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NA-61E



Use of Tree Fodder in Ruminant Feeding



*A Farmers' Guide to the use of
tree fodder as a feed
supplement for ruminants.*



NA-61



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Ruminants are able to use fibrous material (grass, tree leaves, rice straw etc.) as feed to meet their energy, protein, vitamins and mineral requirements. They need to consume adequate quantities of grass and other feed material to produce efficiently and optimally. But in most smallholder farms, the quantity of feed given to ruminants is insufficient and moreover, most of the feed material is of poor quality and deficient in soluble carbohydrates, nitrogen and minerals. The value of these nutrients in ruminant feeding is discussed in Leaflet 1. We also discussed the ways and means of overcoming feed shortages and deficiencies. One of the methods available to us is the use of tree fodder which are abundantly available in and around most rural households as a supplementary feed for ruminants. However, it is our observation that this abundant feed resource available in most farm premises is not used adequately to feed ruminants.

We mentioned that most tree fodders are generally rich in protein, soluble carbohydrates and minerals. This leaflet provides you with information on the different types of tree fodder, cultivation, management, nutritive values and feeding systems.

1. What is tree fodder ?

This is the green forage biomass obtained from trees or shrubs. This includes leaves, twigs and even edible pods and barks of certain plant species. They are dicots and usually perennials. Due to their extensive deep rooting system, they can withstand drought and provide quality green fodder during dry periods. Fodder trees are found growing naturally but can also be cultivated. Generally, they are not purposely grown for fodder, but for other purposes such as live fencing, shade, supports etc. However, their green biomass is available for livestock feeding. Few commonly found cultivated tree fodder varieties are depicted in Fig 1.

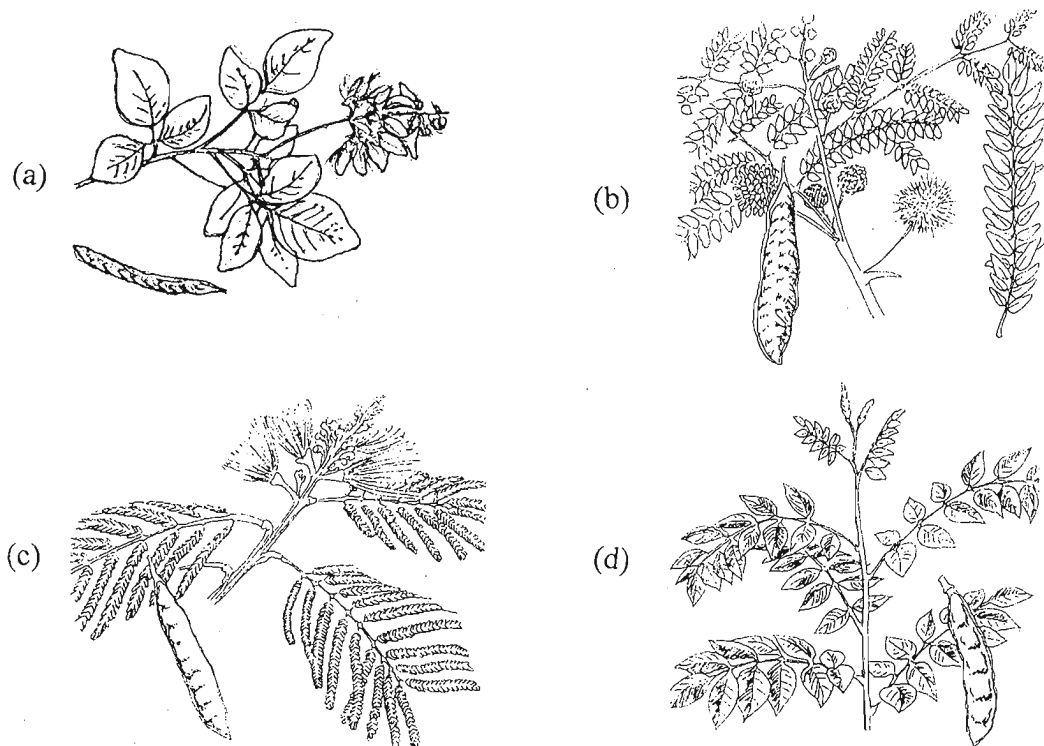


Fig.1 Common leguminous tree fodder varieties
 a) *Erythrina fusca* b) *Leucaena leucocephala* (Ipil Ipil)
 c) *Calliandra calothyrsus* d) *Gliricidia sepium*

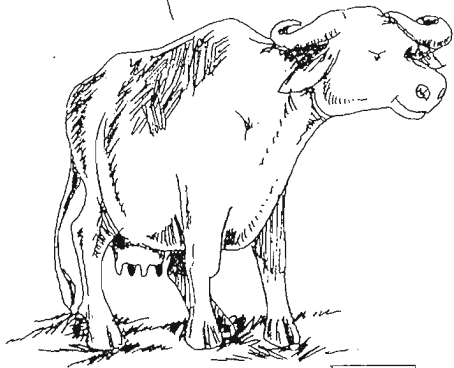
2. **What are the advantages of feeding tree fodder?**

Tree fodders in general are rich in crude protein, soluble sugars and minerals and therefore they could be used as a supplementary feed to compensate for the nutrient deficiencies of poor quality forages. Tree fodder could also provide the bulk of the feed during the dry season, when pasture or fodder grasses are scarce. During drought feeding where the sole source of roughage is crop residues (e.g. rice straw) or mature low quality grass, feeding tree fodder will improve the digestibility of rice straw (by providing nitrogen, soluble carbohydrates and

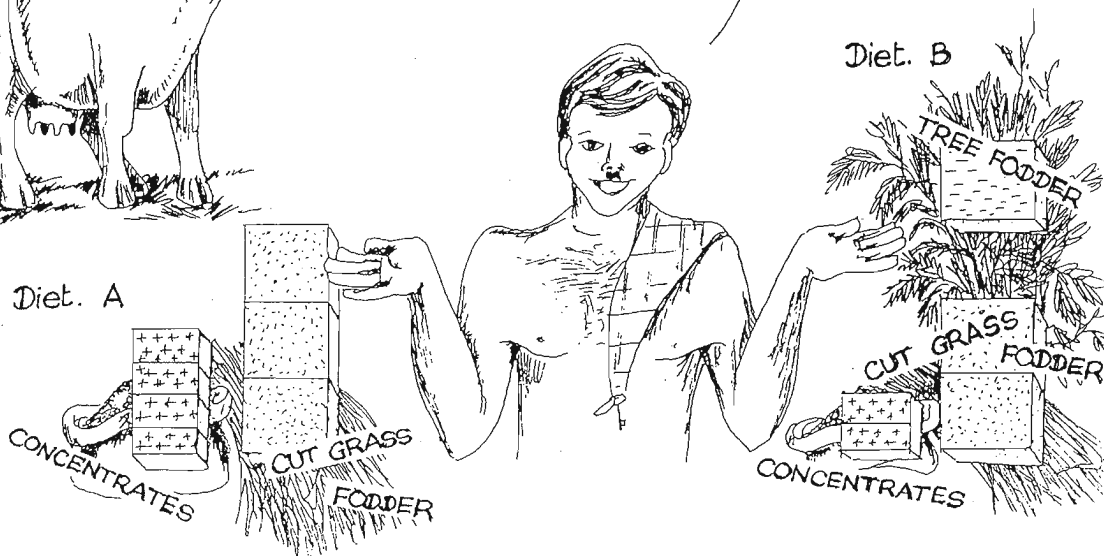
minerals) and therefore will be able to sustain production. Tree fodder can also totally replace the concentrate feed at a low level of milk production.

When quality tree fodder is included in the diet (about 1/3) along with good quality grass, 4-5 litres of milk can be easily obtained without any concentrate feed. For cows capable of higher level of production (>4-5 l/day) tree fodder given at the rate of 1/3 of the fibrous diet, it could partially (30-50 %) replace the concentrate ration. In both situations, the cost of production could be reduced substantially.

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MILK AND CALVES.



YES, I WILL!
I HAVE TWO OPTIONS.
BUT I CHOOSE 'Diet B'
BECAUSE IT WILL INCREASE
MY PROFITS.



3. How would you establish and maintain fodder trees in your home garden ?

Fodder trees grow naturally or are cultivated in home gardens, scrub jungles and waste lands and are climate specific. Some of these are Kos (jak), Kohomba (Neem), Gansuriya, Siyambala (Tamarind), Maila (Bahema), Erabadu

(Erythrina), Palu, Weera etc. Some species are planted on the fences or for shade and some as supports for vines like pepper etc. They are also grown as hedge rows e.g. Gliricidia, Erythrina, Leucaena (Ipil-Ipil), Sesbania etc
Common tree fodder species recommended for different agro-ecological zones and their yields are summarised in Table 1.

Table 1: Fodder tree species recommended and expected yields

Tree fodder species	Recommended zone	Defoliation frequency (months)	Fresh leaf yield (Av) Kg/tree/Yr
Gliricidia	MC, DZ, C▲, LCWZ	3 - 4	7 - 10
Leucaena (Ipil Ipil)	MC, DZ, C▲, LCWZ	3 - 4	5 - 6
Erythrena (dadap)	HC, MC, DZ	3 - 4	5 - 7
Albizia	MC, DZ, C▲, LCWZ	3 - 5	4 - 6

Mid country = MC, Hill country = HC, Dry zone = DZ,
Low Country Wet Zone = LCWZ, Coconut Triangle = C▲,

In an integrated farming system, forage production could be easily incorporated into the home garden through the cultivation of fodder grasses and fodder trees in the following manner shown below.

Fodder trees along the main boundary fence:

Fodder trees could be grown along the main boundary fence. The recommended varieties are: Gliricidia, Ipil-Ipil, Dadap planted at a spacing of 0.5 to 1 M (2 or 3ft) and harvested at a height of 1 to 2.5 M (3 to 8ft).

Fodder trees as internal hedges / hedgerows:

Fodder trees could be grown as hedgerows in the home garden. Vegetables or other home-grown crops like onions, green gram, maize etc. can be grown between the rows. The recommended tree (shrub) species suitable for internal hedgerows are Gliricidia, Leucaena, Flemingia, Calliandra, Sesbania spp.

For more information on cultivation please see leaflet No. 10 in this series.

4) Management of fodder trees

Good management of fodder trees and plants throughout the entire year is essential. Harvesting practices, weed control and careful management will ensure optimum forage production in the system.

Cutting frequency and cutting height: Cutting management is a very important factor that influences the productivity of tree legumes in the system. Severe pruning or harvesting cause adverse effects on the subsequent growth.

- Regrowth of lopped trees is generally faster during the rainy season. Therefore, it would be possible to get frequent harvests of foliage during such periods.
- It is always better to harvest forage before they mature, because the nutritive value is generally higher at this stage, rather than when it is over mature.
- When lopping fodder trees please

remember to use a sharp knife or a trimmer.

- Do not lop the tree at lower heights than what is recommended, because it would reduce the biomass production and the

nutrient recycling. It would also minimise the shading effect on the soil. The recommended *cutting frequencies* and *cutting heights* are given below.

	Cutting frequencies (days)	Cutting heights (ft)
Tree fodder in the main boundary fence	75-90	4 - 5
Tree fodder in the internal hedges	45-60	2

5. *Feeding value of tree fodder*

The feeding value of tree fodder varies with the species, stage of harvest and parts of the plant used. Table 2 provide the nutritive values of the common varieties.

Table 02 Commonly available species of tree fodder and their nutritive values (on dry matter basis).

a) *Leguminous species available in the home garden*

Tree fodder varieties	CP %	CF %	Fat %	Lignin %	Dry matter digestibility %
Gliricidia	24	16	4	7	64
Leucaena (ipil-ipil)	18	14	4	6	61
Sesbania spp.	20	25	3	12	54
Erythrina	26	27	5	14	62

Though these varieties are commonly found in most home gardens, very little is used as ruminant feed. As shown in the table above, those varieties are very rich in crude proteins and a cheap and efficient way of supplementing the nitrogen requirement of the animal, particularly in situations where the animals are fed on low quality fibrous feed.

b) *Non-leguminous species available in the home garden*

Tree fodder varieties	CP %	CF %	Fat %	Lignin %	Dry matter digestibility %
Jak leaves	14	20	4	12	48
Kapok leaves	14	19	7	12	52
Gansuriya leaves	16	20	4	8	58

As shown in the table above non- leguminous tree fodder varieties are moderately rich in crude protein. As such, they could be included in the ruminant diet in situations where grass is in short supply and of poor quality.

c). Species found naturally in the environment

Tree fodder varieties	CP %	CF %	Fat %	Lignin %	Dry matter digestibility %
Margosa (Neem)	16	26	5	13	52
Tamarind	23	19	3	16	47
Maila	16	24	6	12	54
Wild sunflower	23	13	5	7	59

Wild sunflower which is commonly found in the mid and hill country areas is a rich source of crude proteins. Because of the lack of knowledge regarding its value as a good ruminant feed, it is allowed to go waste. The other varieties, which grow naturally are resistant to drought. In the dry zone where dry seasons often extend over 6 to 7 months each year, loppings from these trees could be incorporated into the ruminant diet, to maintain the body condition and production levels.

d). Introduced species used as tree fodder.

Tree fodder varieties	CP %	CF %	Fat %	Lignin %	Dry matter digestibility %
Calliandra	26	24	6	14	52
Flemengia	24	26	5	18	50
Acacia Spp.	18	15	3	15	50
Albizia	21	17	5	16	36

CP= crude protein; CF= crude fibre;

The above species were introduced into the country few years back. They are rich in crude protein and could easily be grown. Calliandra and Flemingia are very versatile plants that could be grown in your home garden

6. Method of feeding tree fodder to cows and buffaloes

Good quality green forage (pasture) in the farm is the most economic diet of a ruminant animal. However, the availability, of such feed varies during the year according to the climatic changes (i.e. rainy and dry months). During the rainy season generally there is a surplus of fodder, while in the dry season pasture grasses are either over matured and of poor quality or dried up completely. To meet the seasonal variations in the feed availability the farmer has to often resort to alternative feeding systems. In this situation farmers could use tree fodder as a regular feed supplement for animals whose basal diet is grass and/or straw, which in most instances is poor in soluble carbohydrates, nitrogen and minerals. In

general tree fodder particularly the leguminous varieties are rich in protein, soluble sugars and minerals.

There are, however few limitations in feeding tree fodder. Sometimes they contain certain chemical substances which could become toxic, if an animal consumes more than the recommended level. Further, some fodder varieties (such as Jak leaves) if consumed in excess could lead to digestive disturbances causing impaction and bloat. However, these limitations could be overcome by following good management practices. a). Give tree fodder as a mixture with grass or straw, because some varieties are not accepted by animals when they are given alone, .b). Blend several varieties of tree fodder when available. c). Wilting for a

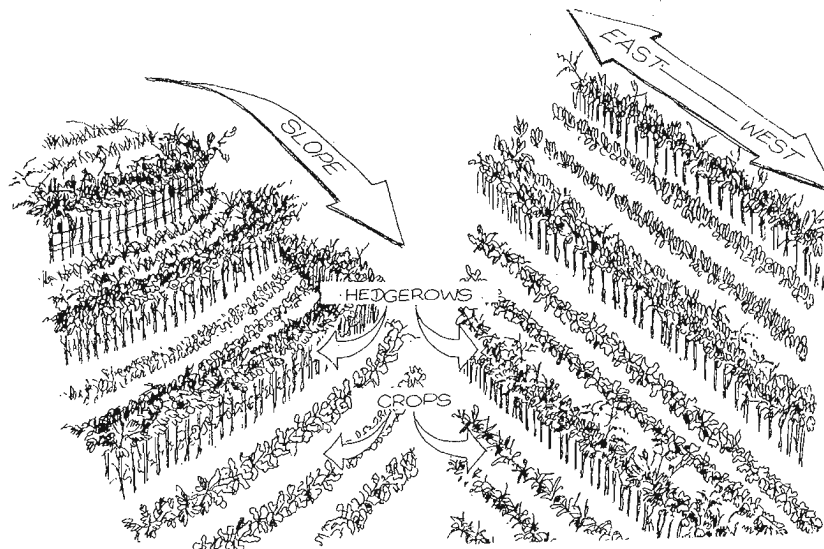
certain period will reduce the toxins. This will improve the extent of utilisation of the feed. Economic utilisation of the available tree fodder resource would also be possible through judicious mixing of the available varieties.

The quantity of tree fodder that could be used as feed supplement will vary with the quantity of grass and/or straw given to the animal, which in turn depends on the body weight in general. However, in order to meet nutritional requirements of an individual animal, the quantity of feed given in the form of roughage or concentrate will have to be increased on the basis of the physiological state of the animal. e.g. pregnant cow, lactating cow or pregnant cow in milk. For details refer to Leaflet (9) in this

series. Table 3 below provides guidelines for feeding different types of cows and buffaloes found in various parts of the country. In general the minimum fresh grass requirement of an animal is equivalent to 10% of the body weight on wet matter basis. Hence, for example, a cow weighing 300 kg would require at least 30 kg of grass. On dry matter basis it is about 3% of the bodyweight. Tree fodder could replace one third of the fresh grass (i.e. grass to tree fodder ratio is 2:1 For animals which are fed on a mixed diet of grass and straw, tree fodder could replace half of the diet (i.e. grass and straw mixture to tree fodder ratio is 1:1). For your convenience, grass and/or straw and tree fodder requirements of different types of cows and buffaloes are given in Table 3.



Tree fodder on boundry fence



Tree fodder as hedgerows

Sloping land

Flat land

Table 03 Use of Tree Fodder in combination with grass and/or straw

Type of cow/buffalo	Composition of diet and the quantity of tree fodder to be used in kg
<p>1. Zebu cow</p> <p>a) Body weight: 150 kg Milk yield : 3 litres/day</p> <p>b) Body weight: 200 kg Milk yield : 6 litres/day</p>	<p>Grass alone : 15 Straw alone : 4.5 Grass + tree fodder: 10 + 5 Straw + tree fodder : 3 + 6 Grass +straw + tree fodder : 6 + 1.5 + 6</p> <p>Grass alone : 20 Straw alone : 6 Grass + tree fodder: 13.5 + 6.5 Straw + tree fodder : 4 + 8 Grass +straw + tree fodder : 8 + 1.5 + 6</p>
<p>2. Temperate/cross bred cow</p> <p>a) Body weight : 200 kg Milk yield : 3 litres/day</p> <p>b) Body weight : 300 kg Milk yield : 8 litres/day</p>	<p>Grass alone : 20 Straw alone : 6 Grass + tree fodder : 13 + 7 Straw + tree fodder : 4 + 8 Grass +straw + tree fodder : 8 + 2 + 8</p> <p>Grass alone : 30 Straw alone : 9 Grass + tree fodder : 19.5 + 10.5 Straw + tree fodder : 6 + 12 Grass +straw + tree fodder : 12 + 3 + 12</p>
<p>3. Buffalo cow</p> <p>a) Body weight : 150 kg Milk yield : 3 litres/day</p> <p>b) Body weight : 300 kg Milk yield : 8 litres/day</p>	<p>Grass alone : 15 Straw alone : 4.5 Grass + tree fodder : 10 + 5 Straw + tree fodder : 3 + 6 Grass +straw + tree fodder : 6 + 1.5 + 6</p> <p>Grass alone : 30 Straw alone : 9 Grass + tree fodder : 19.5 + 10.5 Straw + tree fodder : 6 + 12 Grass +straw + tree fodder : 12 + 3 + 12</p>

G-grass, TF-Tree fodder, S-Straw

When blended diets are given, the feed must be mixed thoroughly to prevent selection by the animal. Further, chopping would enhance the intake and also prevent wastage of feed material.

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