

Fodder trees and shrubs in smallholder dairy production systems in Uganda

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Fodder trees and shrubs are high quality multipurpose trees (MPTs) planted specifically for feeding dairy cattle, goats and sheep. Fodder trees such as *Gliricidia sepium* (Gliricidia) and *Calliandra calothyrsus* (Calliandra) and shrubs such as *Tithonia diversifolia* (Mexican Sunflower) are used to supplement low quality forage grasses and crop residues with significant increases in weight gains and milk yield.

Examples of fodder trees and shrubs





Calliandra calothyrsus (Calliandra)



Gliricidia sepium (Gliricidia)



Mexican sunflower

Common fodder trees and shrubs used in zero grazing dairy cattle systems in Uganda

Fodder tree legumes have been adopted in the cut-and-carry feeding systems in Uganda as protein supplements to poor quality grasses and cereal by-products. This is due to their hardiness and favourable chemical composition with crude protein contents of 18 to 30% in the dry matter of edible leaves and stem. However, diseases and pests such as “die-back” in Calliandra are negatively affecting productivity of fodder trees.

Role of fodder trees and shrubs in a farming system

- Leguminous fodder trees or shrubs have the ability to fix atmospheric nitrogen required to improve soil fertility and animal productivity.
- Fodder tree banks do not provide 100% of feed requirements but supplement available low-quality pasture with high quality protein.
- Their deep and lateral rooting habit provides a structure that stabilizes the soil and the leaf fall from these trees enriches the soil.
- Fodder trees have higher biomass yields, better resistance to mismanagement and a capacity to retain high quality foliage under stress conditions compared to herbaceous pasture legumes.
- Provision of firewood.
- Reforestation in areas where many trees have been cut down.
- Alley cropping whereby the multi-purpose trees are planted as single rows in a field of food crops.
- Hedgerows, contour strips, bund stabilizers.
- Source of income (seed, seedlings, silage, leaf hay and fuel)

Characteristics of ideal fodder tree species

The ideal fodder or multipurpose tree species, should be able to fulfil the 6-“F”s basic objectives of:

1. fodder,
2. fuel,
3. fruit/food,
4. fibre,
5. forest and,
6. fertilizer (green manure).

The desirable agronomic characteristics of fodder trees are:

- ease of establishment,
- good competitive ability,
- high productivity and persistence under repeated cutting or grazing,
- ability to adapt to climatic edaphic conditions,
- require no fertilizer (low input system),
- resistant to local pests and diseases,
- ability to produce seed or be reliable for vegetative propagation, and
- have good nutritive value and reasonable palatability to animals

Establishment, management and utilization of fodder trees and shrubs

Fodder trees will grow in areas with rainfall of 700 mm per year and above. Due to their deep rooting habit, tree can withstand drought. Fodder trees grow in varying soil types ranging from volcanic loamy to acidic soils, hence their wide distribution in the three districts. Calliandra and Gliricidia do not grow well in waterlogged soils, as sesbania.

Good site preparation is necessary to establish fodder banks. The goal is a weed free seedbed, in which plant growth and survival will be maximized. Fodder bank establishment must coincide with the rainy season to ensure high plant survival. Direct seeding is normally recommended for fodder bank establishment. Fodder tree seeds must be soaked in water or scarified to assure good germination. Fodder bank establishment is also possible with seedlings. Species that can be established by cuttings include *Gliricidia sepium*. Fodder tree seed and seedlings are available at the National Forestry Authority offices, Namanve, Kampala-Jinja road and at the National Forestry Resources Research Institute located in Mukono district.

Fodder trees are best propagated from seed. Seedlings raised in nurseries are most commonly used.



Calliandra seedlings ready to be transplanted

Raising fodder tree seedlings

- Construct a good nursery shade where the seedlings will be raised.
- Plant at least two seeds in plastic bags filled with fertile topsoil.
- Remove the small seedling if both develop.
- Allow seedlings to grow until they are 20 to 50 cm tall.
- Prepare to transplant in cleared and well-prepared seedbeds, which may be strips or spots.

Incorporation of fodder shrubs and trees into farming systems

The competitive land use between crops and livestock exerts considerable pressure against utilization of arable land for planting fodder crops and pastures. In this situation, a number of approaches have been suggested in order to incorporate fodder shrubs and trees without competing with crops.

Four ways in which fodder shrubs and trees can be incorporated are:

1. Planting a living fence around the household

Fodder shrubs such as *Leucaena leucocephala* (Leucaena), *Gliricidia sepium* (Gliricidia) and *Sesbania grandiflora* (Sesbania) can be grown as living fences which provide not only human food and fuelwood but also animal feed. The fence can be established by direct seeding or transplanted seedlings at close spacing and be ready

for use in 6–8 months. *Gliricidia* is easily established by sticking the stem or branch cuttings into the ground.

2. Vegetation on uncropped lands

In many of even the most intensively cropped areas of Uganda there are pockets of land which cannot be used for cropping. These may be in the form of farm boundaries, paddy bunds or forest margins which could be used to grow some shrubs and trees. These areas could be planted with fodder shrubs and trees to augment protein needs of livestock and integrated with plantation agriculture.

2. Hedgerows in alley cropping

Shrubs and fodder trees are grown as hedgerows in cropped land. These serve as windbreaks or heat breaks and provide green manure fertilizer for the crops. During the productive period, the cut material from the hedgerow species often provides fodder in excess of the amount needed from green manure for animals. Shade trees such as *Gliricidia*, used in cocoa plantations, can be treated the same way when they are routinely pruned to prevent overshading.

3. Component species in inter-cropping

In this system, shrubs or fodder trees are grown in alternate rows or rows adjacent to food crops. Trees are pruned once or twice for fodder or to reduce competition and shading during the growing period of the crops. Species used in this system are limited to fast growing ones and those tolerant to frequent cuttings. Examples of these include small shrub legumes like *Stylosanthes scabra*, *Stylosanthes viscosa*, *Cajanus cajan* and *Desmanthus virgatus*.

Establishment

A wide plant spacing, 50 x 50 cm or 60 cm x 60 cm, is usually recommended. Sowing depth of 1-2 times the width of fodder tree seed is recommended. In heavy soils, or when seed is small, sowing depth should be shallow. In dry environments sowing depth should be deep. For most seed types, successful sowing methods vary from place to place. Use those methods practiced locally for a similar type of seed. Application rates for fertilizers should be determined locally. Consult your extension staff for the fertilizer rates.

Management

The age of plants at first harvest depends on environmental conditions and fodder bank growth. *Calliandra* can be harvested at 6-9 months after planting the seedlings. A standard cutting height of 50 cm above the ground is recommended. Longer cutting frequencies, 12-18 weeks, generate more total biomass yield but increase the proportion of small wood production. Shorter cutting frequencies, 6-12 weeks, favour fodder yields and fodder quality. Younger foliage tends to have a higher nutritive value and palatability. However, repeated cutting after short frequencies decrease longevity.

Dry-season fodder production is a main objective of fodder tree bank management. Six to eight weeks before the beginning of the dry-season trees should be cut to the recommended height. The new foliage produced over the next few weeks will be retained well into the dry-season when it is most needed. If left uncut for 4 to 6 months, *Gliricidia* will not retain its leaves into the dry-season.

Potential of fodder tree/shrub legumes as a feed resource for dry season supplementation of smallholder dairy cattle systems

During the dry season, the natural pastures and crop residues available after crop harvest for dairy cattle are usually fibrous and lack most essential nutrients including proteins, energy, minerals and vitamins which are required for increased rumen microbial fermentation and improved performance of the host animal. Inadequate nutrition in dairy animals has often been associated with heavy economic losses to the farmers because of animal weight and condition losses, reduced milk yield and reproductive capacity and increased mortality rates. In order to improve the productive and reproductive capacity of smallholder ruminant animals, there is a need to look at ways of extending the availability and quality of feedstuffs produced on smallholder farms. Some of the benefits of supplementing fodder tree foliage to dairy cows include:

- The most important aspect of fodder trees as a source of feed for dairy cows is the high protein content which ranges from 14 to 34%.
- The protein content in fodder legumes consist of both soluble and insoluble components and as such is used both as an important source of nitrogen for increased rumen microbial activity and by-pass protein for supplying amino acids to the lower gut of the host animal.
- In addition to being a good source of protein, fodder legumes are also an important source of minerals such as sulphur, calcium, copper and iron even though they have been shown to be a poor source of manganese, zinc and phosphorous.
- The intake of dry matter is often increased by the amount of green fodder given to the animal. The increase in the intake of materials when animals are supplemented with fodder legumes may be due to increased microbial fermentation in the rumen and subsequent higher rate of passage of digesta through the gastro intestinal tract.