Improved fallows for African farmers

Notes to broadcaster

The following article is adapted from parts of 'Improved fallows for western Kenya: An extension guideline', a 56-page document published by the World Agroforestry Centre (ICRAF). Available on line at www.knowledgebank.irri.org/cglrc/icraf/Improvedfallow.pdf . Please see contact information for the World Agroforestry Centre at the end of the article.

What is the difference between a natural fallow and an improved fallow?

Natural fallow is simply land resting from cultivation. Usually it is left to natural vegetation for a long period to restore soil fertility. Improved fallow is also land resting from cultivation, but the farmer plants leguminous trees, shrubs and/or herbaceous cover crops on the resting land.

How can improved fallows help farmers?

Improved fallows help farmers to restore the soil fertility to their land much more quickly than regular fallows, so they help in cases where it is no longer possible to leave land fallow for a long period of time. Moreover, the soil becomes very fertile and little or no fertilizer is needed to get a bumper harvest.

The development of improved fallows

One of the big challenges for all farmers is to maintain the fertility of their soils. Traditionally, farmers would restore soil fertility by leaving part of their land uncultivated for many years while new and more fertile land was cultivated for food production. The rapid increase in human population has, however, reduced the amount of land available to the farmer and destabilized this traditional system of maintaining soil fertility. Consequently, long-duration natural fallows are no longer possible. They are replaced by short-duration ones, lasting one or two seasons only. Continuous cultivation of land is now also a common farming practice. For example, in western Kenya, about half of the farmers leave 10 to 25% of their cropland fallow during the short-rains period, but since the fallow period does not last long enough to improve soil fertility sufficiently, the yields of subsequent crops are typically as low as those of the preceding seasons.

To ease this problem, improved fallows can replace natural fallows. This means that farmers grow leguminous trees and shrubs and/or herbaceous cover crops on fallow land. So long as soils have enough phosphorus, such fallows can be a practical means of restoring the nitrogen in the soil when they are used in rotation with crops.

The benefits of improved fallows

Research in some parts of Africa has shown that the trees and shrubs grown in improved fallows rapidly replenish soil fertility in one or at most two growing seasons. Therefore they shorten the time needed to restore soil fertility. They also provide other products such as fuelwood and stakes for the farmer. In addition to improving soil fertility, planted fallows can be used to control striga weed (Striga hermonthica). They can also control other weeds such as couch grass, especially if the fallows are repeated frequently or are of long duration- 18 months or more. By incorporating the biomass into the soil, the structure of the soil is also much improved whereby, for example, the water retention capacity is enhanced.

When do farmers establish an improved fallow?

Trees and shrubs can be introduced at different times depending on the location. For example in Kenya the most common practice is to plant trees and shrubs in the long-rains season (usually after the first or second weeding, depending on the rainfall conditions of the area). They are left to grow alone in the short-rains and cut the following year at the beginning of the long-rains season. In countries further south such as Malawi and Zambia where they don't have two rainy seasons, people plant trees and shrubs just after planting the maize. Once they harvest the maize they leave the trees. In the second season no crops are planted. In the third season, the trees are felled and all leaves and litter are incorporated into the soil during land preparation and ridging - and thus used as fertilizer. So the improved fallows in areas with one rainy season only are left for a longer period. This is also recommended for fields of extremely low soil fertility or fields infested by the striga weed, couch grass or other weeds that are difficult to control.

What 'fallow' species can farmers plant on resting land?

A fallow is 'improved' over natural bush fallow - only if the plant species used are more efficient than the species in the local vegetation - at least in improving the chemical and physical properties of the soil. A good fallow plant must have several of the following characteristics.

- It grows quickly and closes the canopy quickly, to suppress weeds and control erosion.
- It is deep rooted so that it picks up nutrients that are deep in the soil.
- It fixes nitrogen biologically from the atmosphere, building up good nutrients overall.
- It supplies extra products such as stakes, grain and fodder.
- It will not spread as a weed into cultivated areas.
- It easily produces seeds with long viability.
- It resists the pests and diseases in the area.

How does an improved fallow work?

At the end of the fallow period the trees, shrubs or herbaceous legumes are cut down and the biomass (leaves, twigs, branches) is incorporated into the soil while the land is being prepared for the next crop. After improved fallows of fast-growing species, maize yield can be 2-3 times greater than maize that is continuously cropped with no fertilizer added. The effect of an 8-month fallow can last for one or more seasons, depending on the level of degradation of the soil. Thousands of farmers in western Kenya are now practising improved fallow systems and have increased their crop yields tremendously. A lot of these farmers tend to replant the improved fallows every year, either on the same plot or shifting plots.

Single-species fallow

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 Colopogonium mucunoides (mucuna).

Mixed species fallow

It is possible, and even preferable, to establish improved fallows by planting alternate rows of two or more different fallow species. The species grow together without affecting each other. This practice is particularly good for slow-growing species that will not strongly compete with one another. Mixed species fallows may offer one or more of the following benefits.

- Different species may produce a wider range of products, such as fuelwood, stakes or leafy biomass, and, if one fails to germinate or establishes poorly, the other may do well.

- Depending on the site and the duration of the fallow, they tend to prolong the residual effect of the fallow, because they make plant nutrients available for a longer period.

- They make optimum use of available resources such as light and space.

The following are some successful combinations for mixed-species:
Sesbania (Sesbania sesban) + siratro
Sesbania + groundnut
Sesbania + Tephrosia vogelii or Tephrosia candida
Sesbania + Crotalaria (Crotalaria grahamiana)
Tephrosia + Crotalaria

Establishment of fallow species
For improved fallow species to benefit crops, they must have enough time in the field to grow, accumulate large quantities of nutrients and produce a lot of biomass. 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.

• 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.

After harvesting the food crop, leave the fallow trees in the field to grow. In 6 to 8 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. Then plant crops at the beginning of the next season.

Fallowing and phosphorous
At this stage, it is often necessary to add phosphorus fertilizer, especially in phosphorus-deficient soils. Place the phosphorus fertilizer in the planting hole or broadcast it and work it into the soil. The amount of phosphorus applied will depend on the crop to be planted after the fallow period.

Farmers can use triple superphosphate (TSP) or diammonium phosphate (DAP) inorganic fertilizer, or phosphate rock such as Minjingu from northern Tanzania, which is becoming available in western Kenya.

Minjingu phosphate rock (MPR) is a finely ground powder containing 13% phosphorus (or two thirds the percentage of TSP). It can be applied by evenly spreading it over the whole plot and incorporating it into the soil together with leaves from fallow plants while the land is being prepared for planting. It can also be put into the planting hole. When using it to grow maize, apply rates that will provide 22 to 25 kg of phosphorus per hectare per season, especially on soils with very low available phosphorus. Some tree and shrub species such as tithonia and sesbania accumulate potassium in their leafy biomass. When this biomass decomposes, the potassium becomes available to crops. Using these species in improved fallow systems can reduce the potassium deficiency for the next crop.

The full version of this document contains further information about:
- economic returns for farmers
- weed control in fallows
- how to establish improved fallow species

….see more at www.knowledgebank.irri.org/cglrc/icraf/Improvedfallow.pdf

Where can broadcasters get more information about agroforestry and improved fallows?

For more information, or to get seeds or seedlings, contact:

National Agroforestry Research Centre
PO Box 5199
Otonglo, Kisumu
Kenya
tel: (035) 51163, 51164, 21918 and 21234
email: icrafksm@africaonline.co.ke and kefrimas@africaonline.co.ke

World Agroforestry Centre (ICRAF)
United Nations Avenue, Gigiri
PO Box 30677-00100 GPO
Nairobi
Kenya
Telephone: +254 20 722 4000
Fax: +254 20 722 4001
Email: ICRAF@cgiar.org
www: http://www.worldagroforestrycentre.org

Or contact your local agricultural extension service who can direct you to organizations involved with agroforestry.

Program undertaken with the financial support of the Government of Canada provided through the Canadian International Development Agency (CIDA)