Establishing compatible tree species in annual cropping lands in sub-humid/semi-arid areas

Why plant big canopy trees in croplands?



Trees form an integral part of the small scale farm systems. Trees 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.
Tree species from the legume families are also able to fix atmospheric nitrogen and make it available for use by crops.

Among other benefits, trees can provide fuelwood for cooking and lighting, fodder for livestock, timber for household use or sale and they also remove carbon from the air.
Farms that have few trees, especially in arid and-semi-arid lands suffer from high temperatures and wind speeds resulting in faster drying of crops when rains are not enough. They are also likely to have less mulch to cover the soil thus losing nutrients and water and there is accelerated soil erosion which results in poor yields.

SELECTED TREE SPECIES PROVIDE:

- Sources of firewood
- Fodder for livestock
- Timber
- Soil fertility improvement
- Soil conservation support

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

Tree species selection - Consultation with tree experts (either trained experts or those with local knowledge) helps farmers identify species that do not compete adversely with crops. These species usually drop leaves during part of the year thus reducing their water consumption. They also have roots that go deep into lower soil layers rather than spread on the surface where crops roots reach. Indigenous tree species are also adapted to the local conditions and survive better in the farms, especially in dry areas, than species introduced from other environments (exotic).

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 purchase seedlings from a commercial tree nursery. Holes for planting trees should be dug in sites with at least three feet of good soil that is not compacted. Holes should be about two times the width of the seedling rootball 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. Indigenous trees can be allowed to grow in sites where they germinate naturally.

Managing trees in croplands - Trees should be well-spaced to minimize competition for air and soil nutrients between themselves (trees) and with crops. Pruning should be done occasionally to avoid dense crowns which encourage pest and diseases in the field because of low air circulation. Pruning also improves the quality of products such as timber and fruits while the pruned branches provide mulch for the crops, fodder for livestock (if palatable) and firewood among other products.

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Croton macrostachyus

Broad-leaved croton


courtesy of www.africamuseum.be

Uses

- Controls soil erosion
- Soil fertility amendment through leaf-fall which provides mulch and green manure
- Leaves can be used as dry season fodder
- Firewood
- Several medicinal uses reported

Propagation

- Mainly from seeds without need for seed pre-treatment
- Up to 40-70% of healthy seeds germinate within 30-60 days of sowing
- Natural regeneration can be through wildlings or coppicing

Integration with crops

- Suitable for intercropping with crops
- Fast growing in good sites but slow in drier sites
- Lopping, pollarding and coppicing are suitable management practices to reduce shading on crops

Cordia africana

East African cordia


courtesy of www.wes-africanplants.senckenberg.

Uses

- Very good timber for high quality furniture
- Firewood
- Soil conservation
- Heavy leaf-fall in dry seasons provides good mulch
- Provides good bee forage and beehives are often placed on the tree

Propagation

- Seeds need pre-treatment - soak in cold water for 6 hours
- Up to 50-80% of healthy seeds germinate within 40-60 days of sowing
- Seedlings require 4-6 months in nursery
- Natural regeneration can be through wildlings

Integration with crops

- Suitable for intercropping with crops due to its good shading ability
- Growth rate is fast reaching 7-8m in about 7 years
- Lopping, pollarding and coppicing are suitable management practices to reduce shading on crops

Erythrina abyssinica

Flame tree


courtesy of www.database.prota.org
Photo: G.H. Schmelzer

Uses

- Foliage provides fodder for livestock
- Wood good for firewood and timber
- Controls soil erosion
- Soil fertility amendment through leaf-fall and nitrogen fixing
- Several medicinal uses reported

Propagation

- Mainly from seeds without need for seed pre-treatment
- Up to 20-60% of seeds germinate within 15 to over 25 days of sowing
- For fast establishment, stakes 2.5m long and 8-10cm diameter can be planted at the onset of rains

Integration with crops

- Suitable for intercropping with crops
- Fast growing in good sites but slow in drier sites
- Lopping, pollarding and coppicing are suitable management practices to reduce shading on crops

Faidherbia albida

Apple ring acacia



Uses

- Leaves and pods provide good livestock feed
- Wood used as firewood
- Controls soil erosion
- Soil fertility amendment through nitrogen fixing and leaf-fall in the rainy season

Propagation

- Seeds need pre-treatment - soak in hot water for 24 hours
- Up to 40-60% of seeds germinate within 6-30 days of sowing
- Direct seeding possible but has high failure rate
- Natural regeneration can be through wildlings or coppicing

Integration with crops

- Suitable for intercropping with crops because of rainy season leaf fall which reduces shading on crops
- Pruning in the second year to about half the tree height may be needed to control low branching
- Responds well to coppicing



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