

Organic Production.

Weed Management

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Weeds - Friend or Foe?

There are many definitions of a weed. Probably the most common one is:

'A plant in the wrong place'.

In agriculture a better definition is a plant that adversely affects the production of the crop.

Weeds can have many benefits

preventing soil erosion

increasing soil fertility

correcting poor soil structure

indicating poor drainage

indicating mineral deficiencies and pH imbalances

host plants for beneficial insects and animals

Weeds can have many benefits

Carbon Gift

Weeds can increase soil fertility through gifting carbon to the soil

Insectaries

Weeds can be used as insectary species to attract beneficial insect and other animal species to suppress insect pests.

Nutrient Storage

Weeds can help to take up excess soluble nutrient in wet periods, stopping them from leaching, running off farm and eutrophying water.

Nitrogen Fixation

Weed legumes can fix over 60 kg of plant available nitrogen per hectare.

Disease Suppression

The microorganisms associated with many weeds are very effective in suppressing diseases in crops.

The Carbon Gift

Between 95 and 98% of plant minerals come from water, carbon dioxide and oxygen.

The remaining 5% come from the soil.

30-60% of the carbon and energy used by plants is deposited into the soil

Plant roots put thousand of tonnes per hectare of organic carbon and bio available minerals into the soil every year.

The Carbon Gift

These carbon based molecules feed billions of microbes - actinomycetes, bacteria and fungi that are beneficial to plants

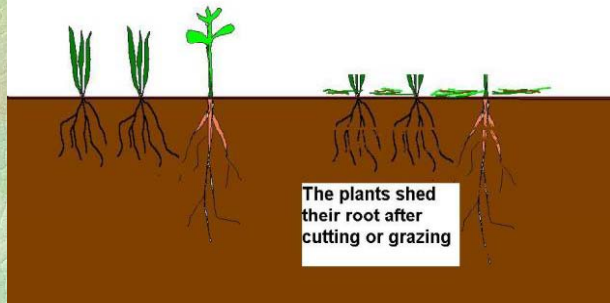
Plants roots are an important part of the process of forming top soils and good soil structure.

This means that plants can put more nutrients into the soil than they remove from it.

If the weeds are managed properly, and their residues are allowed to return to the soil, their nutrient removal from the soil is zero.

MANAGING GROUND COVERS

Cut plants add organic carbon into the soil to feed the microorganisms and the crop

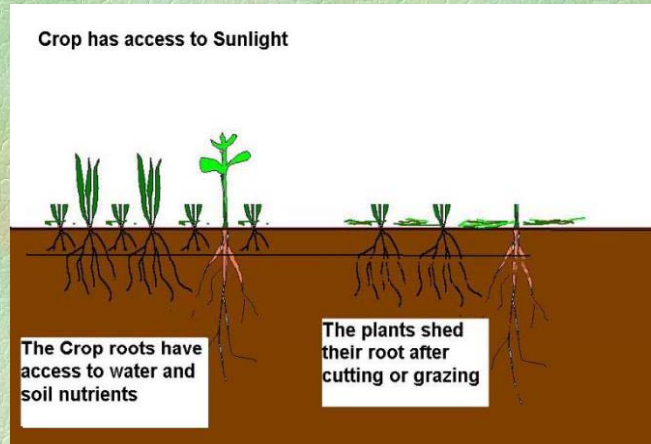


MANAGING GROUND COVERS

Biological activity in soil is stimulated by rootmass activity which feeds microbe communities and generates soil carbon and nutrients for the crop



MANAGING GROUND COVERS



MANAGING GROUND COVERS



Weed Management Strategies

Essentially weeds cause problems by

- 1: Competing for Sunlight
- 2: Competing for Soil Nutrients
- 3: Competing for Soil Water
- 4: Host for pests and diseases and contamination of crop with weed residues.

1: Competing for Sunlight

Sunlight is the most important of all negative attributes of weeds.

Photosynthesis is the basis of most crops.

Weeds that reduce the amount of solar energy collected during photosynthesis will reduce the yield of the crop.

It is important that all weed management strategies ensure that the weeds are kept below the leaves of the crop.



2: Competing for Soil Nutrients

Good soil nutrition is essential to ensure that weeds do not take up nutrients and leave the crop deficient.

1: Ensure luxury levels of soil nutrients that will supply enough for both the crop and the weeds.

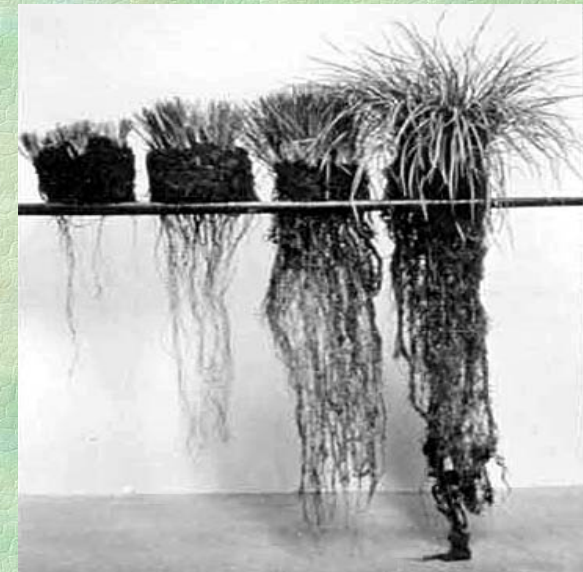
2: Return the weed nutrients to the soil through slashing, grazing, tilling etc.

These strategies ensure the weeds are always returning the nutrients that they use.

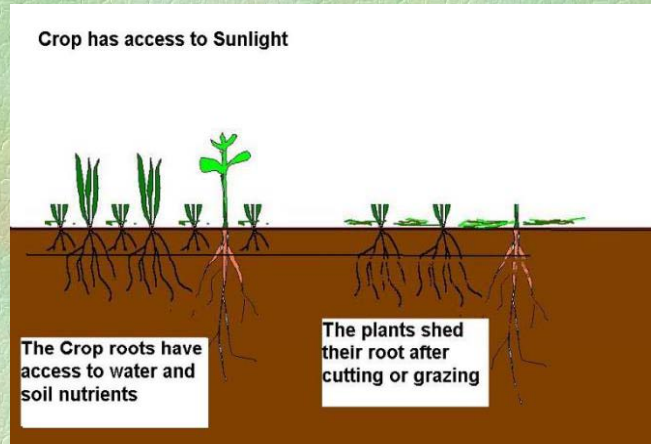
The Carbon Gift means that they are returning more nutrients and feeding the crop.

MANAGING GROUND COVERS

The roots of the cut plant have been shed and do not compete for water of nutrients



MANAGING GROUND COVERS



3: Competing for Soil Water.

It is important that adequate water is provided for both the weeds and the crop.

When water is limited it is important to eliminate or reduce the weeds.

Slashing and using the residue for mulch to retain soil moisture is the best strategy.

Grazing or very shallow tillage before sowing the crop can reduce weed induced water loss.

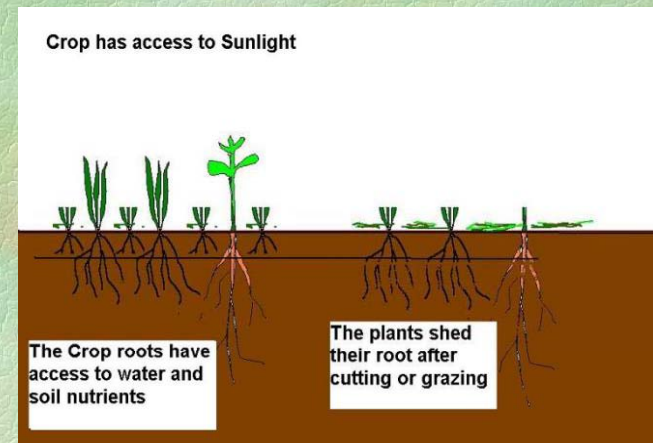
Weeds can be used as to store water and nutrients as mulches.

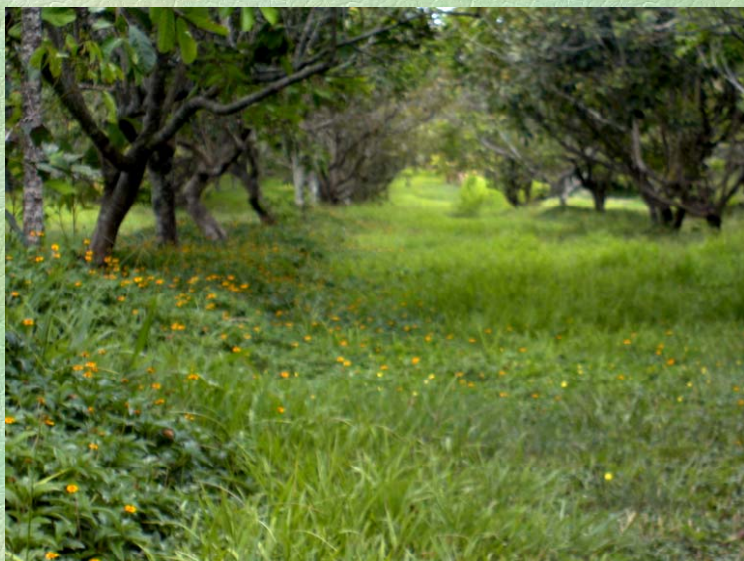
MANAGING GROUND COVERS

The roots of the cut plant have been shed and do not compete for water of nutrients



MANAGING GROUND COVERS





4: Host for pests and diseases and contamination of crop with weed residues.

These are the weed species that should be concentrated on to be eradicated and/or replaced with beneficial species.

Weeds that can contaminate crops with seeds or extraneous matter can be eliminated, kept small or prevented from seeding.

Methods for controlling weeds

Timing

Timing is critical to efficiently control weeds.

- “One year’s seeding is seven years weeding”
- Weeds are easier to control as they emerge

Cover crops

Cover crops suppress weeds by out-competing them

Mulching

Mulching is a very effective way of suppressing weeds.

Cover Crops for Weed Control



Mulch as Weed Control



Mulch from the Grass Suppresses Weeds



Methods for controlling weeds

Shade as weed control.

High density planting of crops will control many weeds by shading them out.

Competition

Beneficial species can out-compete/choke out unwanted weeds

Shade as Weed Control



Shade and Replacing with Beneficial Species as Weed Control



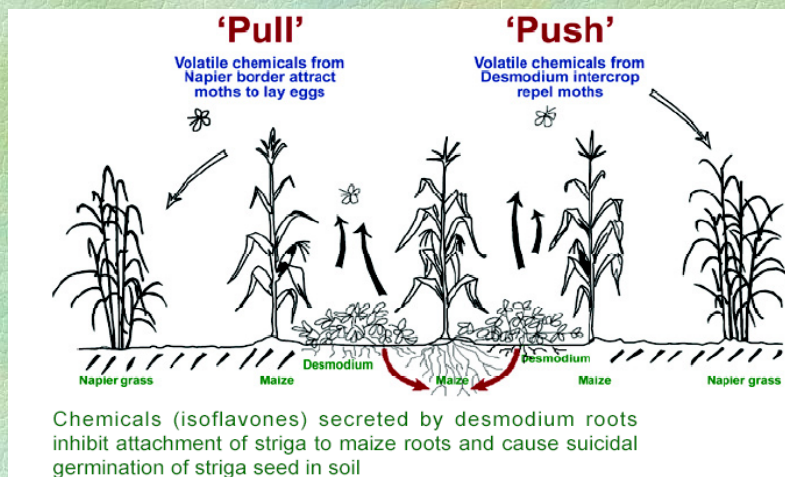
Shade and Replacing with Beneficial Species as Weed Control

- Full sun systems. Phase of establishment with plantains as temporary shade.
- Agroforestry system with shade leguminous trees,
- Successional agroforestry system with the same shade trees of the agroforestry treatment and in addition natural regeneration and crops
- Taking into account natural plant species succession, the high turn over of carbon typical for the conditions of humid tropics, self regulation processes with high biodiversity, to use all storeys and provide as much as possible ecosystem services beside the cocoa production.



High Yields

“Push – Pull” for Stemborer and Striga Control



The System's Approach: Eco-intensification

Using natural systems to regulate pest outbreaks

(example of push-pull greater farm productivity vs higher yields 2 to 10X)



Low growing legumes such as Clover, Alfalfa, Desmodium, Pinto Peanut makes an ideal ground covers
They are prostrate, suppresses many weeds, provides nitrogen and the flowers function as insectaries for beneficial insects



Methods for controlling weeds

Crop Rotations

Crop rotation can be used very successfully to suppress weeds.

Slashing and Mowing

Cutting weeds by slashing, cutting and mowing controls weeds.



Crop Rotation is very effective in controlling weeds
by breaking the reproductive cycles

Methods for controlling weeds

Grazing

Grazing is one of the most effective methods of weed control

Grazing as Weed Control



Pasture Cropping



Oats Sown into Pasture

Pasture Cropping



Oats Sown into Pasture

Methods for controlling weeds

Tillage

Tillage is one of the oldest and most effective weed control methods.

Flame Weeding

Flame weeders are used to quickly sear weeds with a naked flame.

Steam Weeding

Steam weeding works on the same principles as flame weeding for herbicide use due the ease of use and safety to the environment.

Hand Weeding - Pulling, Hoeing and Cutting

One of the most effective and efficient methods of weed control

Quarantine

It is important to have systems to stop the introduction of new weeds



Use a whole of farm approach

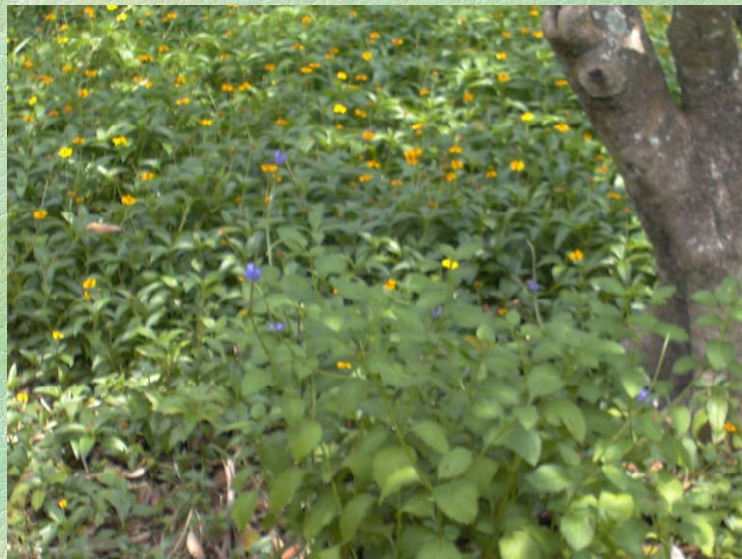
Research shows that the best organic farmers use multiple integrated strategies for weeds and achieve very good control.

It is important to look at weeds from the four criteria.

Good organic farmers find that their weed loads significantly reduce over the years.

Insectaries

- Refuges of flowering plants are known as insectaries
- Small flowering plants are encouraged to grow throughout the orchard
- Nectar and pollen are essential to the adult stage of many beneficial predators
- Research has shown that they breed thousands of beneficial organisms
- Tall flowering plant host more species than short mowed or bare areas
- Strip mowing used to leave pockets and strips as refuges for beneficials
- The remaining are mowed at a later stage leaving other areas as refuges
- The rainforest allowed to regenerate in marginal areas on the farm
- Watercourses planted to provide habitat for the beneficial bird species
- Marginal areas host a variety of beneficial insect species



Weed Control

- Slashing/cutting are used to strip mow the rows
- Other areas are left untouched until later in the season.
- They are necessary as insectaries for beneficial insects.

Change the ground cover balance from negatives that compete with crop to positives

- Soil stabilisation, nitrogen fixation, habitat for beneficials,
- Mulch and organic matter for trees and soil,
- Carbon and nutrient dumping into soil from plant roots.

Legumes, as a ground cover

- Adds nitrogen to the soil
- Chokes out many of the weed species
- Stabilises the soil and builds humus

This weed management method produces a lush meadow style rather than a city park look.

Eco-intensification

**Maximises
solar capture**

**Fixes nitrogen
and soil carbon**

**Flowers attract
beneficial
insects**



Thankyou