Calliandra calothyrsus
Tree management and utilization

A pamphlet for farmers and field extension staff

Charles Wambugu
published 2002

International Centre for Research in Agroforestry (ICRAF)
United Nations Avenue, Gigiri
PO Box 30677-00100
Nairobi

For more information, contact
KARI Regional Research Centre
PO Box 27, Embu, Kenya

or

International Centre for Research in Agroforestry, Maseno
PO Box 5199, Kisumu, Kenya

or

International Centre for Research in Agroforestry, Nairobi

or

your local extension offices

This pamphlet focuses on the management and use of calliandra; information on nursery establishment and management is contained in the first pamphlet in this series
Introduction

*Calliandra calothyrsus* is a small, leguminous tree with characteristic pink flowers. It grows well in a wide range of ecological conditions, from the coast to the highlands, but it performs best in coffee zones. The tree grows relatively fast and can provide quality fodder, fuel wood, stakes, poles and bee forage, as well as helping in soil fertility improvement and erosion control and serving as an ornamental tree. The benefits are realized within the first year after planting and can continue for more than 10 years.

Choosing where and how to plant calliandra trees

Calliandra trees develop a deep root system, so they do not compete much with food crops for water and soil nutrients. Also, the trees should not be allowed to shade the crops. Calliandra hedges can be established in any of the following sites in the farm:

- **Along external and internal farm boundaries.** Calliandra hedges can be used to divide different cropped areas within the farm or to make fences to mark the external boundaries of a farm.

- **Along soil-conservation terraces.** Calliandra’s deep roots help in stabilizing soil-conservation structures. This works best when calliandra is combined with napier grass.

- **Around the homestead.** If planted closely and managed at a suitable height, calliandra hedges can provide privacy for the homestead in addition to fodder for livestock.

- **In fodder banks.** These plots are set aside for fodder production by farmers who have relatively big pieces of land.

- **In kitchen or home gardens.** These are small plots of land in the homestead that are normally used for producing vegetables for home consumption. Calliandra hedges can be planted along the boundaries of such gardens.
• **In napier grass plots.** A hedge of calliandra should be planted at least after every 2 lines of napier grass such that the calliandra hedges are at a minimum distance of at least 3 metres (10 feet) apart.

![Planting sites for and arrangement of calliandra hedges in the farm.](image)

Establishing calliandra as a hedge makes farm operations easy and optimizes the use of the available land. Calliandra hedges can be established in single rows, or in double rows if space is not limiting. The spacing between the trees in a line should be about 0.5 metres (1 1/2 feet). The spacing between the lines in a hedge of double rows should be 0.5 metres. The trees should be planted in alternate spaces in the two lines (in a zigzag manner) so as to reduce soil erosion and optimize the use of space.
Planting calliandra seedlings in the field

The best time to transfer calliandra seedlings to the field is at the onset of rains when the soil has enough moisture and continuous rainfall is expected for more than 2 months. This ensures good establishment and growth. Remember to remove the seedlings from the polythene tubes before planting them and ensure that they have some soil attached to their roots, so as to improve their survival. The process of planting out seedlings to the field includes the following steps:

1. Preparing the sites for planting the seedlings
   Ensure that the site is free of weeds. Prepare the planting holes; they should be about 20 centimetres (8 inches) wide and 30 centimetres (12 inches) deep. In the drier areas, the holes should be bigger than this to help retain more soil moisture. The distance between the holes in a line should be about 0.5 metres (1½ feet) apart. Separate the more fertile topsoil (obtained from the first 5 inches) from the rest of the soil dug from below that level. Mix the topsoil with manure, following the guidelines under (2) below.

2. Applying manure during planting
   Use well-decomposed animal and compost manure, mixed with fresh ash to improve on its quality. Add a 1-kg tinfoil of fresh ash to every ‘debe’ (20-litre tin) of manure. Combining ash and manure enables calliandra to grow on acidic soils, for instance in tea growing areas. The fresh ash also keeps off pests such as termites. Apply about a 1-kilogram tinfoil of manure for every tree, and mix it well with the topsoil when planting.
Ensure that the seedlings are conditioned to withstand the harsh field environment, by exposing them to full sunshine. Remove the shading materials from the top of the nursery bed and reduce the watering to only once every 2 to 3 days for a period of 2 weeks before transferring the seedlings to the field. This process is called ‘hardening’ of the seedlings.

3. Removing the seedlings from the nursery

If the seedlings were produced on raised beds (also known as Swaziland beds), ensure that they are removed with some soil attached to their roots; this will help them survive in the field. If the seedlings were raised in polythene bags, transport them in their bags to the planting sites. Water the seedlings thoroughly just before planting; this will make it easier to remove the polythene bags and to retain the soil around the plant roots.

Seedlings are removed from the nursery 3 to 4 months after sowing, when they are about 25 centimetres (10 inches) tall.

4. Preparing overgrown seedlings for planting

Seedlings that overgrow and become too big in the nursery, for instance if planting is delayed due to lack of rainfall, should be uprooted after heavy rains, when the ground is really wet. First cut the shoot 15 centimetres (6 inches) above the ground and then trim the main root to 20 centimetres (8 inches) long. Finally, trim the lateral roots leaving them 4 centimetres (2 inches) long. Pack these bare root plants in bags containing sawdust, and transport them to the planting sites.
or result in unfavourable flavour in milk. Therefore, it is important not to exceed these ratios when feeding your livestock.

Calliandra contains high levels of protein (20 to 25% crude protein), which is far more than the amount available in the basal diet. On average, grasses contain about 8 to 10% protein in the wet season and less than 7% in the dry season. Protein is important in increasing milk production and maintaining good health. However, digestibility of calliandra is low (about 40%), probably due to the presence of chemicals known as tannins that bind to proteins and affect the ability of the animal to digest the proteins.

Roughly 3 kilograms of fresh calliandra leaves gives about the same milk yield as 1 kilogram of commercial dairy meal (which usually has about 16% crude protein). On average, most farmers who can afford commercial dairy meal feed their dairy cows with about 2 kilograms of this per day. Some of this dairy meal could be replaced with calliandra and other forage supplements. The substitution rates will vary considerably from farmer to farmer according to factors such as size and health of the animal, composition of the basal diet and the level of milk production. Due to the high levels of energy in dairy meal, a combination of calliandra and commercial dairy meal gives the highest milk yield.

5. **Planting seedlings in the farm**

Place the seedlings upright in the prepared hole and fill the remaining space with a mixture of topsoil and manure. Compact the soil and manure mixture to make the seedling firm. Water the seedlings to enhance their chances of survival.

**Managing calliandra trees**

Management practices for calliandra trees depend on the farmer’s objectives for planting the trees, that is, whether the trees are grown for fodder, firewood, stakes or seeds. Whatever the case, it is important to manage the trees in order to

- improve conditions for cultivation of food crops next to the trees
- increase production of leaves for feeding livestock
- increase production and quality of other products, such as stakes and firewood

Some of the management practices are described below.
**Mulching**

Mulching involves placing dry leafy materials at the base of the trees to conserve soil moisture by reducing loss of water through evaporation. Mulching is useful in areas with low rainfall or during the dry season, when soil moisture is not enough for good plant growth and survival.

Mulching can be done by placing a thin layer of dry grass or other dry leafy materials along both sides of the calliandra hedges. Do not place the mulch in direct contact with the trees, since the moist and cool environment it provides could encourage pests and diseases. Avoid mulching in areas with a heavy presence of termites, as this may increase damage of the trees by the insects.

![Mulch the trees to conserve moisture.](image)

**Weeding**

The calliandra tree grows very slowly after establishment, and it can easily be choked to death by weeds. The weeds compete with the tree for water and nutrients, and they also harbour pests. It is important, therefore, to keep the area around the tree clear of weeds. Also, accidental cutting of the trees is likely to occur in farms left with weeds.

To save on weeding costs, plant the calliandra hedges adjacent to food crops so that weeding can be done for both at the same time.
Protecting the trees from animal damage

If possible, erect a protective fence to keep livestock and wild animals from browsing and trampling your crops and trees. Planting trees and crops on the same piece of land saves on the cost of protecting the trees.

Annual application of manure

To enhance the growth of calliandra trees, apply manure at least once every year, at the onset of rains. Each tree needs about one 1-kilogram tin of decomposed manure mixed with ash, following the guidelines provided in the section on planting calliandra in the field.

The soil and manure mixture should be spread along both sides of the hedges avoiding the ground just next to the base of the tree. The root system, which helps in absorption of the nutrients and water, spreads away from the base of the tree. Mix the manure with the soil to prevent the manure from damaging the plant’s roots.

Thinning

Thinning involves removing some trees so as to give the remaining ones enough room to grow strong and healthy. This management method applies mostly to farmers who produce calliandra for firewood, stakes or seeds. The trees that are removed can be used as firewood or stakes, and the leaves to feed livestock. If you are interested in producing stakes or firewood, then space the trees 1 metre (3 feet) apart to allow growth of strong stems and branches.

Trees intended for fodder should be spaced closely (0.5 metres apart) to maximize forage production. Any tree in between should be removed to allow the remaining ones to produce adequate fodder.
Filling in the gaps

Some seedlings or mature trees may be lost after planting due to dry spells or through accidental browsing by animals or other causes. These need to be replaced to ensure that the available land is used effectively. Replacement should be done in the following rain season; therefore, the farmer needs to be sure of the source of the planting materials for that season.

Coppicing

Coppicing involves cutting back the shoots close to the base of the tree so as to induce new growth and production of multiple stems to give plenty of forage. The branches removed can be used as fuelwood or stakes, while the leaves can be used as fodder. Coppicing is best done when the tree is growing vigorously. The coppicing process and stages are as follows:

- The first coppicing is done when the tree reaches the height of about 2 metres (6 feet), usually 9 to 12 months after planting. The tree is trimmed close to the ground level, at a height of about 15 centimetres (6 inches). It is important to make a clean upward cut to ensure that water drains off easily from the remaining stump so that it does not rot. A garden saw, pruning shears or a sharp ‘panga’ (machete) should be used to cut the tree. If the tree has more than one shoot, it should be cut back to a height of 1 metre.
• When the trees grow old and forage production falls, possibly at 7 years of age, coppicing would promote new growth and production of forage.

• After cutting back the trees, the height of the hedge can be maintained at about 1 metre for ease of harvesting.

Cut back the tree to a height of 15 cm (6 inches).

Protecting calliandra against pests and diseases

Only a few pests and diseases attack mature calliandra tree and seriously reduce its productivity or kill it. These pests include:

• Scales are white, powdery insects that attack calliandra stems. Scales can be controlled using washing detergents such as ‘Omo’ dissolved in water. The detergent solution should be sprinkled on affected plants using leafy branches or a knapsack sprayer.

• Black ants damage the tree by debarking the stem. To control them, dig out and destroy their nests. Smear wet dung or used motor vehicle oil to the base of the stem or sprinkle some fresh ash around the base to repel the ants.
• **Termites** can seriously damage the tree. They can be controlled by the methods used to control black ants.

• **Crickets and hoppers** can be harmful to young and succulent seedlings in the nursery and immediately after transplanting. They can be controlled with pest repellants used in horticultural farming or by applying mixtures of tobacco and garlic, a traditional method of controlling pests.

• **Armillaria mellea** is a fungus that attacks the roots of the calliandra plant causing root rot and eventual death. Armillaria attack is common in areas where forests have recently been cleared, and as such, planting of calliandra should be avoided in such areas. To control this problem, the affected trees should be uprooted and destroyed by burning. Trees should not be planted for several years in areas affected by armillaria.

*Caution:* chemicals to control pests and diseases should not be used on forage materials about to be fed to livestock, since they may affect the health of the animals and could eventually be transmitted to human beings through milk and meat.

Calliandra for livestock fodder and other uses

**Harvesting leaves to feed livestock**

• Frequent cutting of leaves stimulates vigorous regrowth and, hence, sustained supply of fodder. It also ensures that the stems do not get woody (lignified), which would make the forage less nutritious.

• For livestock fodder, systematically cut both upright and spreading leafy branches and maintain the height of the hedges at about 1 metre (3 feet).
Mulching involves placing dry leafy materials at the base of the trees to conserve soil moisture by reducing loss of water through evaporation. Mulching is useful in areas with low rainfall or during the dry season, when soil moisture is not enough for good plant growth and survival.

Mulching can be done by placing a thin layer of dry grass or other dry leafy materials along both sides of the calliandra hedges. Do not place the mulch in direct contact with the trees, since the moist and cool environment it provides could encourage pests and diseases. Avoid mulching in areas with a heavy presence of termites, as this may increase damage of the trees by the insects.

Weeding

The calliandra tree grows very slowly after establishment, and it can easily be choked to death by weeds. The weeds compete with the tree for water and nutrients, and they also harbour pests. It is important, therefore, to keep the area around the tree clear of weeds. Also, accidental cutting of the trees is likely to occur in farms left with weeds.

To save on weeding costs, plant the calliandra hedges adjacent to food crops so that weeding can be done for both at the same time. Mulch the trees to conserve moisture.

Feeding calliandra for milk production

To improve milk production of dairy animals, feed them with fodder legumes at the rate of 25 to 30% (about 1 part legume to 3 to 4 parts of the basal forage). Try to use a combination of fodder supplements that are rich in protein. These include legumes such as calliandra, leucaena, desmodium and lucerne and non-leguminous species like mulberry and sweet potato vines. Basal forage consists mainly of the grasses, napier and maize stover fed alone or in a combination. Feeding livestock with forages rich in nitrogen helps them to produce as much milk as they are capable of and to more efficiently use other feeds that are low in protein. However, excess feeding with leguminous species wastes valuable protein and may cause adverse effects on the health of the animal, such as bloating.

The best tool for harvesting forage is a pair of secateurs, which are normally used for pruning coffee, or a sickle like the one used for pruning tea bushes or pyrethrum. Otherwise, use a sharp panga or a knife to harvest the leaves, but avoid splitting the stem or wounding the tree.

Harvest from one end of the hedge and progressively move to the other end. This process can be repeated every 10 to 12 weeks, that is 4 to 5 times a year, although the cutting frequency depends on rainfall availability and fertility of the soil. It is better to ‘cut and carry’ calliandra forage than to let the animals browse the trees on the farm. Direct grazing may reduce fodder production and increase the mortality rate of the tree through die-back (drying up of the plant starting from the upper parts of the shoot).
or result in unfavourable flavour in milk. Therefore, it is important not to exceed these ratios when feeding your livestock.

Calliandra contains high levels of protein (20 to 25% crude protein), which is far more than the amount available in the basal diet. On average, grasses contain about 8 to 10% protein in the wet season and less than 7% in the dry season. Protein is important in increasing milk production and maintaining good health. However, digestibility of calliandra is low (about 40%), probably due to the presence of chemicals known as tannins that bind to proteins and affect the ability of the animal to digest the proteins.

Roughly 3 kilograms of fresh calliandra leaves gives about the same milk yield as 1 kilogram of commercial dairy meal (which usually has about 16% crude protein). On average, most farmers who can afford commercial dairy meal feed their dairy cows with about 2 kilograms of this per day. Some of this dairy meal could be replaced with calliandra and other forage supplements. The substitution rates will vary considerably from farmer to farmer according to factors such as size and health of the animal, composition of the basal diet and the level of milk production. Due to the high levels of energy in dairy meal, a combination of calliandra and commercial dairy meal gives the highest milk yield.

Feed calliandra to dairy livestock for higher milk production
Farmers who cannot afford dairy meal may make homemade rations that include calliandra and other forage supplements. For example, a mixture of maize bran and calliandra forage at the ratio of 2:1 can improve the level of nutrition greatly. If using tree forage alone, feed 6–10 kilograms of fresh leaves per cow per day, and if in combination, feed 1 kilogram of dairy meal and 6 kilogram of tree fodder. A dairy goat would need about 0.5 to 1 kilogram of tree fodder.

To be able to feed these amounts throughout the year, the farmer needs to plant about 500 trees per cow, which would occupy about 250 metres of land if planted in single-row hedges, or 125 metres of land if planted in double-row hedges. A dairy goat would need about 150 trees.

The quantities of calliandra mentioned in this brochure for feeding livestock should be taken as a starting guideline, and the farmer can experiment to determine the best substitution and supplementation rates of commercial dairy meal with calliandra and other types of protein-rich forages.

Calliandra leaves can be fed either fresh or dry. When feeding fresh calliandra, provide fresh leaves with succulent stems (up to 1 centimetre thick), which the animal can digest easily. If they are to be fed dry, the leaves should be dried under shade so as to minimize the loss of nutrients. Dried leaves of calliandra can be stored for a long period, for instance for feeding the animals during the dry period. However, drying can cause loss of nutrients, and, hence, it is better to feed the leaves fresh, just after cutting.

The benefits of feeding livestock with calliandra compared with commercial dairy meal can be assessed both in terms of savings in money, time and effort and in terms of increased milk production.

It is easier and cheaper to meet the protein requirements of dairy animals from plants grown on the farm than through commercial dairy meal. In 1998, farmers in Embu area who were using tree
fodder instead of dairy meal saved about Ksh 8000 (USD 100) per cow per year. In addition, dairy animals fed with calliandra produce milk with a high butterfat content, which improves the nutritional value of the milk.

Calliandra can also be fed to other livestock such as sheep, pigs, poultry and rabbits.

**Other benefits from calliandra**

**Firewood**
Calliandra dries quickly, and it burns well after only 2 days of drying. It burns steadily with little smoke. It can also be made into quality charcoal. The tree produces plenty of fuelwood, because it grows fast and produces multiple branches when coppiced.

**Soil fertility improvement and erosion control**
The deep root system of calliandra assists in collecting nutrients that are too deep in the soil to be reached by the crops, helping to bring them back to the soil surface for crop use. The process of bringing back the nutrients to the soil surface involves the use of manure that comes from animals fed with calliandra and also from calliandra leaves that fall off and decompose.

As a leguminous tree, calliandra improves the nitrogen status of the soil through its ability to trap nitrogen from the air, thereby enhancing soil fertility. Animals fed calliandra leaves produce
manure of high quality, because calliandra leaves, like those of other leguminous plants, have a high nitrogen content.

Calliandra hedges planted along soil-conservation structures provide the additional benefit of stabilizing these structures, thereby reducing soil erosion.

**Bee forage**

Bees enjoy calliandra flowers, and they are usually seen in the morning and evening collecting nectar from these flowers. Thus, farmers can benefit by placing beehives where calliandra is allowed to grow big and produce flowers, for example where it is planted for seeds, fuelwood or stakes. However, for seed production, the tip of the main shoot can be nicked when the tree is about 2.5 metres (8 feet) tall to facilitate seed harvesting.

**Poles and stakes**

When coppiced, calliandra can produce large quantities of stakes and poles within a very short period. The stakes could be used for supporting tomatoes and climbing beans, or for other horticultural purposes.
Income generation from sale of calliandra seeds and seedlings

Seeds of calliandra are usually very expensive, and some farmers have improved their income through selling seeds to other farmers and institutions. For example in 2000 and 2001 the price of calliandra seeds in central Kenya ranged from Ksh 1500 to Ksh 2000 (USD 20-25) per kilogram. The price of seedlings raised in polythene tubes was Ksh 3-5 each. However the price of seeds may vary with their availability.

Limitations in growing and using calliandra

- If not managed properly, calliandra trees can reduce crop production by shading the adjacent crops.

- Calliandra contains tannins that can lower the digestibility and absorption of feeds in the animal’s digestive system.

- In some areas the tree does not produce many seeds, and hence it may be difficult to propagate.

- Calliandra cannot withstand frost or waterlogging, and it grows slowly in acidic soils. This limits its performance in areas with such conditions. Therefore, it is important to diversify the fodder species planted in the farm to ensure that livestock get a balanced diet and to avoid attack of one species by pests and diseases. Other fodder species that have high levels of protein include leucaena, mulberry, tree lucerne (tagasaste), populus, desmodium, lucerne (alfalfa), and sweet potato vines.
**Reviewers**

Steven Franzel, Principal Economist, ICRAF  
Hannah Jaenicke, Plant Physiology Scientist, ICRAF  
George Karanja, Fodder Agronomist, KARI  
Erastus Kiruiro, Animal Nutritionist, KARI  
John Kang’ara, Animal Nutritionist, KARI  
Paul Tuwei, Agroforester, KEFRI  
Janet Stewart, Senior Research Associate, Oxford Forestry Institute  
Simon Muriithi, Extensionist, SARDEP, Laikipia District  
Aichi Kitalyi, Animal Husbandry Adviser, RELMA  
Julius Muturi, Veterinary Research Officer, KARI

**Acknowledgements**

We are grateful to the following for their input in the production of this pamphlet: extension and research staff from Mount Kenya region, for valuable comments; farmers’ groups whose on-farm experiments helped in the verification and adaptation of the practices described in this pamphlet; Kellen Kebaara for editorial and publishing support; and Bainitus Alenga for design and layout and adapting the illustrations.

This publication is based on farmers’ practices and output of research funded by the CGIAR Systemwide Livestock Programme, the Swedish International Development Cooperation Agency (Sida), and the United Kingdom Department for International Development (DFID). The views expressed are not necessarily those of any of these organizations.

*The printing of this pamphlet is an output from a research project funded by DFID for the benefit of developing countries. Project R6549, Forestry Research Programme.*