

Scaling Up Regenerative Practices in the Tropics



HACIENDA LAS IMAGENES

20 Years of Experimentation and Results on the Ranch



What We Will Talk About

- examples of regenerative practices beneficial to our ranching operation
- positive environmental results from regenerating natural systems

This will include:

- importance of diverse forests
- where cattle fit in to the regenerative movement
- soil organic matter and water holding capacity
- effects of grazing and maximizing carbon sequestration for the entire growing season
- importance of watersheds
- importance of diverse forage
- social significance of regenerating natural systems





The Importance of Diverse Forests

Maintaining ground cover.
Absorbing and retaining moisture.
Increasing forest coverage wherever possible.





From pastures to forest



Once bare, over-grazed, and burned annually



An Agroforestry Approach





Native Forage and Trees

- in seasonally dry environments, trees bridge the gap
- deep roots can draw up moisture deep in the soil profile
- evapotranspiration helps to maintain moisture cycling
- condensation and morning dew reduce a brittle environment
- shade and windbreaks hold moisture longer
- springs and aquifers increase in quantity and quality of water





Seeds as a Food Source

In the dry season, seeds become important.

New feed supplements are supplied naturally.

We could not maintain the healthy condition of our cattle without having interspersed trees and access to this important food source.



Guacimo seeds





Neighboring Pasture



What About Livestock

How do they fit in?



500 animals in 4 or 5 groups are moved through rotational grazing each day.
We have 100 permanent pastures.



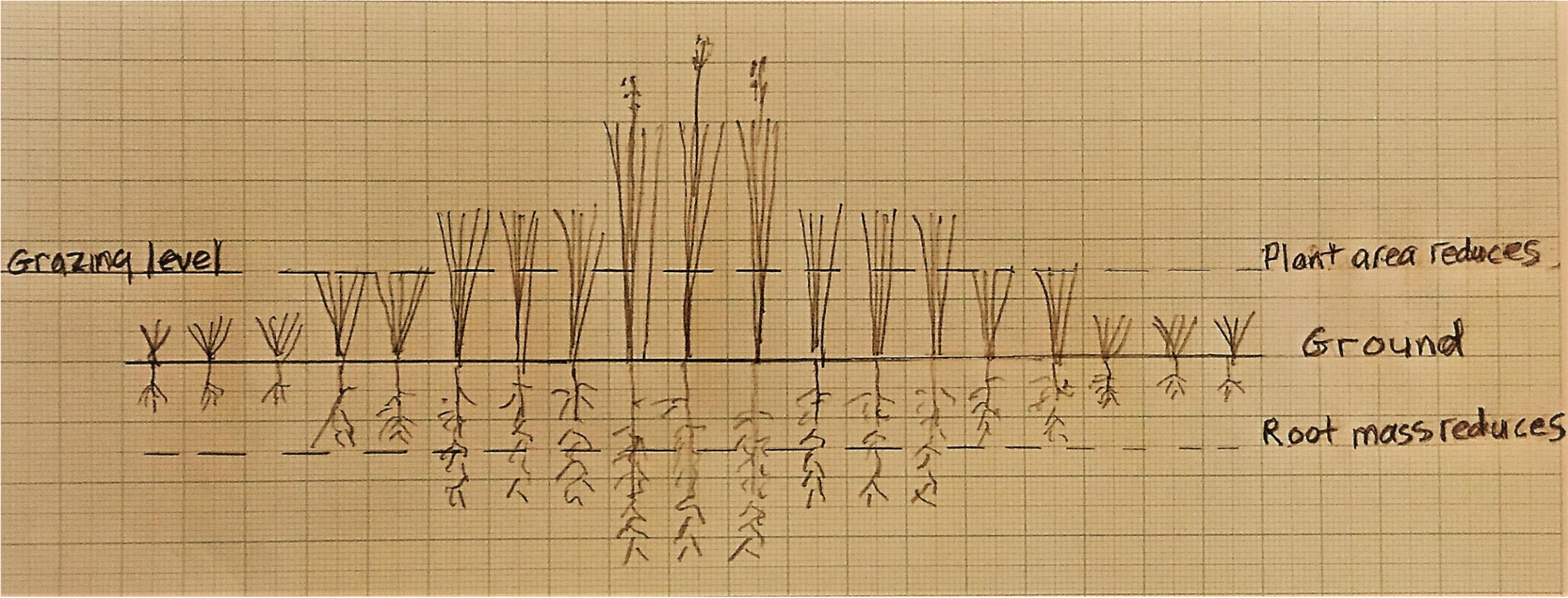




JOSHUA BERDUGO
PHOTOGRAPHY



Diagram of Grass Life Stages



Optimum Developmental Stage for Forage



- carbon sequestration into the soil is at it's highest potential
- forage is at optimum height
- sufficient surface and root mass are present
- there is active nutrient acquisition
- best time for quality tender forage
- stage of growth cows and other foragers are searching for

Mature Grass

vs.

Managed Grass





"Nature had to invent a 4 legged bio digester to process all of this surface material and build soil to maintain an atmosphere conducive to life".

Walter Jehn

Importance of Soil Organic Matter

"For every molecule of glucose formed through photosynthesis in green leaves six molecules of carbon dioxide are being drawn out of the atmosphere."

Dr. Christine Jones has two descriptive terms to explain the processes involved:

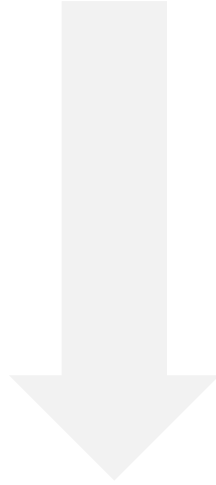
"Liquid carbon" is carbohydrate sugars being formed in the green leaves of plants. This energy is being utilized by the plant with the excess being passed through the roots and exuded into the soil. Microbes process this energy and fertile soil develops.

The microbes in turn supply nutrients, fertilizer, and moisture to the plant. This **"microbial bridge"** establishes a symbiotic relationship whereby increasing nutrient uptake allows for healthier plants that can process more solar energy to stimulate more microbial activity.

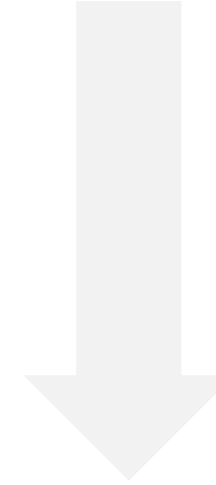


Reductions in Soil Organic Matter

- bare or fallow soil
- tillage
- burning
- chemical fertilizers
- herbicides



- fungicides
- pesticides
- monocultures
- over grazing
- under grazing



All of these activities inhibit the development of soil organic matter and microbial activity.

- Plants are healthier with diverse microbial activity in their root balls
- Cows are healthier with diverse microbial activity in their rumens
- Humans are healthier with diverse microbial activity in our guts



Maintaining Optimum Ground Cover



- even out different heights of grass and less desirable forage
- various forages returning at same growth cycle
- patterning



Effects of Grazing

- as plant surface area reduces, root mass will reduce or slough off correspondingly.
- decomposing root material and microbial activity increase.
- new roots begin to search out new routes.
- these root extensions increase aeration and water absorption.
- new leaves begin to grow and photosynthesis kicks in.
- carbohydrate sugars coupled with atmospheric nitrogen are collected and exuded through the roots into the soil further activating microbial activity.



Completing the Cycle



- In order to complete this cycle you need to have moisture and active soil to retain it.
- Water and soil organic matter become determining factors.
- 58% of soil organic matter is soil organic carbon
- "One gram of carbon can hold 8 grams of water."





Importance of Watersheds

- all land surface is a water shed
- the best place to store water is where it falls
- over a surface area of 40 acres 1" of rainfall equals 1,000,000 gallons of water



Ways to Slow Down Water

- a 1% increase in soil organic matter will allow for an additional 25,000 gallons of water per acre to be absorbed and retained
- each percentage of soil organic matter lost is going into the dry season with 25,000 gallons per acre less



- on the surface we establish 100% ground cover 100% of the time
- in the soil we increase soil organic matter for better filtration and retention
- at lower levels we stimulate biological tillage with differing root penetrations, opening up deeper routes for greater filtration at depth
- we allow for forest coverage wherever possible

Our Water Production

We produce and supply water to a town and 36 other farms that have lost their on farm water sources.

They are next door and just down the road.

What's different?

- extending natural forest coverage
- continuous ground cover
- intensive rotational grazing
- no chemicals
- microbial active soils



Our "microbial bridge" is intact.

Importance of Diverse Forage



Paspalum Notatum (bahía, gramma dulce, batatais)

- permanent forage for intensively grazed pastures
- drought resistant ground cover, soil binder with deep root system
- suitable for agroforestry
- can persist well under sustained grazing in shaded situations
- maintains dense stands due to nitrogen fixation in rhizosphere due to root associations with mycorrhizal fungi and diazotrophic nitrogen fixing bacteria
- grows in wide variety of ph
- survives flooding for over 30 days
- low growing grass that can tolerate constant or frequent defoliation
- highly competitive species particularly when it is frequently defoliated
- few pests and diseases
- requires intensive management* (because it grows so fast)



Achieving Desired Ground Cover

- persuading what we wanted, which typically grows shorter, mostly perennial
- dissuading what we didn't want, which typically grows taller, mostly annuals

Over time a ground cover of native grasses, legumes, and assorted forages has been established.

- Greater diversity in forage increases resiliency.
- Biological tillage is enhanced by different plants with different root penetrations.
- Different plants exude different exudates from their roots attracting different microbes.



"One of the most unnatural practices of conventional farming is its creation of vast landscapes in which only one type of plant is grown.

Such monocultures never occur in Nature.

A lush mixture of plants above ground means that there is a correspondingly lush community of microorganisms underground.

Different plants offer different root exudates and attract an array of different microorganisms, making soil overall more resilient.

Nature is always trying to restore balance to landscapes we degrade.

When we create bare ground, nature sends in a battalion of weeds to colonize and cover the soil.

When we establish a monoculture, nature sends in pathogens to weaken and even kill the crop allowing other species to fill the void."

Ademir Calagari





Social Significance of Regenerating Natural Systems



The real test for any agricultural endeavor is the amount of soil organic matter being added and whether soil fertility is on the way up or down.

The challenge for this century is to:

- maximize photosynthesis over greatest surface area and amount of time possible
- sequester carbon into the ground and build soil fertility
- establish forest coverage wherever possible
- stimulate microbial diversity
- increase water retention in our soils