blenheim	0.4	Siratro/Elephant grass
	Kendal	0.4	Siratro/Roja/ Tinaroo/Elephant grass
	Goldsborough	0.2	Siratro/Elephant grass

Conclusions

Most progress has been made in species selection and farmer education. In terms of area, the impact so far has been relatively small. A total of about 25 ha of pastures have been improved by the introduction of selected species. There is, however, a firm basis for more rapid expansion in the future. Experience has shown that with the grasses recommended by the project, a nursery plot of 40 square metres can provide sufficient material within 12 months to plant out 0.5 ha of pasture, provided that close supervision ensures efficient management. Even if this high multiplication rate cannot be maintained over larger nursery areas, the resources are available to allow a considerable increase in the use of improved pastures over the next few growing seasons.

Farmer receptiveness to the principles of improved pasture management has been increased, due to the demonstrations and field days arranged as part of the project activities. In this regard, the severe 1987 dry season in Tobago has had a positive influence. The recommended, drought resistant grasses maintained productivity, while traditional forage sources failed to support the animals. Many farmers are now aware of the choices available to them. There remains a need for more education on the management of the legume component.

Constraints have been identified which will help to define the problems to be addressed in future work. These include the following:

(1) **Evaluation:** Improved pasture species have been introduced and are being adopted by the farming community. Further attention should be paid to the nutrient value of the pastures as influenced by the time of year. Grazing experiments would define the potential productivity of the pastures and appropriate grazing management techniques to produce optimum levels of animal production without affecting persistence.

(2) **Weed Control:** Both grasses such as Tapia grass (*Sporobolus jacquemonti*) and broad-leaved weeds such as Barrack weed and *Acacia spp* are major problems in pastures. The cost of chemicals has recently increased by 50 percent and labour costs are high. Mechanical brush cutters are not always available. Techniques such as strip planting are advantageous in this respect, since improvements can be made to a large field by sowing a relatively small proportion of the area.

(3) **Outreach:** This aspect of the programme must be maintained and accelerated. This can be achieved now that adequate nursery areas are available. To some extent, expansion of sown pastures has been limited by farmer preference for vegetatively propagated grasses. In some cases where seed has been used, germination (or establishment) has been poor. Vegetative material, though slower and more laborious, is safer in terms of farmer credibility.

(4) **Dry Season:** The dry season and lack of irrigation facilities are major constraints beyond technical control. The 1987 dry season was exceptionally long and severe. Even with improved pasture species, the seasonal lack of rain will lower pasture productivity for several months of the year.

These problems are being addressed. Improved species are available in the field. More detailed evaluations of their impact on production will follow.

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