Agroecology Highlights
International Center for Tropical Agriculture (CIAT)

Improved fallows: an alternative for rapid restoration of degraded soils

A traditional agricultural practice used by a large proportion of farmers consists of leaving soils fallowing or 'resting' when they have lost their productive potential due to inadequate soil management.

Soil fertility recovery usually requires long fallow periods (> 5 years) allowing sufficient regeneration of native vegetation or natural fallow.

Since good agricultural land is limited the increasing population pressure on land has created the need to reduce the period under natural fallow or increase fertilizer use.

When economic limitations exist to acquire inorganic fertilizers an option to natural fallow, developed by CIAT's SOL project (Spanish acronym for Supermarket of Options for Hillsides,), is the use of improved fallows with plants capable of regenerating soil fertility more quickly than native vegetation.

Improved fallows can include fast growing shrubby legumes capable of fixing atmospheric nitrogen, and also other plants that are able to accumulate nutrients in their biomass.

Species frequently used as improved fallows include: *Sesbania sesban*, *Tephrosia vogelii*, *Gliricidia sepium* and *Flemingia macrophylla*.

The double purpose of improved fallows is that besides recuperating degraded soils in less than 3 years, they can also give other economic benefits to farmers such as fuel-wood, bio-insecticides, fodder, etc.

Planted fallows usually need weeding only at the beginning to facilitate their establishment. The contribution of organic matter to the soil is limited to litter fall and root death.However, some improved fallow species can be managed as slash/mulch systems.

Improved fallow with *Sesbania*.

Sesbania roots containing nitrogen-fixing nodules.

Improved fallows with periodic pruning management and biomass application on the soil surface, are inspired from the 'Quezungual' system native of southwest Honduras. This system is based on the repeated application of fallow prunings to the same soil where fallow plants have been growing, thus increasing nutrient recycling. This management system requires plants that are capable of tolerating repeated prunings without loosing their biomass production capacity.

Species frequently used as slash/mulch improved fallows include: *Tithonia diversifolia*, *Calliandra calothyrsus*, *Indigofera constricta* and *Cratylia argentea*.

Slash/mulch improved fallow with *Calliandra*.

Slash/mulch improved fallow with *Tithonia*.

Slash/mulch improved fallow with *Indigofera*

The nutrient content of improved fallow biomass is crucial when considering the species potential for recuperation of degraded soils. Nitrogen content is an important chemical characteristic used to define the potential of fallow prunings and other organic materials as nutrient inputs to soil.

Potential species of improved fallows plants

Species	N (%)	Decomposition and nutrient release rates
Sesbania sesban	3.7	Fast
Indigofera constricta	3.9	Fast
Tithonia diversifolia	3.9	Fast
Glinicidia sepium	3.5	Fast
Tephrosia vogelii	3.0	Fast
Cratylia argentea	3.3	Slow
Calliandra calothyrsus	2.7	Slow
Flemingia macrophyla	3.3	Slow

Tithonia biomass also has relatively high levels of phosphorus (P), potassium (K), calcium (Ca) and magnesium (Mg), which has resulted in its wide use as bio-fertilizer in Africa and Asia.

The rule of thumb is that organic additions with N content higher than 2.5% will present net N release and thus can be used as N source. On the other hand, organic additions with N values less than 2.5% should be mixed with fertilizers in order to be used as N sources, or simply be used as mulches for the erosion control and moisture retention. Nevertheless, other chemical characteristics of fallow prunings, such as high contents of polyphenols and/or lignin, tend to reduce their rate of decomposition and nutrient release.

Difficult access to fertilizers requires strategies to minimize nutrient losses and maximize the residual effect of applied nutrients not used by the crops. A better understanding of the interaction between fallow prunings and fertilizers could provide valuable information about options that could promote efficient nutrient management.

For further information contact:

Proyecto SOL
Centro Internacional de Agricultura Tropical
CIAT

Honduras : m.ayarza@cgiar.org Fax: (504) 239 1443
Nicaragua: j.beltran@cgiar.org Fax: (505) 278 4930
Colombia : e.barrios@cgiar.org Fax: (572) 445 0073