



21 • Improved Fallow

How to grow your own fertilizer and get animal fodder and firewood at the same time by using legumes.

Idea

Legumes are plants with pods, like beans or peanuts. The idea is to use legumes to provide fertilizer for the other crops in the fields. At the same time these plants can provide firewood and food for animals.

This section describes two different systems which may be implemented, depending on how much land is available:

- If there is enough land available, the system of improved fallow should be used. This means that an area is set aside for these legume plants.
- If there is a shortage of land, like in Malawi or close to the big towns, a system of alley cropping should be used. This means that the legumes are grown in between the other crops. This system is best if rainfall is at least 1000 mm. If there is less rainfall, and there is no irrigation, fewer legumes should be planted, or they will take too much water from other crops.

Introduction

The yields on small farms in Southern Africa are low. There are many reasons for this:

- lack of productive varieties,
- losses to diseases, insects, birds and animals,
- lack of knowledge about the importance of crop rotation, erosion control, water

harvesting methods, increasing organic matter in the soil, composting, etc.,

- lack of funds for inputs such as fertilizer, lime, pesticides.

This section describes some of the so-called “agroforestry” systems. These are systems where trees are grown together with the other crops.

Systems which:

- are simple to use,
- require little input other than labour and the first seeds
- are easy to adapt to the local conditions
- benefit the farmers by supplying firewood and animal fodder, besides increasing the yields,
- can be expanded and spread to others by collecting and using the seeds from the legumes.

Agroforestry systems are especially useful for farmers in areas where there is a shortage of firewood and where they need fodder for animals. Many farmers in Southern Africa have access to more land than they can farm, and the system of improved fallow can thus be a good alternative.

Fallows have traditionally been used to let the soils rest (for many years) to regain their nutrients.

Improved fallow consists of growing legume plants on a field for two or three years,



Leucaena
- very good as fodder plant

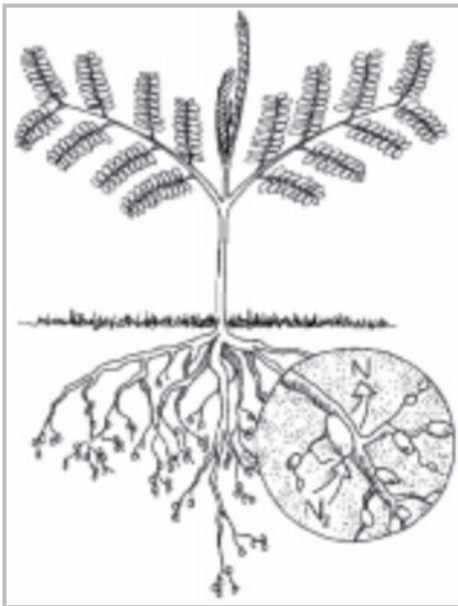


before beginning to grow traditional crops again. The advantages are:

- The deep roots bring nutrients up to the surface of the soil, which the traditional crops would otherwise not be able to reach.
- The roots and leaf material from the legumes will add organic material to the soil as they decompose. This improves the conditions for beneficial microorganisms, worms, etc., and its ability to retain water and nutrients.
- Leaves and twigs can be cut for animals and provide fodder in the dry season, when there is no fresh grass.
- Trees help to reduce the destroying forces of heavy rains and protect the soil from erosion.
- Firewood is produced.

Microorganisms that live in nodules on the roots of legume plants can use the nitrogen from the atmosphere and transform it into nutrients (ammonium), which the plants can use.

Nitrogen is the important element in proteins, and this is why legumes such as beans, peas, etc., have much higher protein content than other plants. It is possible to see the small nodules on the roots. The inside of the nodule is red in colour if functioning correctly. If they are not red, then the correct bacteria are missing in the soil, and these should be mixed with the seeds. This is called inoculation. One can obtain these bacteria by mixing the seeds with soils where the nodules are red. Because of this system of fixing nitrogen, many legumes can grow on nutrient-poor soils.



In Zambia more than 15,000 farmers have taken up the improved fallow system, and even with the drought in 2002, the average yield of maize grown with this system was 3.4 T/ha. Other small farmers who used neither fertilizer nor improved fallow harvested only 1.3 T/ha.

The improved fallows also produce

up to 10 T/ha of fuel wood per year. This can greatly help women (and men fetching firewood) in areas with large distances to firewood. The system thus helps to preserve the woodlands around the villages. The twigs can be cut for animal fodder. This is very nutritious food, and 2-3 T/ha of fodder can be harvested every year.

Bacteria in nodules on the legume roots fix nitrogen from the air

Instruction

How to make an improved fallow with leguminous trees:

The first thing to find out, is which tree is best suited for your area.

Most of Southern Africa has poor soils, a long dry season, and a shorter rainy season with less than 1000 mm of rain. Many of the commonly used agroforestry crops are adapted to these conditions, because they can fix nitrogen and because they have a deep root system.

The legume mostly used in these areas is *Sesbania sesban*. It provides good fodder and firewood while increasing the yields after the fallow considerably. It is quite easy to remove, when the field is again needed for food production.

The local agricultural workers will know if any agroforestry trees have been introduced in the area. Many NGOs are also using them in their projects, and may be able to supply seeds if they are not locally available. ICRAF (International Centre for



Research in Agroforestry) is active in many countries of Africa. Otherwise it is normally possible to obtain seeds from the national or regional forestry departments.

The amount of rain in the specific area is important for deciding how many leguminous trees can be planted. The less rainfall there is, the fewer trees should be planted.

It is best to start the fallow system in an existing crop of cereals because as these grow taller, they will not be out shaded by the trees.

This system will not reduce the cereal yield, but gives the trees a chance to get well established.

Conditions for living systems always vary and trials should be made to determine row distances, direct seeding/nursery, etc., best suited for your specific area.

Improved fallow with *Sesbania sesban*

- Sow *Sesbania* four weeks after half of the maize has emerged.
- If you have few seeds, raise them in a nursery 1- 1½ months before the rainy season, and plant them when they are 3 months old, between the maize rows.
- The distance between the rows should be 1-2 metres. The better soil and more rain, the less distance.
- The distance between the trees in the row can be 0.5-2 metres.

Sesbania sesban

- Regrows well when cut back. It is best to leave 25 % of the leaves.
- Do not cut it to less than 1 metre.
- Do not cut more than 4 times a year.
- Good fodder for goats, sheep and cattle, but it should not be more than 20% of their food.

- Do not feed it to chicken, pigs or rabbits.
- Let the *Sesbania* grow during the next one or two rainy seasons, depending on the need for the land.
- Collect the seeds and use them for the next fields.
- *Sesbania* cannot grow if the soil is very sandy.



Sesbania sesban
- a useful plant to improve soil fertility and provide firewood

The twigs can be used as fodder or to cover the soil (mulch) or as fertilizer. Some *Sesbanias* are annual. They die after a year. Others live from 4 to 5 years and produce much fuel wood.

Improved fallow with pigeon pea

Pigeon pea is well suited for dry areas and poor soils.

- Plant the pigeon pea at the same time as the cereal.
- Plant them between each of the cereal rows.
- Let the pigeon pea grow during the next one or two rainy seasons, depending on the need for the land.
- Do not use this system close to cashew trees, since pigeon pea is host for the cashew pest - tea mosquito bug.



Pigeon pea - efficient for improved fallows



Pigeon pea - *Cajanus cajan*

- Pigeon pea is widely used as food (in India - dahl).
- It has high levels of vitamin A and C.
- It can be grown under very dry conditions and on very poor soils.
- Yields will be very low if waterlogged for 3-4 days.
- It can produce up to 10 T/ha of firewood on good sites.
- Good fodder for all kinds of animals.

Alley cropping using *Leucaena* or *Gliricidia*

This system can be used where there is little extra land available - for example close to towns. It will only work if there is enough rainfall (over 1,200 mm), or if watering is possible. Otherwise the trees will take too

much water from the crops.

Alley cropping means that hedges of legumes are kept permanently in the fields. The trees are cut down (pruned) regularly to keep them from shading the crop.

The pruned leaves and branches are used for fodder, mulch or firewood.



Gliricidia On sloping land the hedges should follow the contour to reduce soil erosion. On such locations it becomes more important to prune the hedges to prevent shading the crops.

- when there is more rain, and also for live fencing

On flat land the hedges should run east-west to reduce shading.

Establishing an alley system with *Leucaena* or *Gliricidia*

- Raise the seeds in a nursery 2-2½ months before the start of the rainy season.
- *Leucaena* seeds need pre treatment stirring for 3 minutes in 80° water.
- Plant the trees just after the maize has been sown.
- *Gliricidia* can be raised from cuttings.
- Prune the tree to 60 cm next year when the maize is sown- but only if it is well developed.
- Use the prunings as mulch - that is to protect the soil.
- If growth is fast, the legumes should be pruned 1-2 times while the maize develops.