Establishing leguminous shrubs in annual cropping lands in sub-humid/semi-arid areas

Why plant leguminous shrubs in croplands?



Trees and shrubs form an integral part of the small scale farm systems. The woody perennials contribute to higher productivity of both crops and animals. They contribute to soil fertility needed by crops through recycling nutrients from the deep soil layers to the top soil layers through dropping of leaves. Trees and shrub species from the legume family are also able to fix atmospheric nitrogen and make it available for use by crops. Among other benefits, trees can provide fodder for livestock, firewood for cooking and lighting, and they also remove carbon from the air. Trees and shrubs also provide stakes for supporting high value crops such as climbing beans, tomatoes and others.

Farms that have few trees and shrubs, especially in arid and semi-arid lands, are likely to suffer from high temperatures and wind speeds resulting in faster drying of crops when rains are not enough. They have less mulch to cover the soil thus lose nutrients and water, lack sufficient root anchors for soil micro-organisms and may have accelerated soil erosion which results in poor yields.

SELECTED TREE SPECIES PROVIDE:

- Sources of firewood
- Fodder for livestock
- Soil fertility improvement
- Soil conservation support
- Wood for farm implement tools

ICRAF and CIMMYT are part of the CGIAR Consortium Centres

ICRAF's mission is to generate science-based knowledge about the diverse roles that trees play in agricultural landscapes, and to use its research to advance policies and practices, and their implementation that benefit the poor and the environment.

CIMMYT's mission is to sustainably increase the productivity of maize and wheat systems to ensure global food security and reduce poverty

Tips on establishing the right trees in crop fields

Species selection – There are many leguminous shrub species, especially from Central America, that have been tested and found to perform well in various agro-ecological zones in the tropics. Consultation with trained experts can help farmers identify species that adapt well to their environment. There are other indigenous species that can be identified through local knowledge and testing in farms to diversify the number of species farmers can plant or allow to grow through natural regeneration.

Tree planting – Unlike crops, trees need tender care when young and are usually established in a nursery. Farmers can establish their own nurseries as individuals or groups or choose to buy seedlings from a commercial tree nursery. Holes for planting trees should be about two times the width of the seedling root-ball to give roots a chance to spread out. In the hole, the seedling should be set in a way to ensure that the seedling soil line is slightly below the surface of the surrounding soil. Leguminous shrubs should be planted during, or immediately after crops have been planted to give sufficient soil moisture for establishment. Indigenous shrubs can be allowed to grow in sites where they germinate naturally.

Managing leguminous shrubs in croplands – Trees should be well-spaced to minimize competition for air and soil nutrients between themselves (trees) and with crops. Coppicing should be done frequently to avoid dense crowns which also encourage pest and diseases in the field because of low air circulation. Stakes and leafs/twigs removed through coppicing also avails products such as fodder for livestock, firewood and stakes for the crops, among other products.

Year 2013. No. 2 ICRAF House, United Nations Avenue, Gigiri. P.O. Box 30677 Nairobi, Kenya. Tel: +254 20 722 4000. Email: icraf@cgiar.org

World Agroforestry Centre
CIMMYT
IFAD INTERNATIONAL FUND FOR AGRICULTURAL DEVELOPMENT
EUROPEAN COMMISSION
KARI
EIAR

Species	Uses	Propagation	Integration with crops
Calliandra calothyrsus 	• Fodder - protein-rich leaves with no toxic substances • Soil fertility amendment - nitrogen fixing and protein-rich leaf biomass • Good firewood - fast growing and multi-stemmed species • Honey - flowers with nectar throughout the year	• Mainly through direct sowing or seedlings • Seeds need pre-treatment - immerse in hot water and allow cooling for 12-24 hours • Up to 90% of healthy seeds germinate within 4-25 days of sowing • It can also be propagated from stem cuttings	• Seedlings can be established simultaneously with crop planting • Pruning should be done in cycles of up to 4 months to limit shade on associated crops. Highest yields obtained from coppicing when cut at 1 m.

Species	Uses	Propagation	Integration with crops
Leucaena trichandra 	• Foliage provides fodder for livestock • Controls soil erosion • Soil fertility amendment through nitrogen fixing and as green manure • Wood good for firewood and posts for house construction	• Direct seeding is the most common method but seedlings also used • Seeds require pre-treatment - soak in hot water (60-80 deg C) for 24 hrs or in cold water for 48 hrs • Re-sprouts readily, even from large stumps after cutting	• Incorporated in traditional indigenous agroforestry systems in its native range • Commonly found scattered in fields and fencelines • Spreading irregular crown modified by lopping

Species	Uses	Propagation	Integration with crops
Gliricidia sepium 	• Fodder - leaves rich in protein and highly digestible • Wood used as firewood, charcoal production, farm implements tools, and house posts • Flowers attract honeybees • Soil fertility amendment through nitrogen fixing and massive leaf litter.	• Propagated most commonly by cuttings but survival is low in poor soils • Direct sowing after good land preparation can give 90-100% germination in 7 days. • When nursery seedlings used, no seed pre-treatment required and plantable size seedling is attained in 3 months	• Used as a nurse tree for shade-loving species • Hedgerows in alley cropping serve to suppress weed growth • Spacing determined by planting objective • Main management activities are pruning and pollarding but tolerates lopping and browsing

Species	Uses	Propagation	Integration with crops
Sesbania sesban 	• Ruminants readily eat the protein rich leaves and young branches • Wood used as firewood and charcoal • Controls soil erosion • Soil fertility amendment through nitrogen fixing - and mulch/green manure • Useful in combating *Striga hermonthica* weed.	• Seeds require pre-treatment - soaking in cold or tepid water for 24 hours. • Seed germination rate is 65% in about 16 days • Vegetative propagation using stem cuttings. practiced but not common • Direct seeding used	• Promising shrub for alley cropping because it is easy to establish • Grows rapidly, coppices readily and provides mulch of high nutrient content • Thrives under repeated cuttings and coppices readily, with many branches arising from the main stem below cutting height.



Enhancing total farm productivity in smallholder conservation agriculture based systems of Eastern Africa

This IFAD- funded project is focused on resource-poor smallholder farmers in Ethiopia and Kenya. It aims at improving both crop and livestock production by reducing current competition on the use of cereal crop residues. On one hand, cereal crop residues are an esential source of feed for livestock, especialy during dry season. Livestock performs a number of functions such as provision of manure, income generation and social display. On the other hand, the retention of cereal crop residues as surface mulch has the potential of increasing crop productivity and improving sustainability of cropping systems