

GROWING FODDER TREES AND USE AS FEED (Level 2)

Topic	Training & information Content
1.1	Planning of fodder/feed requirements for the dry season
1.2.1	Integrated soil fertility management I
1.2.2	Integrated soil fertility management II
1.3	Use of natural resources, compost making, farmyard manure, manure storage and use
1.4	Growing maize and sorghum for fodder and estimating time of harvest and yield
1.5	Brachiaria, Panicum, & Napier (cut and carry) grass management
1.6	Growing fodder trees and use of feed
1.7	Estimating of dry matter content, feeding value and yield of various fodder crops
1.8	Guidelines for Tropical pasture management and grazing management
1.9	Scaled mechanization of forage production and harvesting (harvesting practices)
1.10	Operating farm equipment and self-propelled tractors
1.11	Mechanization of feeding management
1.12	Economics of forage and pasture production



1. You will learn about (learning objectives):

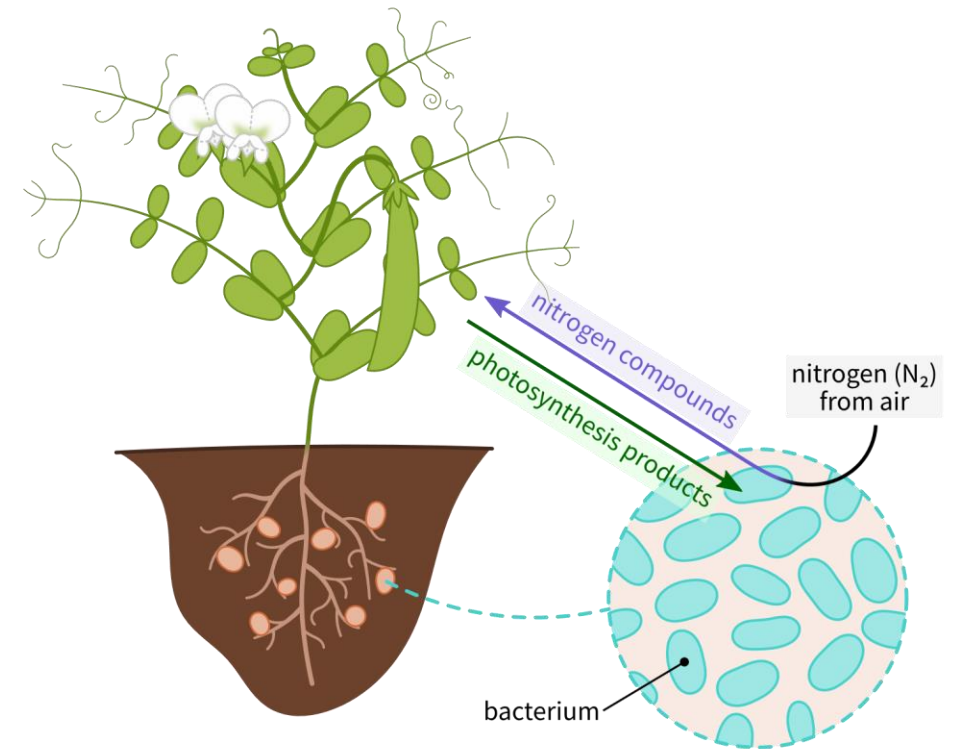
- ❑ Importance of fodder trees in farming systems
- ❑ Significance of fodder trees as a supplementary feed to the diet



Desmanthus pernambucanus

2. Benefits of (agro)fodder trees

- Fodder trees are a high quality supplement to animal diets especially during dry seasons
- Have multipurpose use in households e.g. source of food to cattle and households e.g. pigeon peas
- Assist in controlling soil erosion when used to form contours
- Leguminous fodder trees improve fertility of soil through nitrogen fixation
- Storage medium for CO² (the standing biomass)
- Storage for CH₄ (the decaying organic matter from fallen leaves and unused branches)
- Are extra source of income from sale of seedlings
- Act as wind breakers and shelter belts around farms
- Used as a fence for homesteads
- Provide construction materials and firewood
- Encourages farmers to adopt to climate smart farming practices.



3. Characteristics of fodder trees

- Are deep rooted making the plants more tolerant to drought
- Provide feed over short periods upto five times a year under proper management
- Have good nutritive value and adequate palatability to livestock
- Require minimal management and inputs like weeding and fertilizer use
- Good growth (survival) rate when planted
- Have long production life (fodder trees/shrubs) over years (up to 20 years)
- Little to no competition with food crops when grown together
- Have the ability to produce seeds and some are viable for vegetative propagation.



Tree Lucerne (*Chamaecytisus proliferus*)

4. Examples of fodder shrubs and trees

- Calliandra (*Calliandra calothyrsus*)
- Leucaena (*Leucaena leucocephala*)
- Sesbania (*Sesbania sesban*)
- Gliricidia (*Gliricidia sepium*)
- Pigeon pea (*Cajanus cajan*)
- Moringa (*Moringa aleifera*)
- Mulberry tree (*Morus alba*)
- Tree Lucerne (*Chamaecytisus proliferus*)



Pigeon pea
(*Cajanus cajan*)



Mulberry tree
(*Morus alba*)



Gliricidia
(*Gliricidia sepium*)

Calliandra
(*Calliandra calothyrsus*)

5. Growing fodder trees

Steps in sowing fodder trees (legume trees)

- Land preparation (Refer to module on Growing maize for fodder)
- Seed treatment
- Rhizobium inoculation (only done to legume tree species)
- Establishing fodder trees
 - Sowing seeds in nursery
 - Vegetative propagation
 - Direct field planting



6. Seed treatment

- Most fodder tree seed have a hard seedcoat that prolongs germination by inhibiting water infiltration, hence the reason to break seed dormancy. This can be done through:
 - i. Cold water treatment
 - ii. Mechanical scarification/Nicking
 - iii. Chemical seed coat degradation
 - iv. Hot water treatment



6.1 Seed treatment Cont'd...

Cold water treatment

- Method is mostly used on small seeds
- Soak seeds in cool water for 12-48 hours

Mechanical scarification/Nicking

- Seed is scratched off using a file, knife or sand paper
- Care should be taken to avoid damaging the seed embryo by avoiding the micropyle.



6.2 Seed treatment Cont'd...

Chemical seed coat degradation

- Place seeds in a solution of concentrated sulphuric acid and stir according to the species' recommended time period
- Rinse off the acid by rinsing seeds in cold water and dry off the water.

Hot water treatment

- Soak seeds in hot water for 2-5 minutes then cold water for 12 hours
- Care should be taken not to kill the seed.



7. Rhizobium inoculation

- Inoculation increases legume nodulation for the process of nitrogen fixation where atmospheric nitrogen in air is converted into ammonia for use by the plant
- The process involves treatment of rhizobium inoculum on seed before sowing or after seed treatment
- The seed has to be planted immediately after inoculation when the bacteria is still alive.
- It is important to identify the right inoculum for each tree species.



8. Establishing fodder trees

- This can be done through the following:
 - i. Sowing fodder tree seeds in a nursery
 - ii. Vegetative propagation
 - iii. Direct field planting



Moringa aleifera



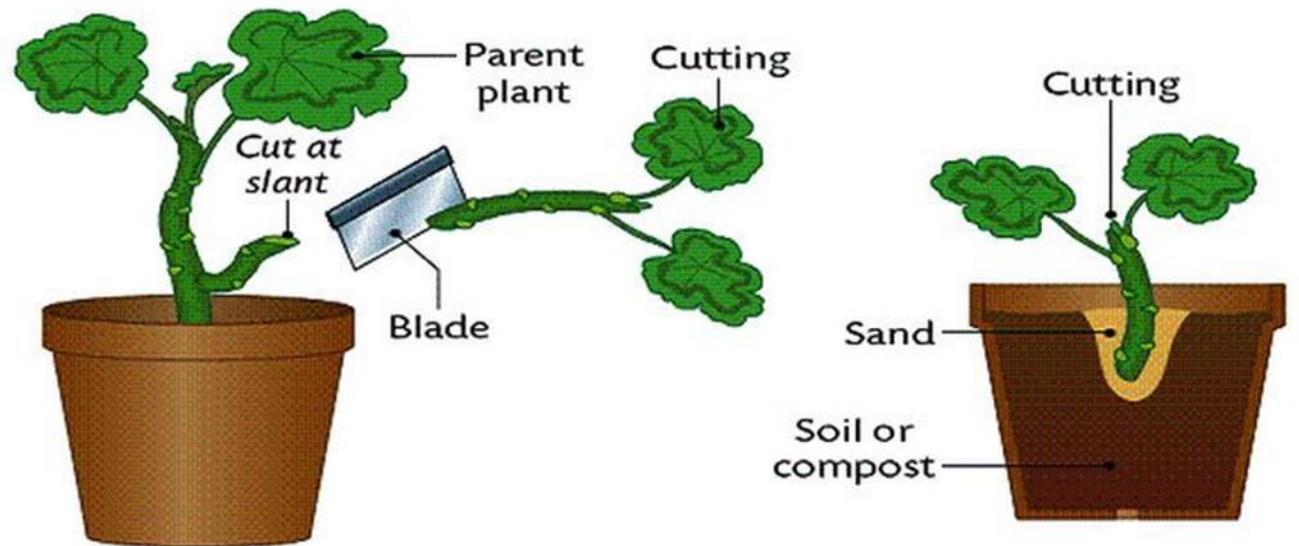
8.1 Sowing fodder tree seeds in a nursery

- Nursery stands are easily made by four wooden poles and at the top shaded with small sticks or old hay grass or stovers.
- Nursery should be shaded, cool, aerated and allow light penetration.
- Seeds should be sown at 2-3 times the seed width (i.e. between two rows/lines), but if in area receiving low rainfall, should be sown at 10 times the seed width.
- Attacks by weeds, insects and pests should be managed.



8.2 Vegetative propagation of fodder trees

- Cuttings should be healthy and straight (stems, roots, branches or coppice growths).
- Cutting equipment should be sharp and clean/sterilized.
- Vegetative parts should be harvested in the beginning of rains or during dry periods.
- Vegetative materials should be stored in dry and shaded place.



8.3 Direct field planting of fodder trees

- Land should be well prepared before seeds are planted in the field
- Larger seeds (i.e. Sesbania) do not require seed treatment and can be planted directly in the fields
- Seedlings from the nursery and vegetative materials are also transferred to the field
- Seedlings in the nursery can be transplanted after 6-16 weeks.



9. Fodder trees as animal diet supplements

- Fodder tree leaves can be used as supplements in diets of dairy cows especially during dry season. They are used to mostly supplement dairy meal or other protein rich forages.
- Different fodder tree leaves can be used as a supplement feed i.e. 3kg of calliandra can replace 1kg of dairy meal
- Caution should be taken on total percentage the supplement accounts for in total diet. This is due to presence of antinutritive factors of trees e.g., Mimosine contained in Leucaena. This can be done by considering;
 - the weight of the animal
 - the recommended amount of a particular fodder tree a dairy cow can consume per day



Leucaena

10. Management of fodder trees

- Maintain good soil fertility e.g. through fertilization to achieve good production of fodder tree foliage.
- Timing of pruning (harvesting) affects quantity of fodder produced.
- Do not cut trees at a height that is too low close to the ground as regrowth will be slower.
- Extreme climatic conditions affects fodder growth.



11. Calliandra (*Calliandra calothyrsus*)

- Calliandra is one of the most commonly cultivated leguminous fodder tree in Uganda and with its multipurpose use it is also incorporated in agroforestry systems
- It can be established from seeds or stem cuttings
- Seeds are planted in nurseries and later transplanted in the farm.
- For easier germination, scarification is required
- Calliandra does well in a wide range of soils including sandy to volcanic soils that are acidic
- It also grows well in areas receiving rainfall between 700 to 3000mm per year; but also tolerant to dry spells.
- Feed fresh forage , drying calliandra forage for feeding is discouraged as it has negative impacts on the quality of forage.
- Dairy cows can take between 5-10 kgs of fresh calliandra per day depending on productivity. Maximum is not to feed more than 10 kgs of fresh calliandra per day.



12. Leucaena (*Leucaena leucocephala*)

- Leucaena is a leguminous, multipurpose tree that provides fuel wood, green manure, improves degraded lands and can be used as a cover crop
- It is resistant to drought and a good feed source for cattle
- The leaves contain about 22.7% crude protein and survive well on degraded soils which are low in nutrients.
- Does best in well drained soils, does not like soils that retain too much water. It grows preferably in neutral to alkaline soils.
- Grows in area receiving between 650 – 3000 mm of rainfall per year.
- Leucaena can be grown directly to the field or in nurseries.
- Seeds may need to be treated; sowing rate per hectare is 1-2kgs.
- Livestock cannot consume more than 30% of Leucaena forage in their diet on dry matter basis per day as it may be toxic due to mimosine contained in the plant. Feed within the range of 3-4 Kgs fresh leucaena per cow.
- Feed two hours before milking due to its effect of tainting milk.



13. Sesbania (*Sesbania sesban*, *S. grandiflora*)

- Sesbania grows best in areas receiving rainfall between 500-2000 mm per year
- The plant grows in wide variety of soils
- Sesbania withstands waterlogging in the late stages of seed growth only
- It can be intercropped with variety of cereal crops and grasses in various farming systems
- Harvested (cut and carry) when at 1-2 m high.
- Sesbania can undergo 3-5 cuts a year.
- As a supplementary feed sesbania can be included up to 25% of the diet.



Sesbania sesban

14. Gliricidia (*Gliricidia sepium*)

- Gliricidia has been identified as an excellent quality forage in many tropical countries due to its' nutritive value and composition.
- It has a high content of crude protein (20- 25%) that readily digests in the rumen.
- The plant grows well in areas receiving rainfall between 900-1,500mm per year
- It is tolerant to waterlogging and wide range of poorly fertile soils (poor growing conditions)
- It is not greatly affected by pests attacks.
- Gliricidia is a leguminous fodder trees whose leaves have a half life of 20years making it a good litter and soil improver.
- It exhibits fast growth and has deep rooting system making it a good windbreaker.
- Wilt leaves for 24 hours after harvesting to reduce odour of the leaves.
- It is recommended to feed 1-3% of the cows body weight (3-12 kgs/day fresh to a 400 kg cattle).



Gliricidia sepium

15. Pigeon pea (*Cajanus cajan*)

- Pigeon pea is a multipurpose legume crop; pods are food for human consumption and leaves are feed to livestock.
- It is a drought-resistant crop and can grow in areas with less than 650mm of rainfall
- Does well in areas receiving rainfall above 625 mm per year
- It is a perennial crop that can be re-planted after 2-3 years
- Suited to wide range of soils, with a pH of 5-7
- It can be established by direct seeding (seeds do not require treatment before sowing)
- Sow seeds to a depth of 2-4cm, at the rate of 20-25kgs/ha
- Insufficient rain in the first 2 months may cause poor establishment, hence demanding irrigation for the period
- Pigeon pea can be intercropped with cereals.



16. Fodder trees in farming systems

- Fodder trees can be incorporated in various ways in agroforestry systems as follows;
 - Vegetation on uncropped land areas
 - Areas of land that cannot be used for cropping like boundaries of farms & forests
 - Planting fodder trees to act as a hedge/living fence around the farm
 - Inter-cropping fodder trees with other crops
 - Fodder trees can be used to create contours and terraces along hills for best soil management practices.



17. Fodder trees in agroforestry systems

- Trees in agroforestry systems can be incorporated with crops, pasture and animals as in the systems below;

i. Silvopastoral systems

- Is the incorporation of trees and pasture/animals. Grasses or legumes are grown in the inter-space of trees.
- This method improves fodder productivity; and is mostly practised in the arid and semi-arid areas

ii. Agrosilvocultural systems

- Is the combination of crops and trees similar to alley cropping systems

iii. Agrosilvipastoral systems

- Involves trees, crops and pastures/animals



18. Fodder tree adaptation challenges

- There exists poor skills and knowledge on nursery establishment, pruning and seed collection of fodder tree species.
- There are inadequate fodder tree species suited to different agro-ecological zones.
- There is a poor seed supply system, poor seed collection practices for fodder trees among farmers hence reducing adoption by farmers.
- General lack of emphasis on the multipurpose benefits of fodder trees and their contribution to climate smart agriculture.

