Food and Agriculture Organization of the United Nations

Improved fallows in Kenya

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Sustainable Development Goals	No poverty and life on the land

Summary

This practice describes how fallows can be used to improve soil fertility.

Description

In western Kenya, farmers are using improved fallows to build up soil fertility. Fallows can be single species or mixed species. A single-species fallow is established with only one plant species in the whole field. Typically, this system is recommended for species that grow fast and develop dense canopies that shade and kill weeds. Such species are *Crotalaria grahamiana*, *Crotalaria paulina* and *Colopogoniummucunoides (mucuna)*.

On the other hand, planting alternate rows of two or more different fallow species is a mixed fallow system. The species grow together without affecting each other. This practice is particularly good for slow-growing species that will not strongly compete.

1. A woody mixed fallow of Sesbania and Crotalaria

Not all improved fallow practices are suited to all locations and all farmers. The farmers and extension staff are expected to be active partners in identifying, evaluating and adapting the practices that can address their specific needs and the resources they have at hand.

Growing a fallow involves a number of simple steps: obtaining the appropriate seeds of the desired species, seed pre-treatment, establishment, managing pests and harvesting. These are described in detailed below.

1.1 Obtaining Seeds

Seeds for improved fallows species could be obtain by buying or producing on farm. A good fallow plant must have several of the following characteristics:

- Its growth is quick, closing the canopy quickly, to suppress weeds and control erosion.
- It yields much biomass of good quality that decomposes fast and becomes fertilizer for the crops.
- It is deep rooted so that it picks up well the nutrients that are leached and deep in the soil.
- It fixes nitrogen biologically from the atmosphere, building up good nutrients overall.
- It is easy to establish and manage.
- It supplies extra products such as stakes, grain and fodder that make its use attractive.
- It will not spread as a weed into cultivated areas.
- It easily produces seeds with long viability.
- It is adapted well to resist the pests and diseases in the area.

Examples of improved fallow species are the following.

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1.1.1 Woody species

- *Cajanus cajan (pigeon pea)*
- *Calliandra calothyrsus (calliandra)*
- *Crotalaria grahamiana (crotalaria)*
- *Crotalaria mucronata*
- *Crotalaria paulina*
- *Crotalaria striata*
- *Desmodium uncinatum (desmodium)*
- *Gliricidia sepium (Mexican lilac)*
- *Sesbania sesban (sesbania)*
- *Tephrosia candida (tephrosia or fish poison)*
- *Tephrosia vogelii*

1.1.2 Herbaceous species

- *Canavalia ensiformis*
- *Colopogonium mucunoides (mucuna)*
- *Dolichos lablab*
- *Macroptilium atropurpureum (siratro)*

1.2 Seed pre-treatment

Seeds of some fallow species do not germinate quickly or germinate poorly. One such species is Sesbania sesban. This is because sesbania seeds have a very hard seed coat that requires softening before the seed can germinate. It is recommended that seeds of such species be soaked in hot water at 65° C for 10 to 15 minutes.

Do this by leaving boiling water to cool for 15 to 20 minutes before fully immersing the seed in it in a cloth bag. Dry the seed in the sun for 15 to 20 minutes before planting it. Seeds of other plants listed in this guideline germinate easily without pre-treatment.

1.3 Plant density

Spacing depends on the size of the seed. The spacing recommended in Table 1 below should give high biomass yield and good canopy cover within 6 to 8 months. The narrow in-row spacing of Crotalaria paulina and Crotalaria striata is because they are short plants when mature. This seed rate can also be used for herbaceous legume cover crops such as mucuna.

Table 1 shows recommendations for establishing 1 hectare of various fallow species. NB: amounts calculated on seeds

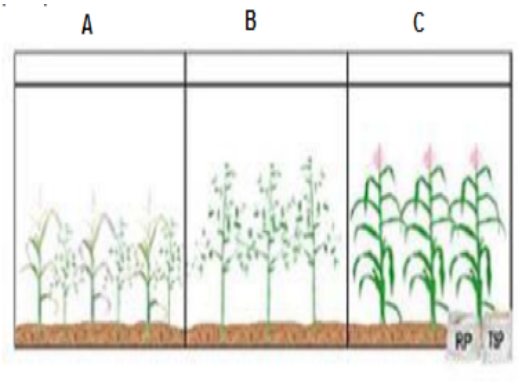
Table 1. Recommendations for establishing 1 hectare of various fallow species

Species	Seeds (per kg)	Spacing (cm)	Seed rate (kg/ha)	Seed rate ((g/plot)a
Cajanus cajan	7,000	75x30	18.2	1638
Crotalaria grahamiana	18,000	75x30	7.0	630
Crotalaria paulina	64,000	75x10	2.0	180
Crotalaria striata	110,000	75x10	1.2	108
Sesbania Sesban	100,000	75x30	0.3	27
Tephrosia candinda	18,000	75x30	7.0	630
Tephrosia vogelii	18,000	75x30	7.0	630

Source: ICRAF 2013

being planted two per hole; planting four seeds per hole doubles the seed rate. The germination rate for all seeds is 80 percent, except for Sesbania sesban, which has a rate of 70 percent.

Figure 1. Planting crops on the same field at the beginning of the next season. (A) Maize+trees: fallow species planted in maize plots. (B) Trees: fallow species left to grow alone. (C) Maize: maize planted after improved fallow



1.4 Establishment

For improved fallow species to benefit crops, they must have enough time in the field to grow and accumulate large quantities of biomass and nutrients. Several methods can be used to establish improved fallows:

- Broadcast the seed in fields among existing crops, for example, with maize after either the first or the second weeding. If intercropping bean with maize, harvest the bean then sow seeds of the fallow plants. This technique is best suited for species with large seeds such as mucuna. An advantage of this practice is that crop husbandry practices such as applying fertilizer and weeding also help the trees to grow better.
- Plant in rows. Sow seeds of improved fallow trees, shrubs and herbaceous legumes directly between the rows of the food crop after the first weeding or as soon as the food crop has germinated, and cover the seeds with soil. With maize, for example, plant in the furrows between the rows after either the first or the second weeding.
- Plant the improved fallow trees into existing natural fallows. One way to do this is to dig holes in the natural fallows and sow seeds directly or plant seedlings. If the weeds in the fallow are dense and inhibit digging the holes, first slash them. *Crotalaria grahamiana* and *Tephrosia vogelii* can be planted directly into natural fallows. For species like Sesbania sesban that have small seeds or do not grow easily from seed, raise seedlings and plant them either in an existing crop or in natural fallow lands

1.5 Managing pests

Like any plant, fallow species can be attacked by a variety of pests and diseases. When the fallow species share these with the crops to be planted after the fallow, the problem is even more serious and the beneficial effect of the fallow on soil fertility may be lost completely because of a soil-borne pest or disease. It is therefore important to identify pests and diseases and to take appropriate measures to control them.

1.6 Harvesting the fallows

After harvesting the food crop, leave the fallow trees in the field to grow. In six to eight months, they form a closed canopy and cast a dense shade on the ground, which helps to suppress weed growth. With fast-growing species such as crotalaria and tephrosia, it is not necessary to weed the fallow. At the end of the fallow period (eight to nine months or longer after planting), cut down the fallow trees and chop off the leaves, twigs and soft branches. Spread them evenly over the field, and then incorporate them into the soil while

preparing the land for planting the next crop. Use a jembe or an ox-drawn plough. Remove the woody parts of fallow plants from the field and use them for fuelwood or for stakes for crops such as climbing bean and tomato.

1.7 Planting crops

Planting crops on the same field at the beginning of the next season. At this stage, it is best to add phosphorus fertilizer, especially in phosphorus-deficient soils.

2. Further reading

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3. Agro-ecological zones

- Tropics, warm

4. Objectives fulfilled by the project

- Resource use efficiency; and
- pro-poor technology.