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Factsheet

LEGUMES FOR JAMAICAN ANIMAL PRODUCTION

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HISTORICAL ASPECTS

In the 1950s and 60s when international oil prices were low, fertilizers were cheap compared to the value of animal products. In Puerto Rico, use of 3.8 - 5.0t/ha (1.5 - 2 ac) of compound fertilizer was recommended for grazing pastures in order to support 3.5 cows/ ha (1.4 cows/ac). In Jamaica at this time it was not uncommon to talk of a basal application of phosphorus and potassium followed by 1100 kg/ha (1000 lb/ac) of sulphate of ammonia on an annual basis. Under such conditions, little thought was given topasture legumes since they could not compete with the high yields produced by heavily fertilized grass.

In the 1970s the energy crisis increased fertilizer prices. Pasture legumes were well known in temperate areas but tropical legume agronomy was poorly understood. In the grazing experiments of that period, the legumes failed to persist under management systems developed for heavily fertilized grasses. Introduced species remained on research stations but were not incorporated into commercial production systems.

INTERNATIONAL TRENDS

Australia remains at the forefront of tropical pasture research for relatively fertile soils in semi-arid areas. The Centro Internacional de Agricultura Tropical (CIAT) has developed legumes for highly acid, infertile soils in moderate to high rainfall areas in South America and South East Asia. It was left to the University of the West Indies to initiate a programme of pasture research for the fertile, neutral to alkaline soils and unpredictable rainfall as found in the Eastern Caribbean. This programme passed to CARDI in 1979. Successful species were selected and tested from the Virgin Islands to Tobago. Seed produced in Antigua has been sown in Manchester and St. Elizabeth in Jamaica, where it appears extremely promising.

THE PROSPECTS FOR LEGUMES IN JAMAICA

Jamaica has a history of intensive animal production based on fertilized grasses and imported concentrates. Where pasture growth is not greatly limited by lack of moisture–over 1,500 mm rain (60 in) or under irrigation, – legume based pastures cannot compete with well fertilized grasses in terms of yield, although they are often superior in terms of quality. In areas of less than 1000 mm (40in), the deeper rooted legumes grow longer into the dry season and often out-yield grass pastures. The prospects for the use of legumes therefore depend on the annual rainfall and availability of irrigation.

High rainfall

Many medium to large farms in the higher rainfall areas of Jamaica are already planted to good, aggressive

grasses which receive annual applications of fertilizer. Animals are carried at high stocking rates and receive varying amounts of concentrates. Whether this system can persist will depend to a large extent on the continued availability of foreign exchange to import both fertilizers and feedstuffs. On the larger properties it may be potentially more profitable to keep fewer animals on low-input legume based pastures without concentrates, but managers maybe unwilling to incur a capital cost in legume establishment which would reduce future production.

It is not expected that existing grass pastures will be replaced by grass-legume mixtures, but as fertilizers become more expensive, there will be a tendency to economise in their usage and the pastures will degenerate. As this happens, it will be necessary to increase the level of concentrate feeding in order to maintain production levels. Legumes can be used to replace much of this imported concentrate.

There are a number of ways in which legumes can be introduced onto intensive livestock farms in the higher rainfall areas.

(1) Steeply sloping or rocky land which is often only partially developed and where fertilizer application is difficult can be planted to legumes. Tree species often do well on rocky areas and they will help to stabilize slopes.

A Leucaena protein bank on rocky land.

(2) Tree species can be planted along roads and fence-lines. Although they will need protection from grazing during the first two years, they can later be used as living fence posts, reducing the cost of fence maintenance.

Gliricida planted along fence lines at Grove Place , Manchester. Above picture after lopping.

(3) When a field is ploughed up for re-planting, a legume catch-crop will help to destroy troublesome, unpalatable grass weeds. If the legume alone does not smother them, herbicides can be used which will kill the grass without affecting the legume. Grass-legume associations can then be established.

Grass – legume pastures at Hounslow, St. Elizabeth grazed by milking goats.

Legumes used in these ways can be grazed, fed as green chop or dried and stored as leaf meal for feeding at a later date. They can be particularly useful for growing steers or replacement heifers. As this technology becomes more accepted, some farmers will choose to plant fields of pure perennial legumes to compliment their grass pastures.

Milking cows grazing grass-legume pastures at Goshen, St. Elizabeth.

Low rainfall

In the drier parts of the country, many grazing areas, whether sown or natural, are dominated by Guinea grass (*Panicum maximum*) while Seymour or Hurricane grass (*Bothriocloa pertusa*) has invaded large areas in recent years. Work in Antigua has shown that both of these species can be grown with a range of legumes. There exists the possibility of introducing herbaceous, scrambling or erect legume species into these pastures. Strips can be ploughed or disced during the dry season and the legume seed planted on these strips which comprise about 20 percent of the total area. With careful management, the legumes will spread into the unplated area in the following 2 to 5 years. This low-cost introduction process will lead to increases in both quantity and quality of pasture, features that will be particularly noticeable during the dry season. Over a period of time, the legumes will allow a substantial reduction in the use of concentrates (if they are presently used), together with an increase in carrying capacity. If concentrates are not now used, the productivity per animal will be increased by the introduction of legumes into the pasture.

Star-grass and legumes at Goshen, after grazing.

In addition to the use of legumes in general pastures, tree species can also be used along roads and fence lines as noted above, for the provision of shade and fire-wood, together with either fresh fodder or leaf meal for use during the dry season. Rocky land, as noted above, can also be brought into production by the use of tree species. In many cases, the best way for a farmer to become familar with legumes is through the establishment of a protein bank for dry season cutting or grazing. In this way, he will see for himself the effect of these plants on his own animals. Details of the bank technique are provided in the CARDI Bulletin, No. 11 *The Management and Use of Forage Banks.*

Guinea grass and legumes at Hounslow. Note cheap shade made from roundwood and palm thatch.

Jamaica is blessed with a wide range of naturally occurring legumes including herbaceous species such as *Centrosema, Desmodium, Indigofera,* etc. and the tree species *Leucaena* and *Gliricidia.* While these legumes have long since disappeared from intensively grazed areas in the wetter parts of the country, many are still to be found in the drier parishes. In general, these local types are less productive than those which have been selected in systematic evaluation programmes, but they nevertheless represent an important natural resource which if properly managed could make an increased contribution to Jamaican livestock production. Legumes require lighter stocking rates and longer rest periods than most cultivated grasses, but in return they need less fertilizer and produce higher quality fodder. Management which favours the native legumes will lead to lower production costs and more sustainable production systems. Where legumes need to be replanted, it will be best to sow the more productive, introduced varieties.

Work in Barbados has shown that the Jamaican breeds of beef cattle do extremely well on legume based pastures without any concentrate feeding. The Eastern Caribbean has been allowed to show the way with regard to the rational exploitation of Jamaican cattle under the economic realities of the 1990s. It is time that the originators caught up with the innovators!

Jamaican Red cattle at Springhead, Barbados, fed entirely on high quality, grass-legume pastures with no concentrates.

GENERAL CHARACTERISTICS OF LEGUMES

Like all groups of plants, every legume has its own characteristics which set it apart from others in the same group. The following features are common to all commercially available pasture and forage legumes, however, and are also shared by many naturally occurring species.

ADVANTAGES

1. Legumes have a deep tap-root system which enables them to grow well into the dry season. This provides them with a good seasonal distribution of production. It also allows them to recylce soil nutrients since they can absorb minerals from depths well below the levels reached by grass roots.

2. Nodules on the roots contain bacteria (*Rhizobium spp.*) which can fix atmospheric nitrogen into a form which the plant can use. Many species can fix about 200 kg/ha (180 lb/ac) of nitrogen under good conditions. They still require fertilization with phosphorus (P) and potassium (K), but they provide their own nitrogen (N).

3. Legumes contain higher levels of crude protein, vitamins and minerals (particularly calcium and magnesium) than grasses. The protein levels often exceed 20 percent, so legumes make a useful supplement for animals grazing grass alone. As a comparison, dairy ration (concentrate) usually contains about 16 percent protein.

4. The protein contained in legumes has a good balance of the amino acids required by grazing animals. Much of this protein is called "by-pass" protein, meaning that it passes unchanged through the rumen to be directly absorbed by the animal through the small intestine.

5. Many legumes hold their leaves and maintain feeding quality well into the dry season. This means that they can be used as standing reserves. It is not necessary to store them as either hay or silage since they lose little quality during the hardest time of the year.

6. Many legumes contain tannins and other chemicals which reduce their palatability in the wet season. All pasture and forage legumes are well accepted by livestock during the dry season when grasses start to dry off, and it is at this time that legumes can do most good for the animals.

DISADVANTAGES

1. Each legume species is generally more specific in its range of environmental requirements (soil, climate) than the usual pasture grasses. Several different species many therefore be needed to cover all potential sites on a single farm. Few legumes will tolerate poorly drained soils.

2. Legumes will not tolerate frequent close cutting or grazing. They therefore need special management including lower stocking rates and longer rest periods than heavily fertilized grasses. This is especially true of highly palatable species such as Wild Tamarind (*Leucaena leucocephala*) and Blue Pea (*Clitoria ternatea*).

   These disadvantages must be offset against the favourable features noted above.

In summary, well managed, adapted legumes offer a means to locally produce reliable, high quality feed for ruminant livestock at a low cost in terms of imported inputs. Their widespread use could substantially reduce imports of both fertilizers and concentrate feeds and lead to considerable savings in foreign exchange.

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