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FOREWORD

This is the second edition of CARDI Review which is intended to disseminate information on completed research conducted by the Caribbean Agricultural Research and Development Institute (CARDI).

CARDI Review will be published at least twice a year and will be posted on the CARDI Website (http://www.cardi.org). A limited number of hard printed copies of each edition will be made, but the major dissemination medium will be electronic.

Articles that are published would have been screened through a process of internal peer review. This ensures that the quality of research and published articles is of the same standard as recognised scientific journals.

At present, CARDI research programmes cover mostly non traditional crops and livestock. However, there are also projects in the traditional Caribbean export crops of coffee, sugar and bananas. Thematic areas of research are fairly wide ranging and include (not necessarily in order of importance) IPM, organic farming, production systems, plant genetic resources, feeding systems, environment, marketing, post-harvest and socio-economics.

CARDI Review sees research and development as a holistic activity encompassing all stages from pre planting to production, post-production, processing, and marketing. Each article in CARDI Review will be from researched areas in one or several parts of the commodity chain.

Therefore the articles published in CARDI Review will be varied, wide ranging and, I hope, interesting and informative.

Bruce Lauckner
Editor, CARDI Review
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The performance of cowpea, maize and sorghum in an alley cropping trial with Leucaena and Glyricidia in the Intermediate Savannahs of Guyana

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ABSTRACT
In three trials conducted over a period of one and half years in the Intermediate Savannahs of Guyana, Leucaena (*Leucaena leucocephala* [Lam.] de Wit) and Glyricidia (*Glyricida* spp.) leaves were used in separate treatments for the second application of fertilizer to sorghum, cowpea and maize crops compared to the traditional granular fertilizer treatment as control. In the first two trials the levels of estimated nutrient elements provided by the legume leaves were below those supplied by granular fertilizers. There were, however, no differences in yield and yield components of sorghum and cowpea measured at harvest among the three treatments in these two trials.

In the third trial, the level of nutrient elements supplied by Glyricidia was far superior to that provided by granular fertilizers and this resulted in significantly higher (P=0.05) weights of cobs and grain of maize. There was also a 50% higher yield of maize in plants treated with Glyricidia as opposed to those given granular fertilizers. Leucaena was not able to produce the total amount of nutrients as that obtained from Glyricidia in any of the trials, but there were no significant differences (P=0.05) between Glyricidia treated plots and Leucaena treated plots for plant components measured in the three trials.

In addition, legume leaves provided micro-nutrients not provided by the granular fertilizer used. It is likely that the legume leaves also enhanced crop performance by increasing soil organic matter and moisture, reducing soil temperature and improving residual soil fertility to the benefit of subsequent crops.

INTRODUCTION

Alley cropping is an agroforestry system developed as an alternative to shifting cultivation (Kang et al. 1981). It involves the cultivation in rows, usually 4-5 m apart, of fast growing legume trees within cropping fields (Mulongoy and Sanginga 1990). These trees have the ability to fix N, to reclaim lost nutrients from deeper layers of soil and to supply N-rich foliage which may be used as a green manure or mulch for soil fertility maintenance (Atta-Krah 1990). In alley cropping, the legume trees are pruned periodically and the prunings are applied to the

Keywords: Agroforestry; fertilizers; legumes; soil nutrients

growing crop to provide nutrients and mulch (Kang et al. 1981). These leguminous trees are expected to help recycle nutrients, reduce leaching and contribute atmospheric N to the association, while improving the organic matter content of the soil.

The Intermediate Savannahs of Guyana consist of an area of native grasslands growing on low fertility, acidic, brown, sandy soils. Various researchers have reported on the physical and chemical characteristics of these soils (Bullen et al. 1981; Fletcher 1989; Simpson 1989) and the performance of various crops thereon (Chesney 1973 and 1975; Fletcher 1977; Kazim 1979; Bullen 1989). Research has been carried out by the Caribbean Agricultural Research and Development Institute (CARDI) for the last 20 years and the recommendations are that the area should be used for agricultural production along any one of three land and crop rotational models (Paul et al. 1997). All the models contain some element of row crop production, usually a cereal/legume rotation.

One of the more expensive agricultural practices is the application of imported, granular fertilizers. The cost of transporting this bulky material to the Intermediate Savannahs also adds to the inefficiency of this mode of fertilization. Simpson (2000) has reported on the performance of foliar fertilizers on the production of cereals and legumes and this practice is likely to be more economical than the use of granular fertilizers. There are however some limitations to the use of this mode of fertilization.

This series of trials looked at the possibility of utilising Glyricidia (*Glyricida* spp.) and Leucaena (*Leucaena leucocephala* [Lam.] de Wit) tree legumes to provide at least part of the nutritional needs of the growing crops, in an alley cropping system. This practice is likely to be particularly useful for the small producers in the area, many of whom do not use fertilizers.

MATERIALS AND METHODS

Three experiments utilising Leucaena and Glyricidia leaves as fertilizers were conducted in rotation over the three planting seasons beginning mid-year 1998 to mid-year 1999 in the Intermediate Savannahs of Guyana. The trials were carried out at field Kasarama No. 15A on Kasarama loamy sand classified as an *Arenic Paleudult* (Simpson 1989). The experimental design of each of the trials was a randomized complete block with three treatments and six blocks. The treatments were T1-A weighed amount of Leucaena (*Leucaena leucocephala* [Lam.] de wit leaves applied; T2-A weighed amount of Glyricidia (*Glyricida* spp.) leaves applied and T3 (Control)- Granular Fertilizer applied at the traditional rate for the particular crop. Plot size was 6 m x 15 m. The data were subjected to a statistical analysis applying the ProcGLM, in SAS, 1989.

Three trials were planted using crops of sorghum (*Sorghum bicolor*), cowpea (*Vigna unguiculata* [L.] Walp) and maize (*Zea mays*) respectively. All trials were planted in the same location, without mechanical tillage of the soil (No-tillage). The trials were planted manually in the case of the first trial and mechanically in the other two trials, on the dates indicated (Table 1). The initial granular fertilizer was applied within a week of planting to the soil surface. All other agronomic practices were as described in the guides for the production of these crops in the Intermediate Savannahs (CARDI 1999a and1999b) except that all weed control was done manually using an agricultural hoe. The varieties of these crops planted were all selections from the CARDI Germplasm Evaluation Programme which have shown some promise on the soils of the savannahs.

Table 1 Crop characteristics, planting dates and initial fertilizer application in the three alley cropping trials conducted in the Intermediate Savannahs

Trial	Crop	Variety	Planting Date	Fertilizer applied
1	Sorghum	3D	24/07/1998	D-A-P 200 kg/ha Sul-Po-Mag 100 kg/ha Fte 40 kg/ha
2	Cowpea	Minica # 4	08/01/1999	D-A-P 100 kg/ha Sul-Po-Mag 50 kg/ha Fte 40 kg/ha
3	Maize	M92-B2	05/06/1999	D-A-P 200 kg/ha Sul-Po-Mag 100 kg/ha Fte 40 kg/ha

N.B D-A-P is Diammonium Phosphate
Fte is Frittered Trace Elements
Sul-Po-Mag (22.7S:22K:11.2Mg)

Supplementary granular fertilizer was applied to the control plots in each trial at the time of flower initiation. For sorghum and maize, this application was at the rate of 86 kg N, 0 kg P, 44 kg K, 22 kg Mg, while for the cowpea plot the rate was 30 kg N, 30 kg P, 30 kg K/ha. The other plots received weighted quantities of Leucaena leaves (T1) and Glyricidia leaves (T2) at flower initation in the first two trials and at two times 32 and 75 days after planting in the third trial.

Leucaena and Glyricidia leaf harvesting was done by pruning the plants of their branches in a manner which would allow re-growth. The leaves were then stripped off of the branches and weighed and three sub-samples were taken for moisture measurements and tissue analysis of the nutrient elements N, P, K, Ca and Mg. Analyses were carried out by the Central Laboratory of the Guyana Sugar Corporation (GUYSUCO). Because of the differences in growth between the two species of fast growing legumes used and also among the six plots of each specie, the harvested leaves were distributed equally over each of the plots.

In the maize and sorghum trials, 20 plants were selected at random from each plot at harvest and their heights (cm), weight (g), number of cobs (in the case of maize), weight of cobs and heads (g), and weight of grain collected (g). The yield of cobs and heads of maize and sorghum respectively and grain per plot was also collected.

In the cowpea trial, 10 plants were selected at random from each plot at harvest, and their weight, number of pods, weight of pods and weight of grain determined. The yields of pods and grain for the entire plot were also determined.

RESULTS AND DISCUSSIONS

Nutrient Levels

As already indicated, the rate of legume leaf fertilization depended on the total amount of leaves harvested. These leaves were spread equally over the six replicates. Table 2 gives the rate of fertilization which was achieved in the three trials.

Table 2 Rates of supplementary fertilization achieved in the three alley cropping trials

Trial	Method	Rate of application (Kg/ha)	Rate of selected nutrients applied (kg/ha)				
			N	P	K	Ca	Mg
1	Leucaena	342	11.0	0.59	4.7	5.1	1.6
	Glyricida	933	31.6	1.57	10.3	5.9	5.2
	Granular		86.0		44.0		22.0
2	Leucaena	333	12.0	0.61	5.8	4.9	1.8
	Glyricida	1016	36.2	1.92	11.9	6.4	5.6
	Granular		30.0	30.00	30.0		
3	Leucaena	708	29.0	1.66	8.8	11.3	2.3
	Glyricida	3532	127.0	9.85	92.4	46.4	12.1
	Granular		86.0		44.0		22.0

The data indicated that in the first two trials the rate of fertilization using the legumes was not as high as that from granular fertilizer. However, the legumes provided added nutrient elements and were also likely to be beneficial to the growing plant as a mulch, providing lower soil temperature and higher soil moisture content. Additional benefits of this form of fertilization is increased soil organic matter particularly in the soil surface, which is likely to enhance the chemical, physical and biological properties of the soil, and increase residual fertility.

In the third trial, it was possible to apply two treatments of legume leaves, and here the combined nutrients applied in the form of Glyricidia leaves was far superior to that applied by granular fertilizers. Leucaena growth was not adequate enough to provide as high a level of nutrients as that obtained from granular fertilizers.

Rainfall

In the absence of irrigation, the amount of rainfall received by the growing crop is pivotal to crop performance. During the growing period of the three trials, there were unusual rainfall patterns in the Intermediate Savannahs related to the El niño/La niña phenomena. The sorghum crop received a total of 667.5 mm of rainfall which though relatively low, was well distributed over the first 9 weeks of the growing period; the lower than average rainfall in the last 5 weeks of the crop was not expected to affect crop yields. In the cowpea crop, the total rainfall was 390.1 mm which was fairly evenly spread over the growth of the crop. This total rainfall was relatively low and may have affected overall crop yields. In the third trial in which the test crop was maize, the total rainfall was 1128.1 mm and this was well spread over the first 11 weeks of the crop. There was a drastic decline in rainfall after this period, which coincided with the grain filling stage of growth, and this may have affected overall yields, particularly in treatments which did not provide mulching. Weekly rainfall during the cropping period of the three trials is given in Figures 1-3.

Figure 1: Weekly rainfall in relation to age of sorghum in the first alley cropping trial

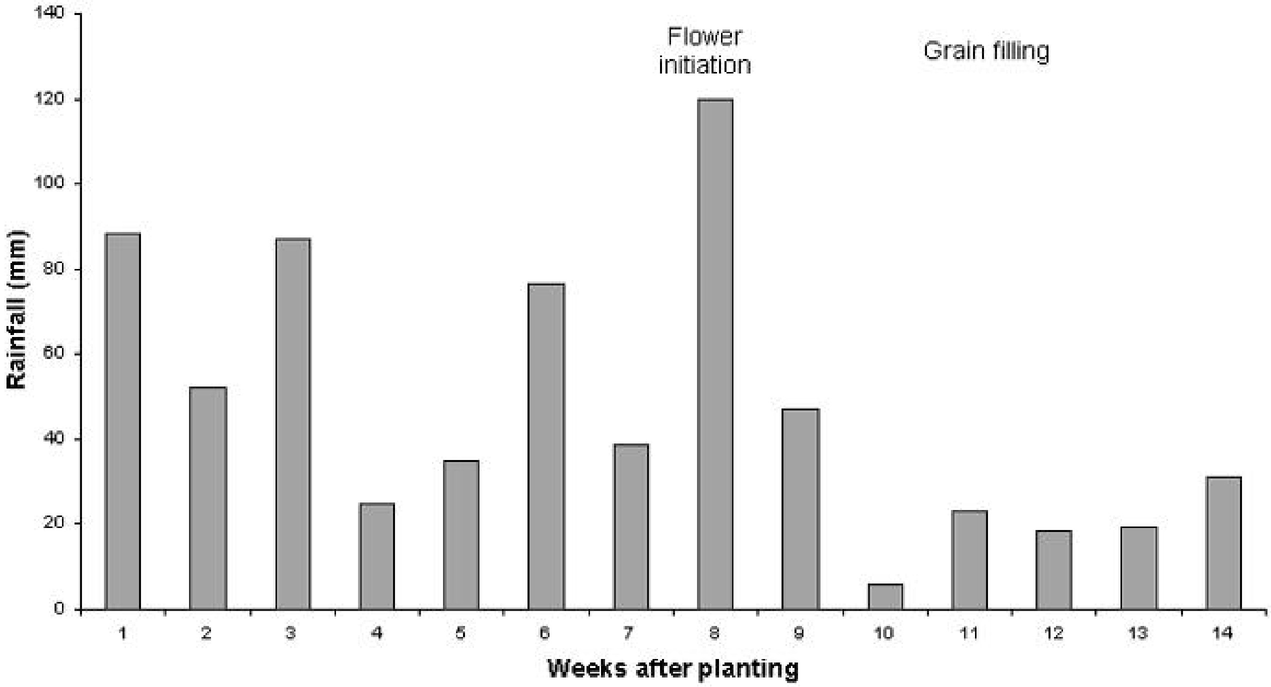
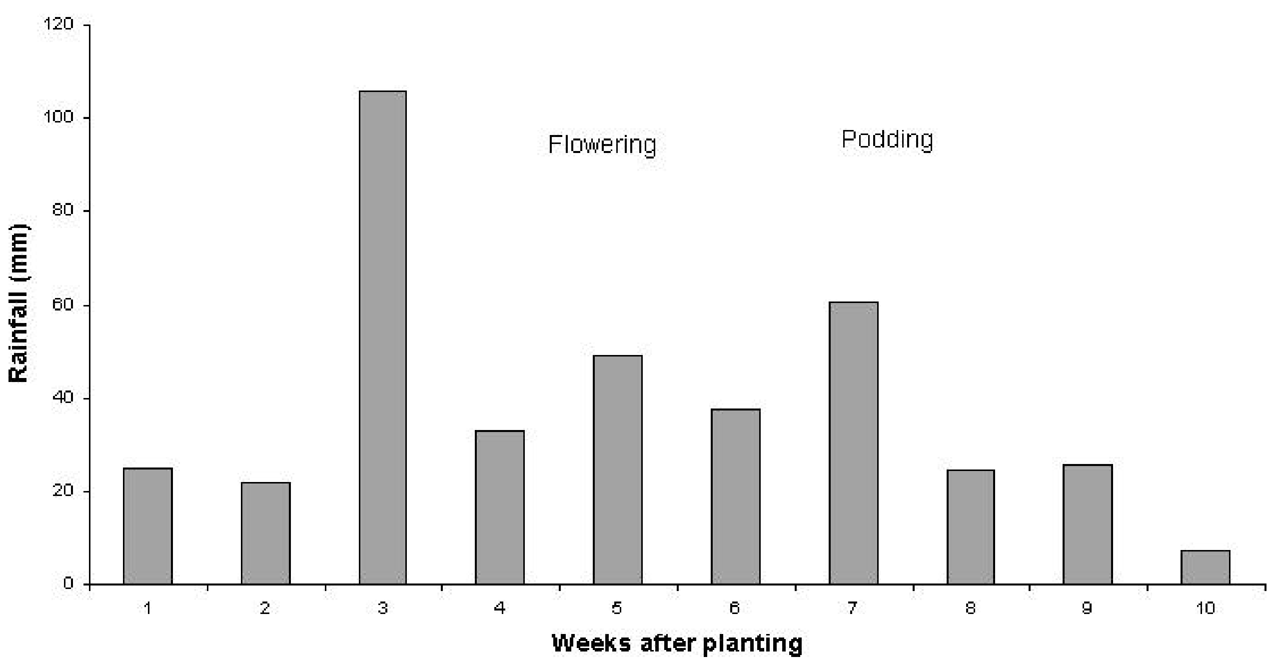
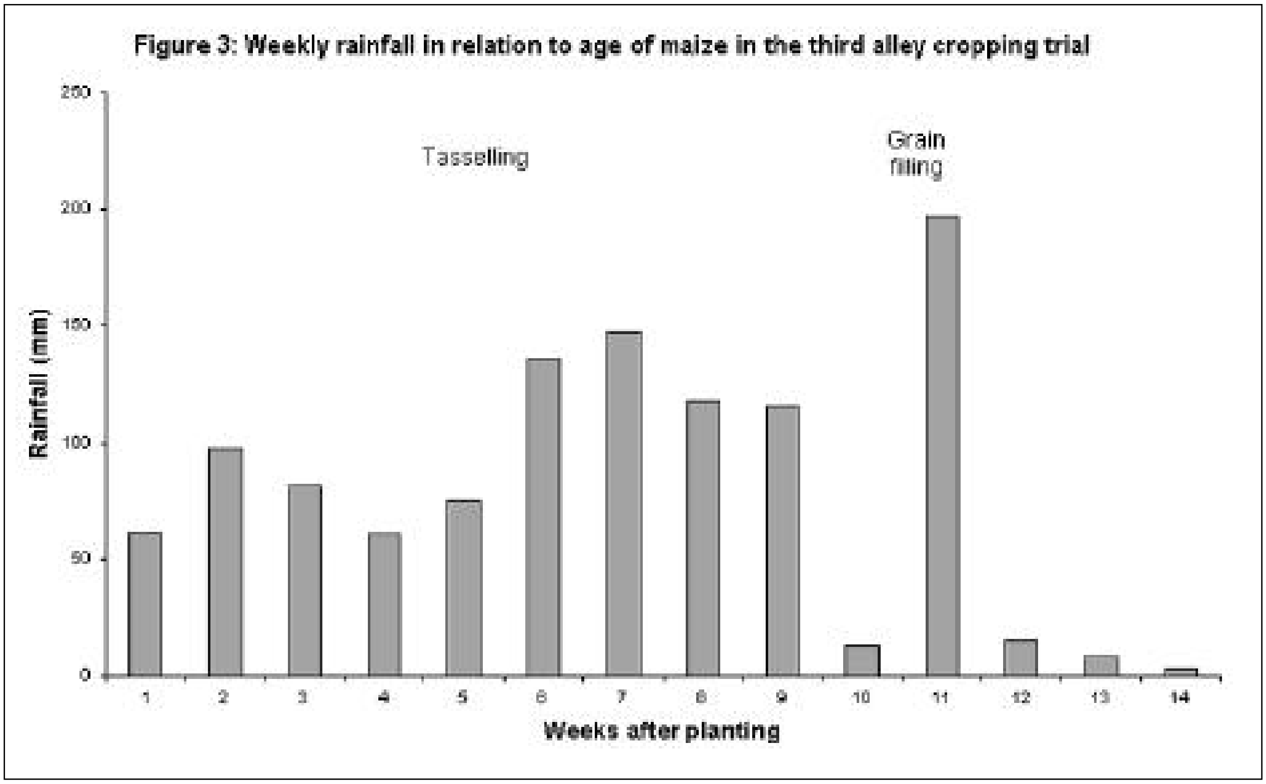


Figure 2:Weekly rainfall in relation to age of cowpea in the second alley cropping trial





Crop performance

Sorghum

Table 3 gives the results that were obtained in the first trial, which was planted with sorghum. There were no significant differences (P=0.05) among treatments for the variables measured in this trial, although the amount of nutrients applied by legume leaves was much less than that applied by granular fertilizers. In addition, the mulch provided by the legume leaves may have been beneficial to the plants when rainfall declined late in the growing season.

Table 3 Sorghum yield and yield parameters measured at harvest in relation to the three treatments

Treatment	Plant Height (cm)	Grain Yield (kg/ha)
T1- Leucaena Alley	110.8	1376
T2 - Glyricidia Alley	111.2	1543
T3 – Granular Fertilizer	117.8	1437
S.E.D $_{(10df)}$	11.8	315

Cowpea

Table 4 gives the results of the second trial which was planted with cowpea. The results indicate no significant differences (P=0.05) between treatments for any of the parameters measured, although the T3 treatment (Granular Fertilizer) showed higher numerical values for the parameters- number of pods, weight of pods and seed weight. The final yield, however, showed a numerically higher yield of pods and seeds for the treatments receiving legume

Table 4 Cowpea yield and yield components measured at harvest in relation to the three treatments

Treatment	Parameters			
	10 Plant sample			
	Plant Fresh Wt (g)	# of Pods	Pod Yield (kg/ha)	Grain Yield (kg/ha)
T1- Leucaena Alley	415.7	36.8	1089	708
T2 - Glyricidia Alley	404.3	34.6	1095	711
T3 – Granular Fertilizer	402.2	43.3	1069	694
S.E.D.$_{(10df)}$	91.2	8.8	141	92

Plate 1: Early growth of cowpea in a Glyricida alley in the second alley cropping trial

leaves fertilization. This again indicates that fertilization with the tree legumes Leucaena and Glyricidia is just as beneficial as fertilizing with imported granular fertilizers. Plate 1 shows the early growth of cowpea in a Glyricidia alley in this trial.

Maize

The results of the third trial that was planted with maize are given in Table 5. There were again no significant differences (P=0.05) among the three treatments for plant height, plant fresh weight at harvest and cob and grain yields of the plots. The plots fertilized with Glyricidia leaves, however, had a significantly higher (P=0.05) weight of cobs and grain weight for plants sampled at harvest compared to the plots given granular fertilizers. There were no significant differences (P=0.05) between the Glyricidia and Leucaena treatments for these parameters.

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Table 5 Maize yield and yield parameters measured at harvest in relation to the three treatments

Treatment	Parameters				
	Plant height (cm)	Five plant sample		Cob yield (kg/ha)	Grain yield (kg/ha)
	Joint	Cob weight (g)	Grain weight (g)		
T1- Leucaena Alley	80.8	774.5ab	571.2ab	2753	1972
T2 - Glyricidia Alley	84.8	833.3a	628.3a	3497	2477
T3 – Granular Fertilizer	85.0	646.3b	488.7b	2205	1570
S.E.D.$_{(10df)}$	11.7	110.9	91.3	1104	825

From t tests, numbers in the same column followed by the same letters are not statistically different at P=0.05

In this trial the nutrient levels supplied by Glyricidia leaves, particularly N and K were far superior to that supplied by granular fertilizer and this must have attributed to the better performance of the plants which were given this treatment. This higher nutrient supply along with probable benefits from mulching resulted in a 50% higher yield of cobs and seeds in the Glyricidia treated plots compared to those treated with granular fertilizer.

CONCLUSION

The results of the three trials indicate a comparable performance of the plots treated with green fertilizers with those treated with granular fertilizers. This implies that fertilization with the tree legumes Leucaena and Glyricidia is just as beneficial as, if not superior to, fertilizing with imported granular fertilizers. The legume leaves are also likely to enhance crop performance by increasing soil organic matter and so enhancing the chemical, physical and biological characteristics of the soil. The use of tree legumes is also likely to be cheaper and more environmentally friendly. The results indicate that the full effects of applying green manures appear in the second year when the trees are fully established and there has been some mulch build-up.

Of the two legume species used, Glyricidia provided more biomass and nutrients than Leucaena, and appears to be more adapted to the conditions of the Intermediate Savannahs. Glyricidia is also easier to establish as cuttings grow quite readily, and can produce leaves quite quickly.

The results of these trials are encouraging enough to indicate the need to continue to assess the benefits of the use of Glyricidia as a plant nutrient provider and soil enhancer to producers in the Intermediate Savannahs. This practice is likely to have tremendous effects on the sustainability of crop production in this ecozone. The use of glyricida leaves will increase soil moisture availabilty, increase the organic matter content of the soil leading to increased nutrient holding capacity, biological activity and inherent soil fertility

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The performance of Leucaena and Glyricida and their potential as sources of plant nutrients in the Intermediate Savannahs of Guyana

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ABSTRACT
Two tree legumes Leucaena (*Leucaena leucocephala* [Lam.] de Wit) and Glyricida (*Glyricida* spp.) were grown in the Intermediate Savannahs of Guyana to determine their respective performance and assess their ability to produce plant nutrients for the growth of short term food crops. From the five harvests of these tree legumes made over a two year period, Glyricida outperformed Leucaena at every harvest. Glyricida produced significantly higher ($P<0.01$) weights of leaves and stems compared to Leucaena. Differences in the nutrient content of the leaves were not very marked but higher yield of leaves inevitably led to higher amounts of plant nutrients being produced by the Glyricida plants. From the total amount of plant nutrients produced by the Glyricida trees, it is recommended that Glyricida be grown in the Intermediate Savannahs as a source of plant nutrients particularly N and K.

INTRODUCTION

Leucaena (*Leucaena leucocephala* [Lam.] de Wit) and Glyricida (*Glyricida* spp.) are both fast-growing leguminous trees which are native to South and Central America and the Caribbean. Owing to their ability to fix atmospheric nitrogen (N) their leaves contain relatively high levels of elemental N. These trees are not extensively grown in the region. However, they have many potential uses including high protein forage for livestock, timber, and raw material for pulp and paper. They are also useful for the control of erosion and the reafforestation of denuded, dry, N deficient soils (Batson et al. 1987; Bennison and Paterson 1993).

The Intermediate Savannahs of Guyana is an area of native grasslands growing on low fertility acidic brown sandy soils (Ahmad 1989; Bullen et al. 1981; Fletcher 1989; Simpson 1989). This area has a good potential for sustainable agricultural production, provided that suitable soil management strategies are utilised. Research by the Caribbean Agricultural Research and Development Institute (CARDI) over the last 20 years has developed land and crop rotational models which can be economically viable (Paul et al. 1997). One such model is a small crop rotational model in which cowpea, peanuts, cucurbits (mainly, watermelon and pumpkins) and the root crops, (sweet potato and cassava) are grown. Providing fertilizer for these crops is very expensive and many producers do not fertilize, depending on any residual nutrients present after land clearing.

Keywords: Agroforestry; fertilizers; soil nutrients; legumes

There is therefore the need for a cheap source of plant nutrients in the area and in this regard, the two tree legume species were assessed for their total biomass production, as well as leaf production and nutrient supply. This assessment was done in an alley cropping trial in which the nutrients supplied by the leaves were used to supplement the fertilizer provided to growing row crops. The results of the alley cropping trials are presented elsewhere (Simpson and Wickham 2001). In this study, the performance of the two tree legumes is assessed.

MATERIALS AND METHODS

Leucaena was planted by seeds which had been soaked in boiling water over a 24-hour period. The seeds were then planted into seedling trays. Seeds germinated within 10 days and were transplanted into black polythene propagation bags at about 35 days. The propagation bags were filled with an equal mixture of brown sand and sheep manure which had been ameliorated with limestone. Plants remained in these bags until they were transplanted into the field. Transplanting was done into 15-m lines of holes dug 1 m apart and filled with soil to which 1 kg of limestone was added.

Glyricidia was planted by stem cuttings, about 75 cm long, which were placed about 15 cm into the ground 1m apart in lines15 m long. Most stem cuttings began to sprout leaves within ten days of planting. Those cuttings which did not sprout in about 30 days were replaced. Initial planting began in March 1997 and plants were all established by August 1997.

Plate 1: View of a typical alley before planting of a row crop

For both Leucaena and Glyricida a pair of planted lines was separated by a space or alley 6 m wide. Plate 1 shows a typical alley before the planting of a row crop. There were six pairs of lines for each legume specie. Each pair of lines was considered a plot as it was used to supply nutrients to an alley plot 15 m x 6 m. The alleys were arranged in a randomised complete block design for purposes of statistical analysis. Harvesting of both Leucaena and Glyricida began in September 1998 and up to March 2000 there were five harvests. Leaf harvesting was done by pruning the plants of branches in a manner which allowed re-growth. The leaves were then stripped off of the branches and weighed and three sub-samples were taken for moisture measurements and tissue analysis of the nutrient elements N, P, K, Ca and Mg. Analyses were carried out by the Central Laboratory of the Guyana Sugar Corporation (GUYSUCO). From the second harvest, the remaining stems were also weighed in order to determine the entire biomass being produced. Yield and nutrient content data were statistically analysed utilising the ProcGLM in SAS, (SAS 1989).

RESULTS AND DISCUSSIONS

Growth of legume trees

Table 1 gives the mean yield of the above ground portion of the two tree legumes being assessed. In every harvest, Glyricida had significantly higher yield of leaves, stems and total biomass ($P<0.01$) than Leucaena. This seems related to the fact that the Glyricida was more adapted to the acid soil conditions which prevail in the Intermediate Savannahs. Plate 2 shows legume leaves being applied to a cowpea crop, while Plate 3 shows Glyricida leaves recently applied to a crop of maize. The Leucaena trees were treated with liming material, because it is well known that Leucaena requires more alkaline conditions. This liming helped to establish the plants, but did not allow for as rapid growth as that achieved by Glyricida.

Table 1 Mean weight of leaves, stems and total biomass obtained in the five harvests of tree legumes

Harvest	Treatment	Mean weight of leaves harvested (kg/plot)		Mean weight of stem harvested(kg/plot)	Total biomass (kg/plot)
		Fresh	Dried	Fresh	
1	Leucaena	10.3	4.1	-	-
	Glyricida	30.9	11.2	-	-
	SED $_{(5df)}$	3.6			
2	Leucaena	8.7	4.0	15.2	24
	Glyricida	31.0	12.2	41.7	73
	SED $_{(5df)}$	4.6		3.7	7
3	Leucaena	13.3	6.0	6.6	20
	Glyricida	83.5	31.9	54.7	138
	SED $_{(5df)}$	15.0		8.9	23
4	Leucaena	5.8	2.5	4.0	10
	Glyricida	28.3	10.5	24.7	53
	SED $_{(5df)}$	3.4		2.9	6
5	Leucaena	14.3	6.4	10.4	25
	Glyricida	40.5	15.3	58.4	99
	SED $_{(5df)}$	6.1		5.9	9

Plate 2: Legume leaves being applied to a cowpea crop

Plate 3: Glyricidia leaves recently applied to a maize crop

Nutrient content of legume trees
Table 2 gives the level of selected nutrients found in the leaves of the two tree legumes at the five harvests.

As expected both legumes had a relatively high N content and there was no significant difference (P>0.05) between the N content of the two species in any of the harvests.

The P content was low in both tree legumes and again there was no significant difference (P>0.05) between the two species in any of the harvests.

K content in the leaves of Glyricida began low but increased with each harvest, while in the Leucaena leaves, the level of K remained fairly constant, increasing only minimally. From the third harvest onward, the K content in the Glyricida leaves was significantly higher (P<0.05) than that in the Leucaena leaves.

The Ca content in the leaves of the two tree legumes moved in the reverse to the K content. The Leucaena leaves showed significantly higher (P<0.05) levels of Ca than the Glyricida leaves for the first four harvests. But by the fifth harvest the levels had equated at a relatively low level. The initially higher level of Ca in the Leucaena leaves was due to the liming which the soil in the plant holes received.

There were no significant differences (P>0.05) between species in any of the harvests for the leaf content of Mg. The level of Mg in the leaves also decreased marginally from the first to the fifth harvest.

Table 2 Content of selected nutrients in the leaves of the two legumes in the five harvests

Harvest	Treatment	Selected nutrient elements				
		N	P	K	Ca	Mg
1	Leucaena	3.21	0.174	1.37	1.49	0.46
	Glyricida	3.39	0.168	1.10	0.63	0.55
	SED $_{(2df)}$	0.47	0.014	0.41	0.13	0.05
2	Leucaena	3.60	0.183	1.12	1.48	0.49
	Glyricida	3.56	0.189	1.17	0.63	0.55
	SED $_{(2df)}$	0.28	0.004	0.16	0.11	0.06
3	Leucaena	4.08	0.223	1.17	1.67	0.34
	Glyricida	3.59	0.227	2.12	1.20	0.29
	SED $_{(2df)}$	0.46	0.018	0.16	0.05	0.03
4	Leucaena	4.13	0.267	1.44	1.40	0.31
	Glyricida	3.61	0.307	2.92	0.97	0.33
	SED $_{(2df)}$	0.26	0.014	0.26	0.05	0.02
5	Leucaena	4.05	0.283	1.41	1.03	0.31
	Glyricida	3.78	0.306	3.04	0.83	0.31
	SED $_{(2df)}$	0.07	0.029	0.16	0.26	0.00

Plant nutrient supply

The amount of plant nutrients supplied by the tree legumes over the two year period if the experimental layout was extrapolated to an hectare is given in Table 3. Over the two year period of the harvests, the Glyricida plants were able to produce 242.7 kg/ha of elemental N. This is equivalent to approximately 500 kg of fertilizer urea. The Leucaena produced less than a third of this amount in a similar time. The Glyricida plants were also able to produce 153.1 kg of K compared to 26.8 kg from Leucaena. The amount of P, Ca and Mg produced by the two tree legumes were relatively low, but in all cases Glyricida produced higher levels than Leucaena. This was due to the larger biomass of Glyricida which was produced at each harvest.

Table 3 Total amount of nutrients supplied by the two legumes in the five harvests

Nutrient	Amount of nutrients supplied (kg/ha)	
	Glyricida	Leucaena
N	242.7	73.6
P	17.2	4.4
K	153.1	26.8
Ca	69.2	26.7
Mg	26.8	7.4

Figures 1-5 give the nutrients produced at each harvest from the two legume species. These figures show clearly the dominance of Glyricida over Leucaena in producing the plant nutrients measured.

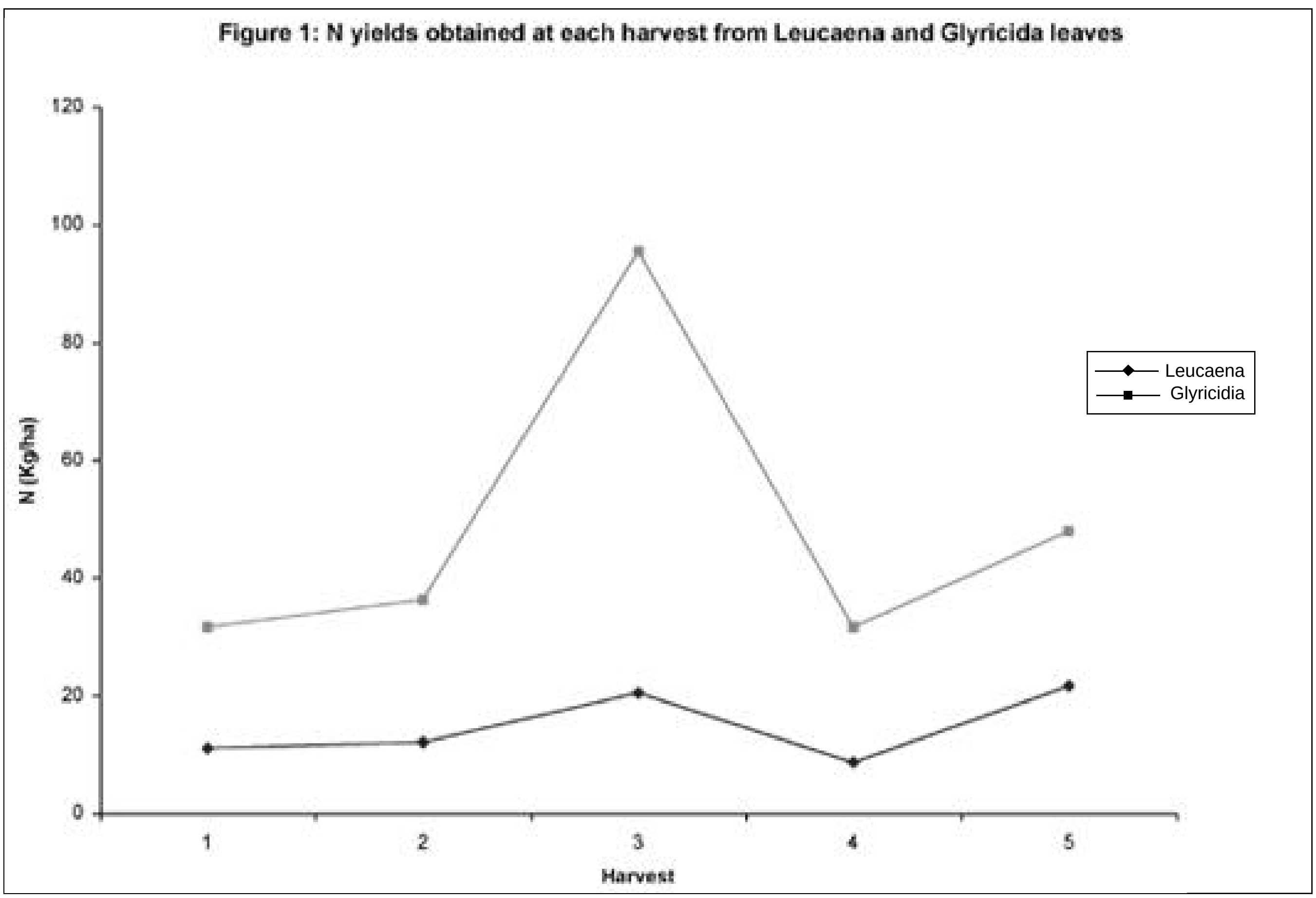


Figure 2: P Yields obtained at each harvest from Leucaena and Glyricida leaves

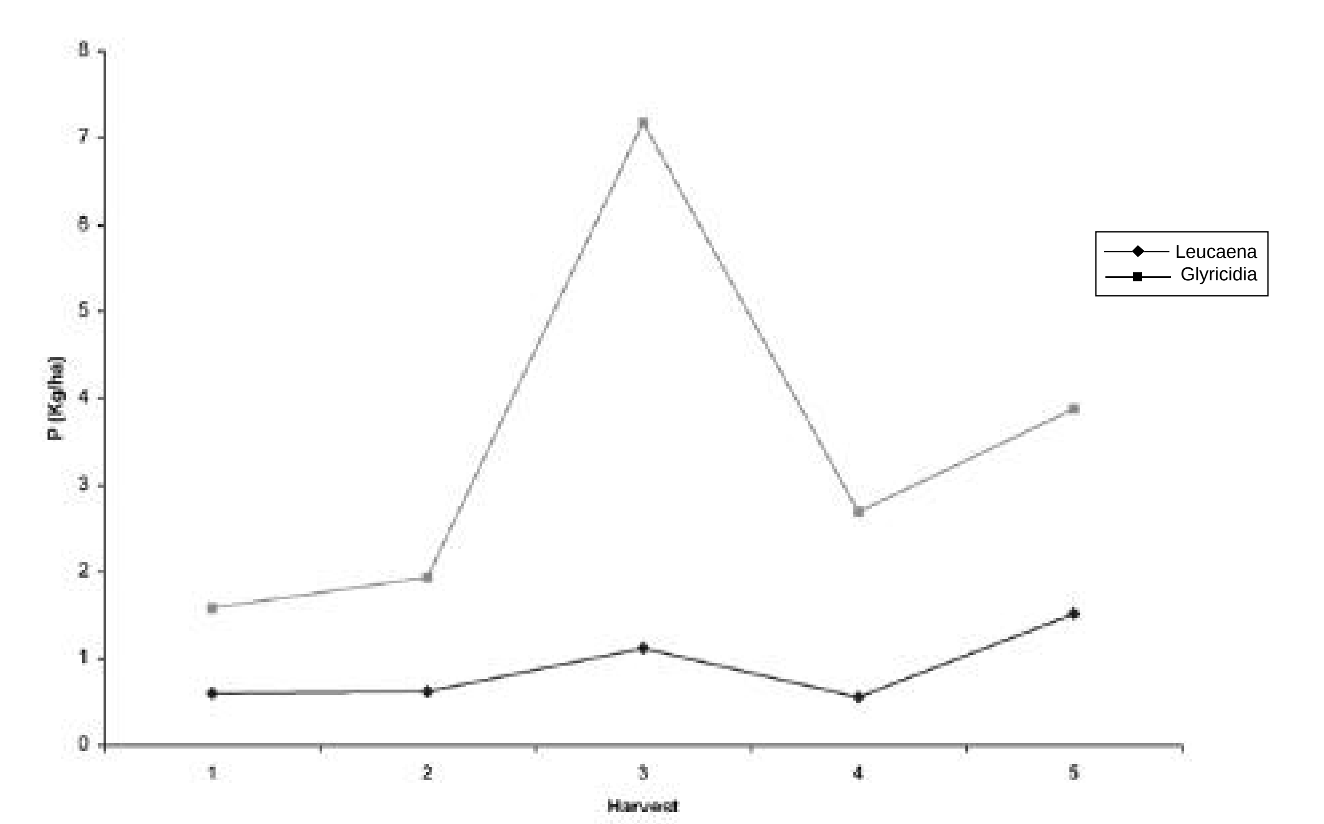


Figure 3: K yields obtained at each harvest from Leucaena and Glyricida leaves.

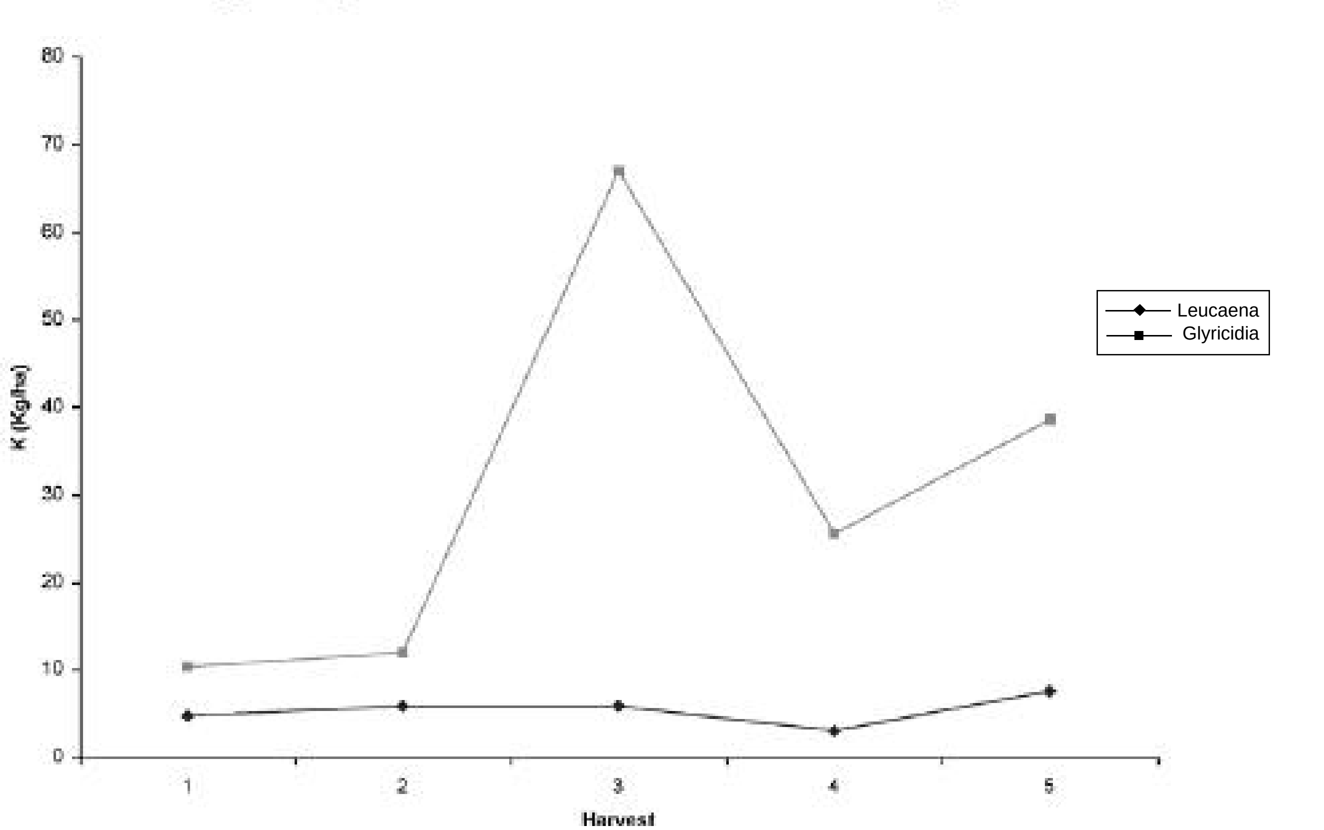


Figure 4: Ca yield obtained at each harvest from Leucaena and Glyricida leaves

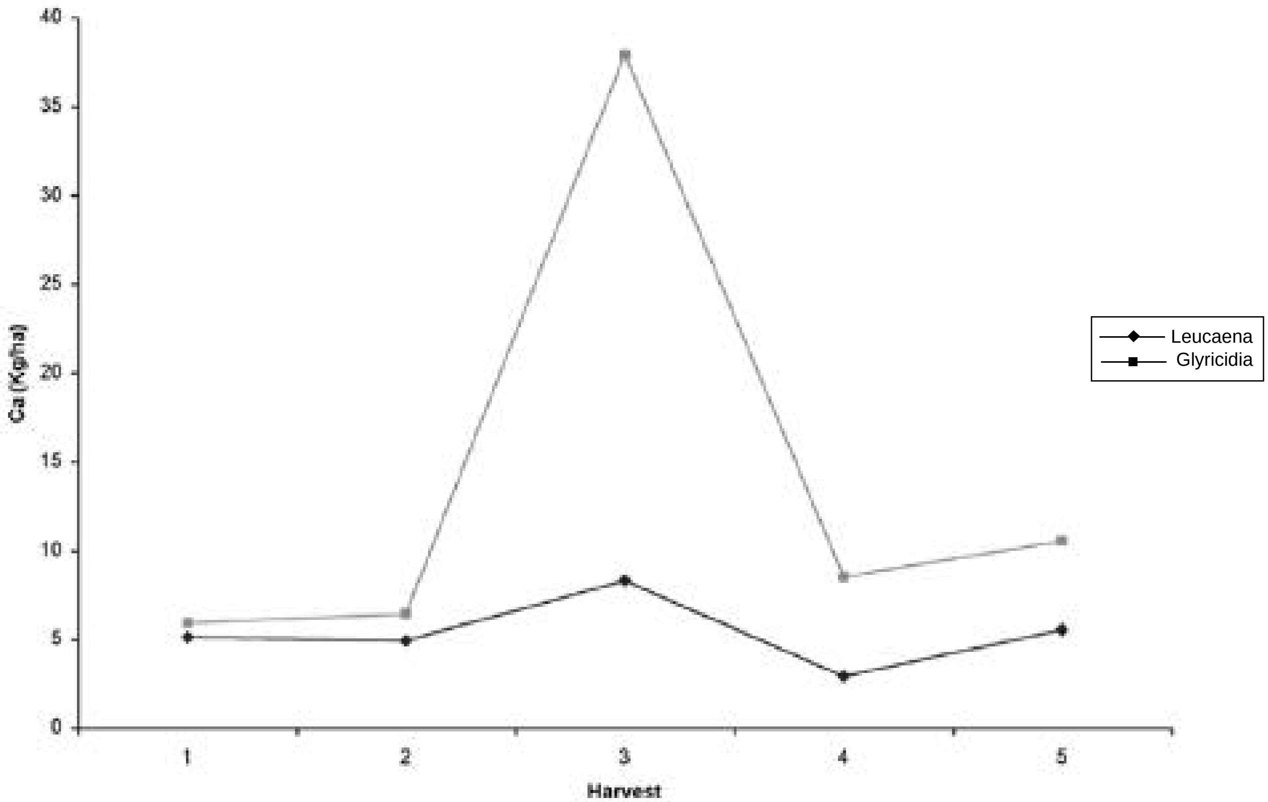
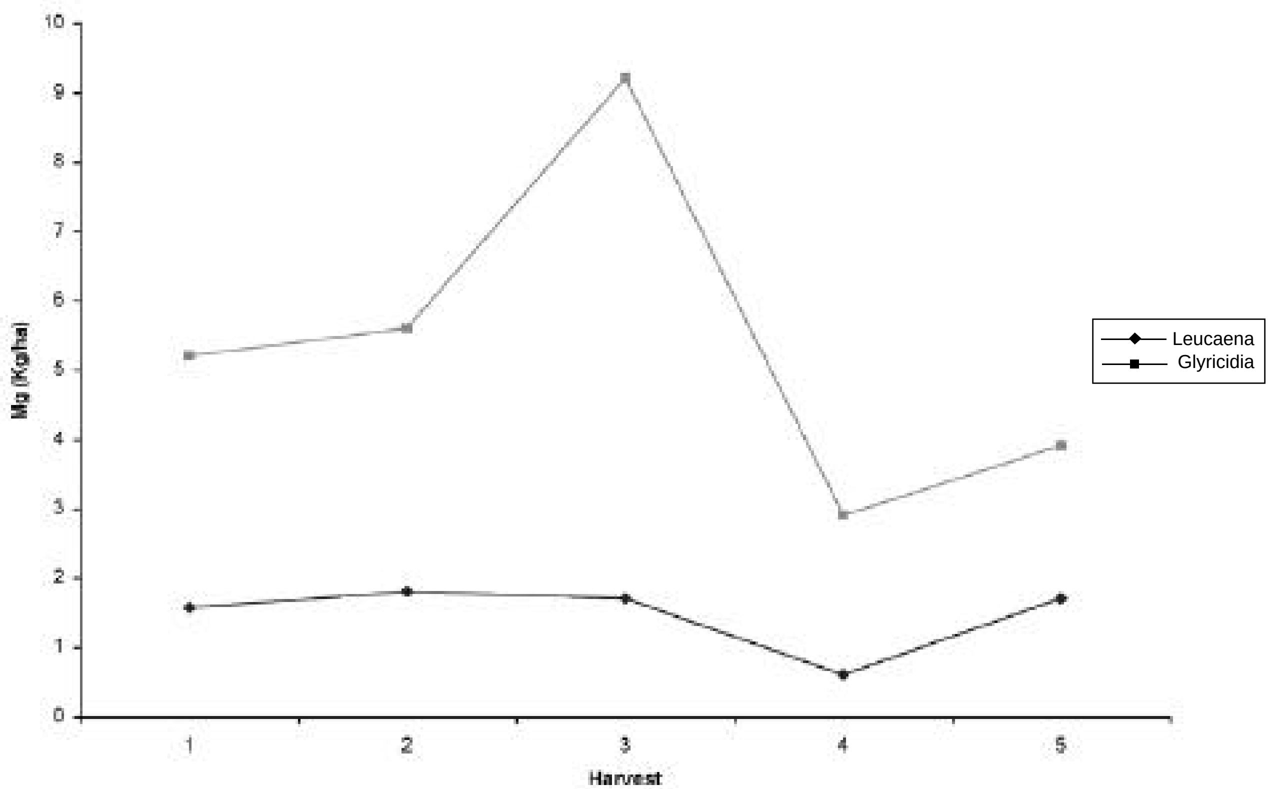


Figure 5: Mg yields obtained at each harvest from Leucaena and glyricida leaves



CONCLUSIONS

Of the two legumes being assessed, Glyricida outperformed Leucaena in both biomass and plant nutrient production in the Intermediate Savannahs. The level of nutrients in the leaves of the two legume species varied over the five harvests, but in most cases there were no significant differences between these levels.

In terms of biomass and plant nutrient production, it is recommended that Glyricida be used, as this species is more adapted to the conditions of the Intermediate Savannahs and can produce relatively larger quantities of fertilizer N and K for the production of other crops in the area.

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The aim of CARDI Review is to highlight quality research by scientists working or collaborating with CARDI. Articles are subject to full scientific scrutiny before they are published. All manuscripts should be submitted to the editor of CARDI Review in electronic form. The e-mail address for the editor is biometrics@cardi.org or ic@cardi.org. The preferred format for submission is Microsoft Word, but most versions of Word Perfect can also be read.

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It is expected that most articles which are published will be between six and 20 pages in length; abstracts will be between 100 and 300 words; the title will be informative but not lengthy and there will be between five and 10 key-words. Tables are numbered serially and figures are also numbered serially. Table titles appear above the table to which they refer and figure captions appear below the figure.

Prospective authors who require more information or detail may request this from the editor.

FOREWORD

This is the second issue of CARDI Review which is intended to disseminate information on completed research conducted by the Caribbean Agricultural Research and Development Institute (CARDI).

CARDI Review will be published at least twice a year and will be posted on the CARDI Website (http://www.cardi.org). A limited number of hard printed copies of each edition will be made, but the major dissemination medium will be electronic.

Articles that are published would have been screened through a process of internal peer review. This ensures that the quality of research and published articles is of the same standard as recognised scientific journals.

At present, CARDI research programmes cover mostly non traditional crops and livestock. However, there are also projects in the traditional Caribbean export crops of coffee, sugar and bananas. Thematic areas of research are fairly wide ranging and include (not necessarily in order of importance) IPM, organic farming, production systems, plant genetic resources, feeding systems, environment, marketing, post-harvest and socio-economics.

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Therefore the articles published in CARDI Review will be varied, wide ranging and, I hope, interesting and informative.

Bruce Lauckner
Editor, CARDI Review
August 2002