

Regenerative Agriculture Ending The Neolithic Age Weed Mythology



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Ending The Neolithic Age Weed Mythology



QUESTION: Why is the polyculture healthier and yielding better than the monoculture in this drought?

Standard agronomy says that all plants that are not the cash crops are weeds because they are competing for nutrients and water therefore lower yields

If this is correct the monoculture on the right side would be the strongest and the polyculture should be struggling in this drought

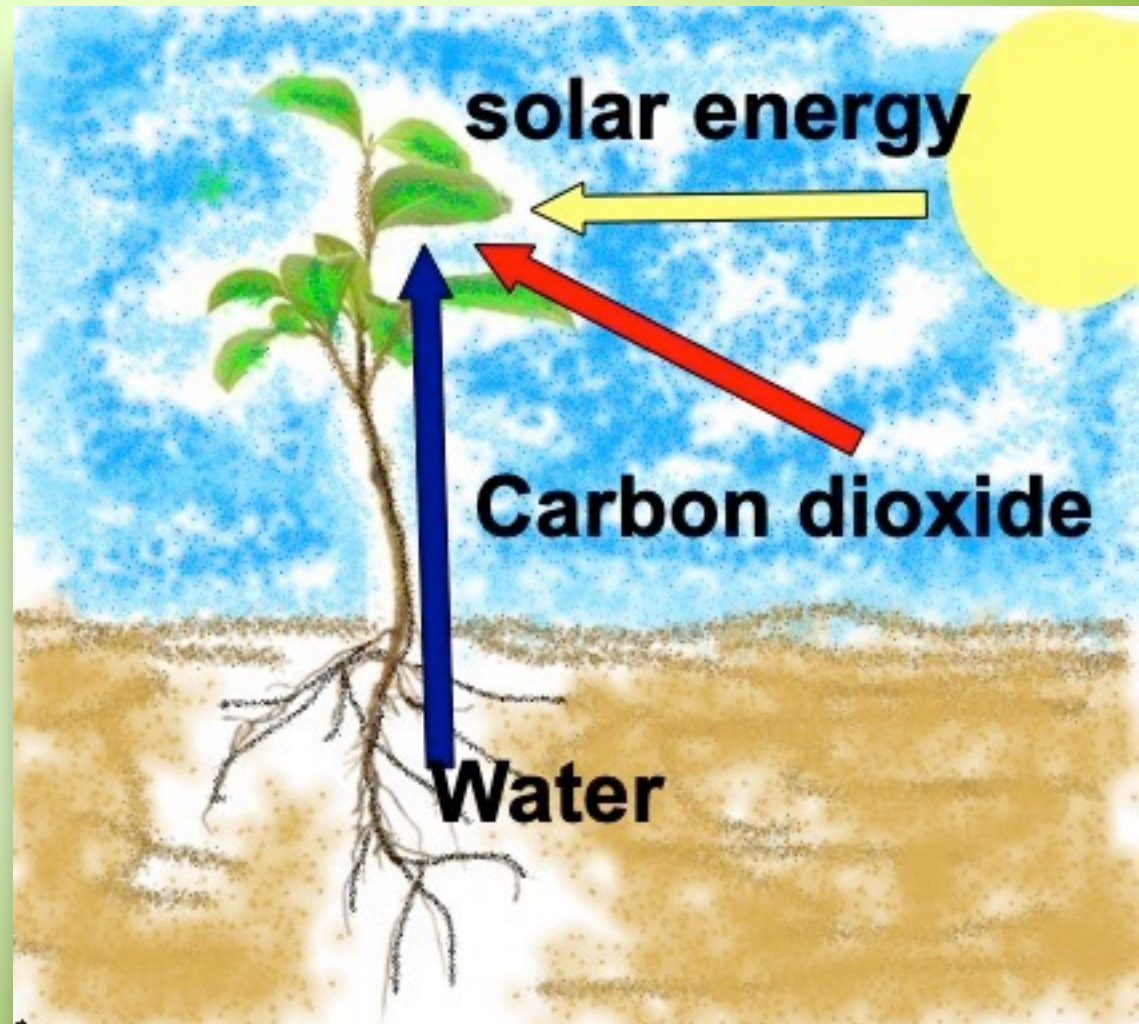


Picture: Courtesy of Christine Jones

Maximize Solar Energy



What is the most important thing we do when we farm?

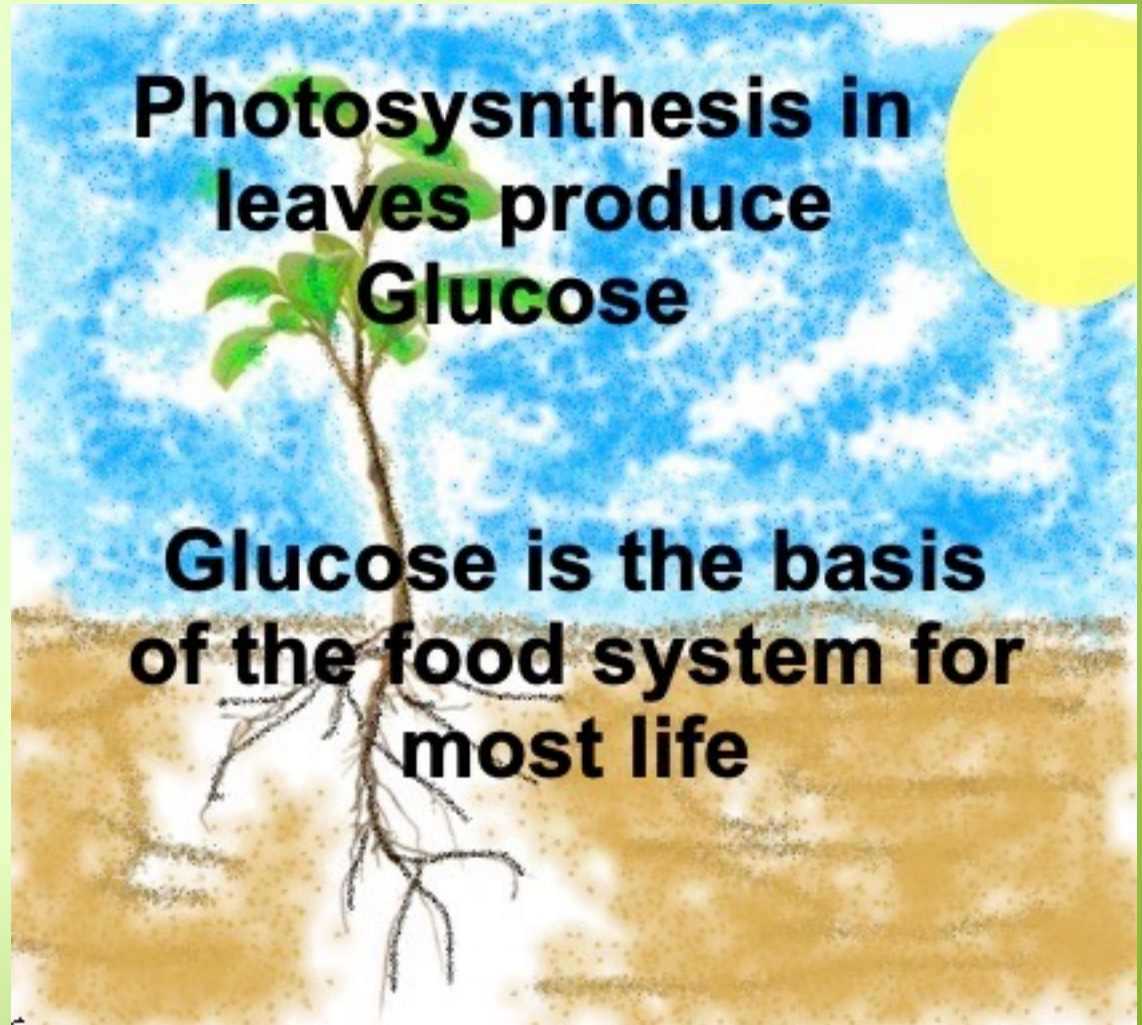


Maximize Solar Energy



We use
solar energy
to power
photosynthesis
to create the

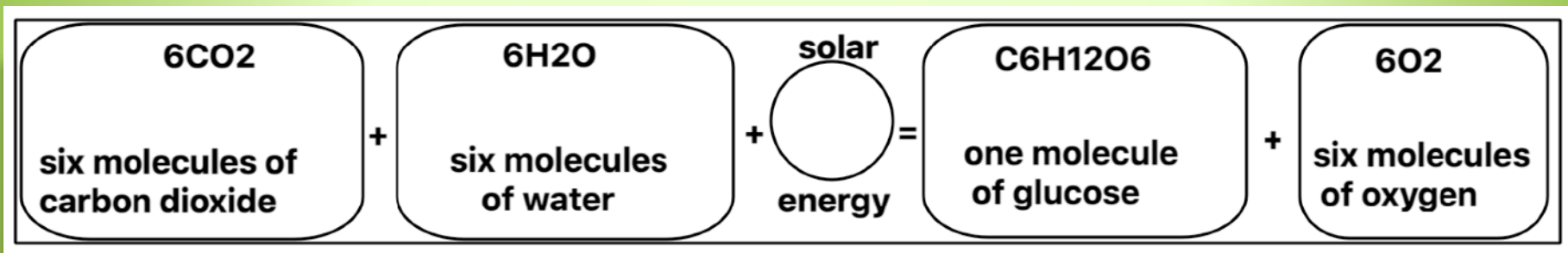
Molecules of Life



Maximize Solar Energy

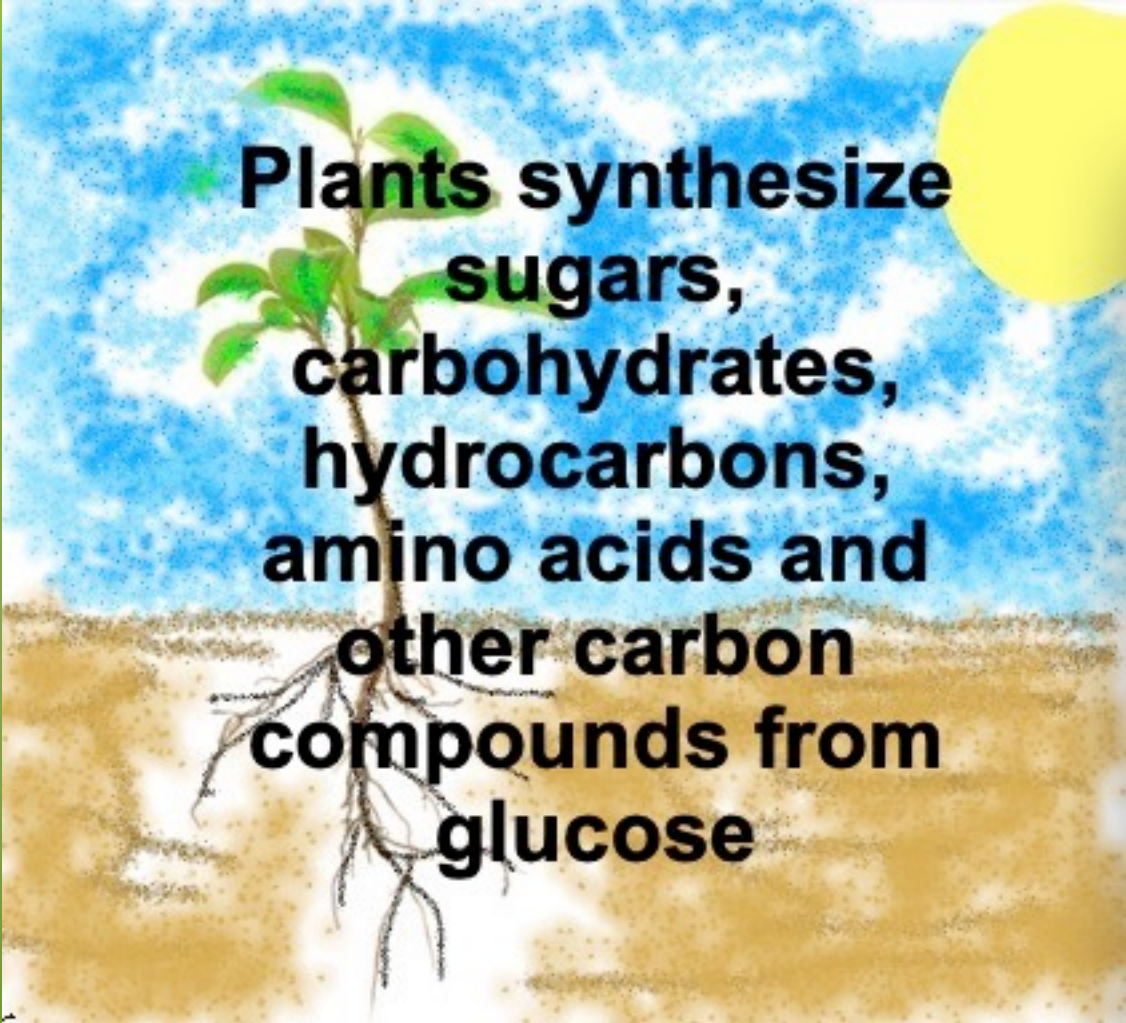


Use Photosynthesis to make the key Molecule of Life



- Between 95% and 98% of a plant's biomass come from water and carbon dioxide using the energy from photosynthesis to make glucose

Maximize Solar Energy



**Plants synthesize
sugars,
carbohydrates,
hydrocarbons,
amino acids and
other carbon
compounds from
glucose**

**Glucose is the key
Molecule of Life**

It is the basis of all
the other
Molecules of Life,

the compounds that
all living entities
need to grow,
reproduce and
to stay alive!

The Molecules of Life



Glucose is the key Molecule of Life

- It is a primary energy source of the cells of most living organisms, including plants and animals.
- Glucose molecules can be modified to build many other sugars such as fructose (fruit sugar), sucrose (cane sugar), lactose (milk sugar), maltose (malt sugar) etc.
- **Glucose molecules can be combined together in long chains to form cellulose. These are the basis of wood, leaves, stems and paper.**
- Glucose molecules can be also modified to form carbohydrates — starch which is the basis of flour, bread and staples such as rice, wheat, corn, potatoes, cassava, taro etc.

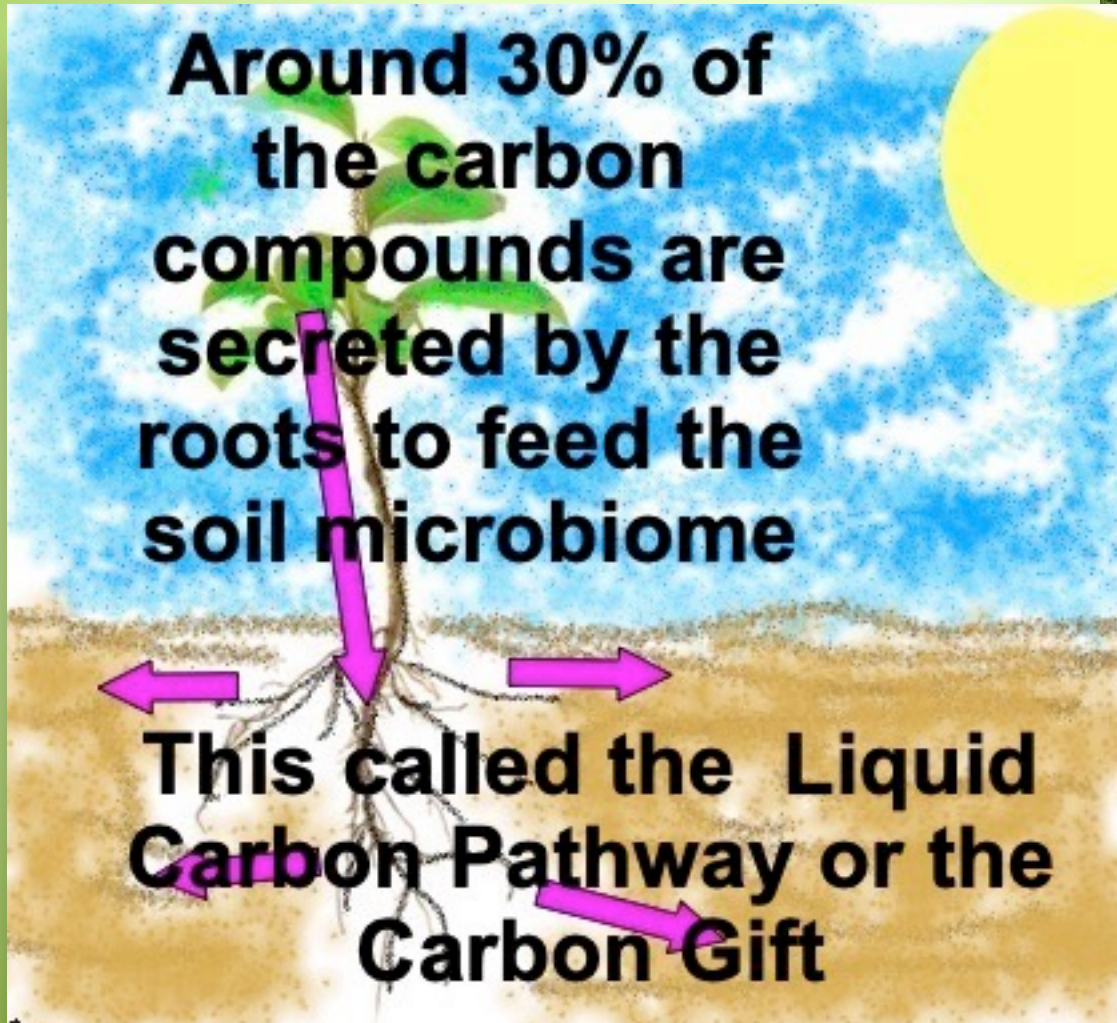
The Molecules of Life



Glucose is the key molecule of life

- The carbohydrates can be modified to form hydrocarbons — oils and fats.
- Glucose molecules can be modified again with the addition of nitrogen and sometimes sulphur to form amino acids — the basis of proteins, DNA, hormones, etc.
- Nearly all life on earth is dependent on the products of photosynthesis either directly or indirectly
- We get our sugars, starches and oils from plants or from animals that have fed on plants.

Maximize Solar Energy



The Rhizosphere



Plant Roots and The Rhizosphere

- The majority of microbes live around plant roots
- This is called 'The Rhizosphere'
- They feed off root exudates and have important roles in releasing nutrients and protecting plants from diseases
- ***Roots and microbes release enzymes, acids and other compounds that dissolve nutrients from rocks***
- Roots build soil structure
- Deep roots build deep soils

Maximize Solar Energy



The Liquid Carbon Pathway - the Carbon Gift

- Soils are created through the biological activity of the microbiome/soil food web/rhizosphere - mediated by roots
- Soil creation and resultant plant available nutrients are primarily due to biological processes rather than chemical or mechanical weathering processes
- **The greater the amount of food that can be provided to the microbiome/soil food web, the greater the soil and plant available nutrients can be produced.**
- Plants - **correctly managed** - increase soil nutrient levels rather than depleting them.

MANAGING GROUND COVERS

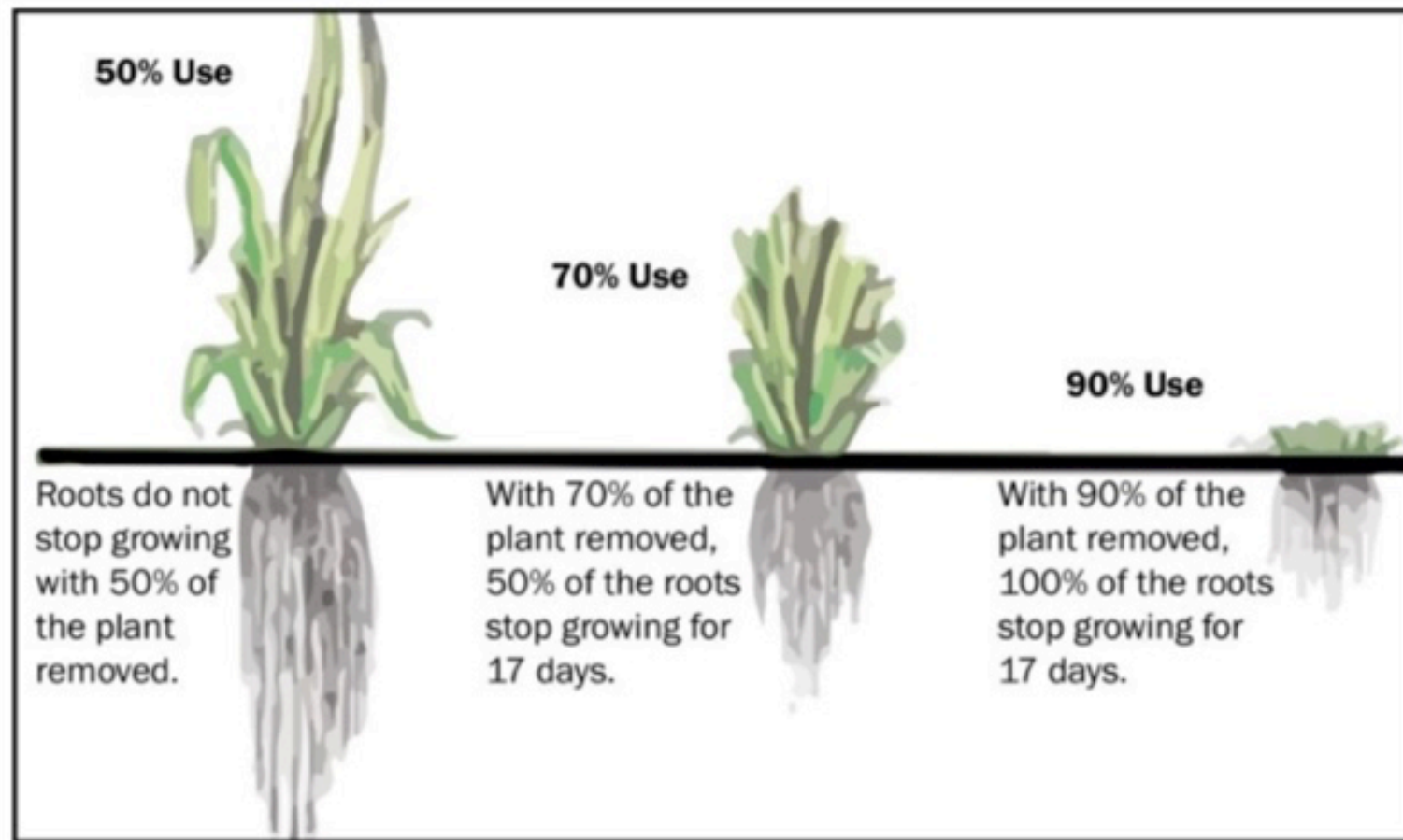
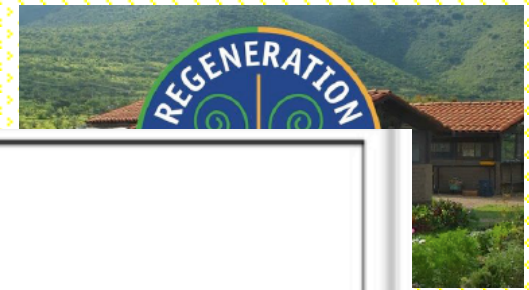


Rootmass activity stimulates nutrient availability in soil by:

- Root exudates that feed microbe communities
- Root enzymes and acids extract minerals from rocks
- Builds soil structure and deepens soils
- Generates soil carbon and nutrients for the crop through correct management



MANAGING GROUND COVERS



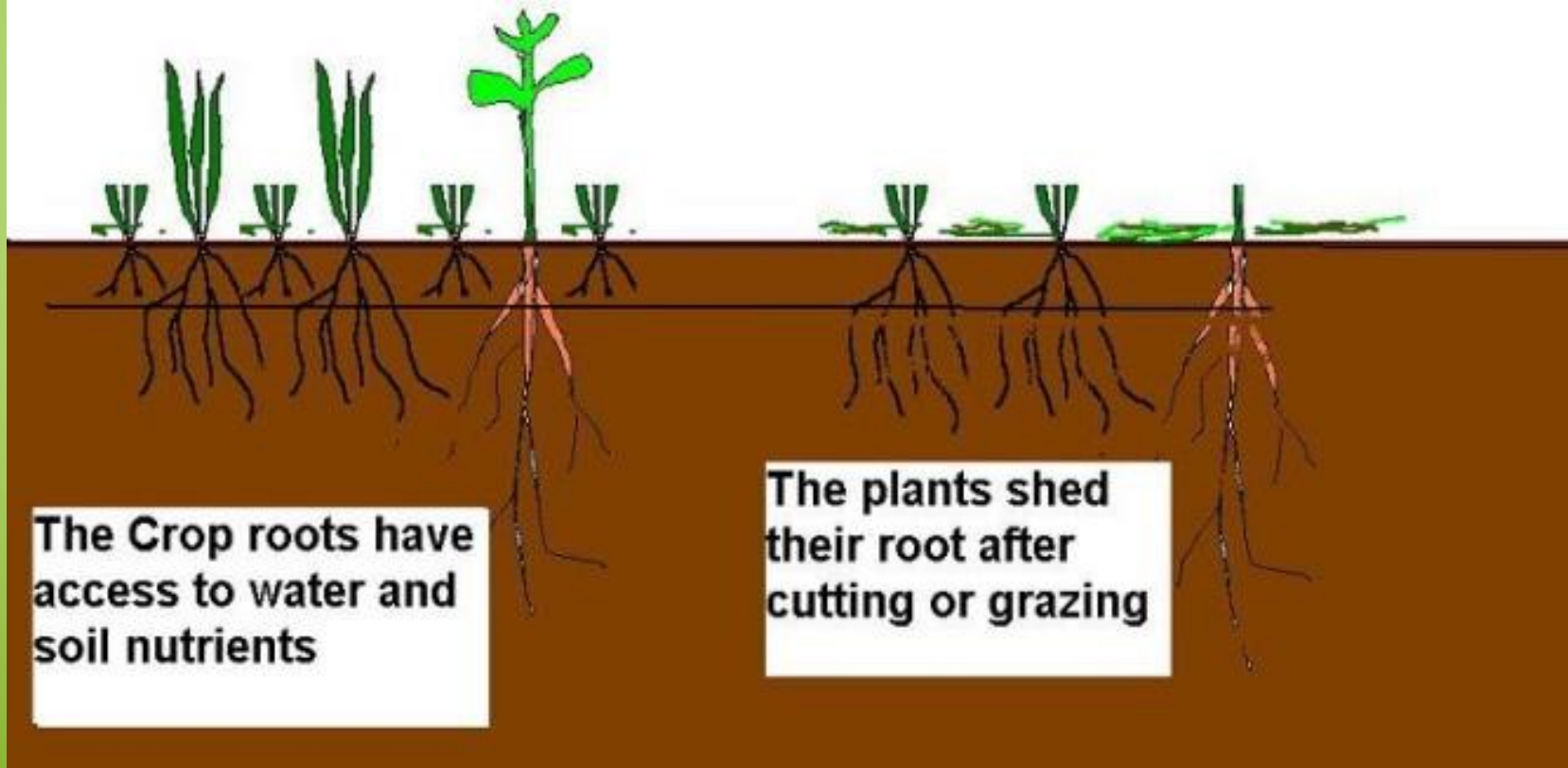
Growth of both tops and roots is significantly impaired if more than 50 percent of the green leaf is removed in a single grazing event (10).

This information can be used for management decisions

MANAGING GROUND COVERS



Crop has access to Sunlight



MANAGING GROUND COVERS



Building Topsoil

Soil organic matter increased from 1% to av. 6% in 11 years

- pH 4.5 to 6.5

The Total Exchange Capacity from 6.66 to 24.78.

- Available N from 46 kg/ha to 123 kg/ha.
- Calcium 534 ppm to 3696 ppm,
- Magnesium from 101 ppm to 391 ppm,
- Potassium from 45 ppm to 230 ppm,
- Phosphorous from 123 ppm to 1561 ppm.



Pasture Cropping

Sowing annuals into perennial pastures



Oats Sown into Pasture
Only a little bit of phosphate
was added due to deficient soils

Gives the same yield as intensive plowing
and fertilizers, at a fraction of the cost
Animals can go back on pasture after harvest-
giving two crops and double income

Pictures: Colin Seis

Pasture Cropping

Dr Christine Jones has conducted research at Colin Sies's property in Australia

An average increase of 8 tons/ha of SOM per year

Increases in soil nutrients

Calcium 177%, Magnesium 38%, Potassium 46%, Sulphur 57%, Phosphorus 51%, Nitrogen 48%, Copper 102%, Zinc 86%, Cobalt 79%, Boron 56%, Molybdenum 51%, Selenium 17%



Soil Comparison between Winona and nearby property. Picture: Dr Christine Jones



SOIL CARBON

- 0 - 10cm
150%
- 10 - 20cm
243%
- 20 - 30cm
317%
- 30 - 40cm
413%
- 40 - 50cm
157%

Pasture Regeneration

Soil Kee, Australia

- Sowing annual cover and cash crops in perennial pastures
- 5.6 metric tons of Soil Organic Matter/ha/yr. (11t CO₂ ha/yr)
- The Australian Clean Energy Regulator issued the first Australian carbon credits for this



Regenerative -Holistic Grazing

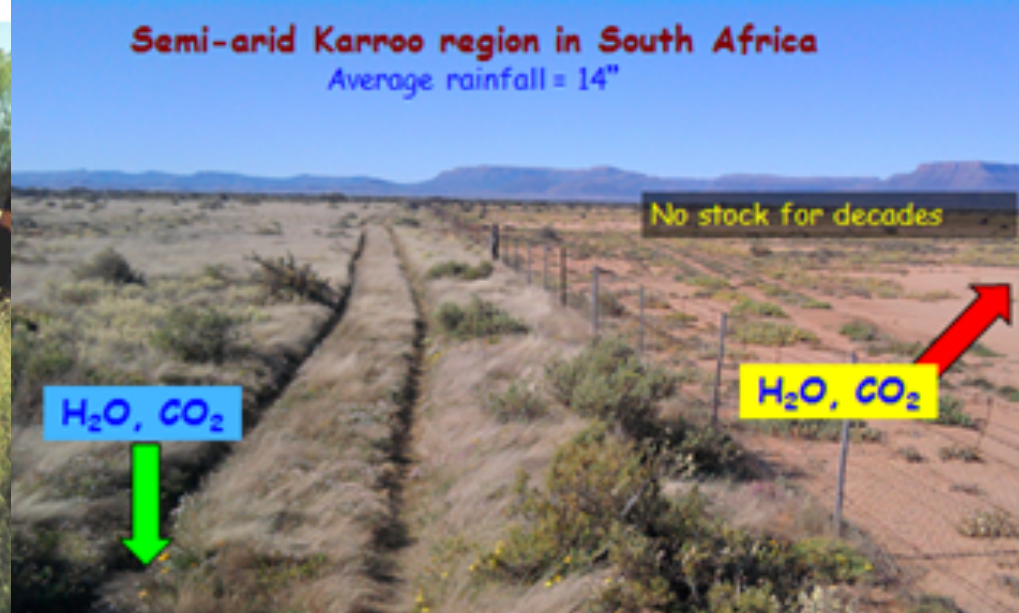
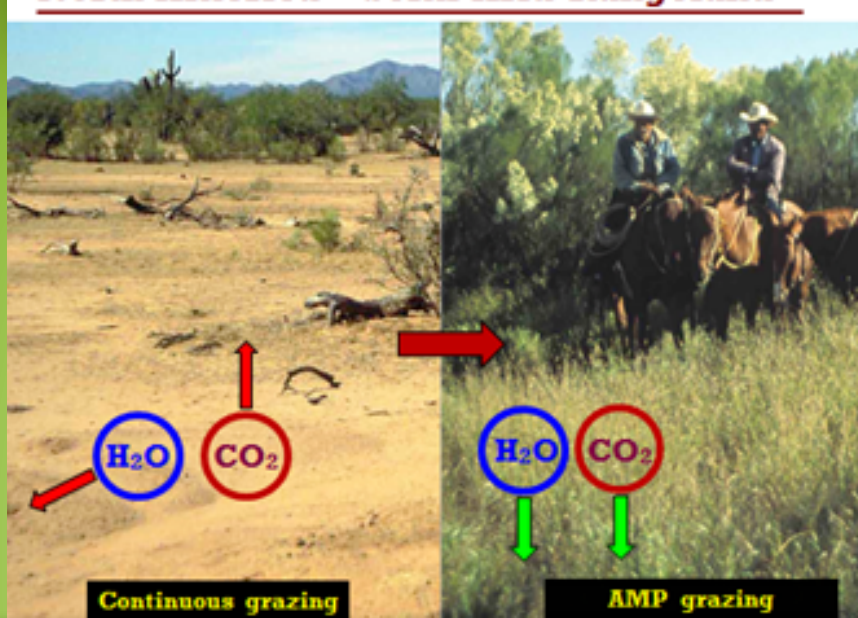


Light, quick graze early in season

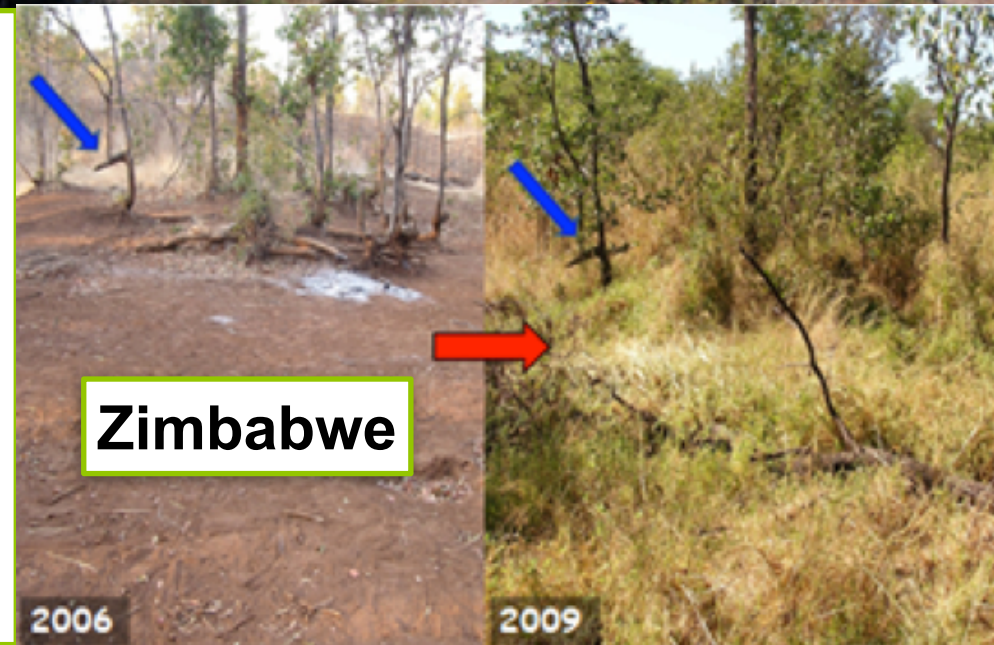


Later, graze for high trample to graze ratio

Regenerative/Holistic Grazing



- Regenerates degraded rangelands
 - Increases biodiversity
 - Improves water infiltration
 - Increases stock carrying capacity
 - Sequesters CO_2
 - Biodegrades methane
- Pictures:
Richard Teague



High Yield Regenerative Organic no-till Agriculture



Pictures: Rodale Institute

No Till without Herbicides



Eco Function Intensification



The desmodium, suppresses weeds, adds nitrogen, conserves the soil and water, repels pests, attracts natural enemies and provides high protein stock feed



Eco Function Intensification



Cover Crop suppresses weeds, adds nitrogen, conserves the soil and water, repels pests, attracts natural enemies and provides high protein stock feed



Shade and Replacing with Beneficial Species as Weed Control – Soy Beans in Sugarcane

Cover Crop suppresses weeds, adds nitrogen, conserves the soil and water, repels pests, attracts natural enemies and provides high protein stock feed

**Does not compete
for sunlight**

Fixes nitrogen and
soil carbon – roots
add nutrients
instead of
competing
Green Manure

Flowers attract
beneficial
Insects

Conserves water
and soil – living
mulch

**Maximize Solar Capture
to make
The Molecules of Life**



Legume vines in fruit trees. Example of
good practice and not a neglected orchard



**Maximize Solar Capture
to make**

The Molecules of Life

High Species Biodiversity

Does not compete for sunlight

Fixes nitrogen and soil carbon

Green Manure

Flowers attract beneficial Insects

**Conserves water and soil – living
mulch**

Minimal solar
capture

Not Eco-function
intensification



No Fix of nitrogen
and soil carbon

No Green Manure

No Flowers to
attract beneficial
Insects

Does not conserve
water

Soil subject to wind
and water
erosion



This is an example of worst practice in weed
and soil management

Thank You

