Cover Crops for Cowboys

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Challenges in West Texas

**Nutrient Availability**
- Phosphorus Tie up
- MicroNutrient Deficiencies
- N Movement: Runoff, Leaching, Dentrification
- Nutrient Uptake & Efficiency
- Calcareous Soils
- High pH

**Soil Organic Matter levels**
- Tough Soils
  - Hard, Compacted
  - Sandy

**Pests & Disease Pressures**
- Pathogens including soil borne diseases
- Insect & Weed Pressure
West TX Soil Properties

Challenges:
- Low Organic Matter
- High pH
- P:Ca - P Availability
- Ca:Mg - Mg Imbalance
- K:Mg - Mg Imbalance
West TX soil biological properties

VAST - Soil Aggregation score
SLAN - How much N will be released during stress
HT3 - biological activity
C:N - N storage capacity
WEOC - water extractable carbon, better indicator than OM
WEOC/CEC = double digit = high yield potential
% improvement No Till over Conventional Till

- **OM**: 7%
- **pH**: 4%
- **P:Ca**: 33%
- **Ca:Mg**: 24%
- **K:Mg**: 1.5%
- **VAST**: 29%
- **HT3**: 25%
- **WEOC**: 7%
- **WEOC/CEC**: 16%
The Ideal Soil

- Pore space: 50%
-Solids: 50%
- 25% Water
- 45% Inorganic (mineral materials)
- 25% Air
- 5% Organic Matter
Keep Soil Covered

1. **Controlling Wind & Water Erosion** - holds soil in place along with valuable SOM and Nutrients

2. **Evaporation Rates** - reduce, keeping more moisture for plant use

3. **Soil Temps** - maintains a more moderate range of soil temps, the soil food web functions best when temps are moderate

4. **Compaction** - rainfall/irrigation on bare soils is one cause for soil compaction. Water = weight. Energy of water drop is dissipated when it hits plant material

5. **Suppress Weed Growth** - limits amount of sunlight to weed seedlings and uses excess nitrates reducing availability to weeds

6. **Habitat** - provides a protective habitat for the soil food web’s surface dwellers
Soil Water and Temperature Interactions on Biology

- Microorganisms are most active between 50-75% soil moisture
- Microorganisms are most active between 40-80F
  - For every 10F temp increase the activity of the soil will double if adequate moisture is present
  - 1% increase in Oxygen will significantly increase the activity of soil microbes
Minimize Soil Disturbance

1. **Physical Disturbance** - tillage restricts infiltration of water and destroying biological glues that hold our soil together
   
   A. Water erosion, wind erosion, ponding water, crusting, SOM depletion

2. **Chemical Disturbance** - over application of nutrient and pesticide can disrupt the soil food web functions

3. **Biological Disturbance** - overgrazing limits the plants ability to harvest CO2 and Sunlight
Energize with Diversity

- **Legumes** are better at getting water into the soil more quickly and maintaining root-soil strength, ability to fix N, attracting beneficial insects, erosion control - SunnHemp, Cowpeas, Mungbeans, Austrian Winter Peas, Snow Peas, Vetch

- **Grasses** have fine rooting systems that enhance the stability of soil making more resistant to erosion. Suppress weed germination & growth, scavenge nutrients, loosens compacted soils, can suppress some plant parasitic nematodes - Cereal Rye, Oats, Barley, Sorghm/Sudangrass, Millet, forage sorghum

- **Brassicas** suppress plant parasitic nematodes and soil borne diseases, capture soil Nitrogen, breaking up soil compaction, weed suppression, root exudates that reduce pH in rhizosphere, improves water infiltration. - Radish, Turnip, Rapeseed, Canola, Kale, Collards

- **Broadleaf** useful for breaking up compaction, scavenging for nutrients, weed suppression - buckwheat, okra, sunflower
Maximize Living Roots

Roots nourish microbes by providing a food source. Plants release 10-40% of the Carbon fixed by photosynthesis therefore increasing SOM.

1. **Carbon Acidifies the soil.** Healthy plants produce exudates that acidify the soil, therefore reducing pH and making P more available

2. **Root tips** produce insoluble lubricating gel (Glomalin) that helps root penetration, gather nutrients, bind soil particles into aggregates that allow for better soil aeration and H2O percolation

3. **Exudates** are produced and leach from root surface. They can solubilize plant nutrients (P), change the redox state on the root surface making Fe more available, chelate Zn from clay surfaces.

4. **Sugars** are fed directly by roots to fungi & bacteria - ie. Rhizobia, Arbuscular Mycorrhizal fungi

5. **Dead Cells** are being lost from root surface continually - provides food for fungi and bacteria
How do you increase Soil Organic Matter?

• Organic Matter is material in the soil that was once part of a living organism

• Examples = plant leaves, stems, roots, animal manures, poultry litter, compost, sawdust, etc…

• Additions of these can increase soil organic matter

• Even management like not overgrazing pastures
Soils Higher in Organic Matter Hold More Water

- For Every 1% increase in soil organic matter, the soil will hold an extra 1” of water (27,200 gals/Acre)

- Living Plants not only help increase organic matter but improve infiltration to capture more water
Advantages of MultiSpecie Mixes for Grazing over 1 or 2 way mixes

- Plant diversity improves yield efficiency MORE AVG DAILY GAIN
- Plant diversity reduces, weather, insect and wildfire risks
- Plant diversity reduces risk of feed toxicity (i.e. nitrate toxicity, bloat, etc…)
- Plant diversity provides for a more balanced diet of protein, fiber, energy, and minerals
- And these complex mixes seem to have an extra benefit for the soil - improved pore space along with organic matter
Multi Specie Cover Crop Mixes are One New Efficient Way to Improve Organic Matter

**Long Term Benefits**

- Reduce Soil Erosion & Evaporation - protect the soil for more months in a year
- Increase Rainfall or Irrigation Infiltration
- Increase Soil Organisms in the top soil
- Mine Nutrients from deep in the subsoil
- Increase Soil Organic Matter - At the very least increase the water extractable organic carbon component
Fitting Cover Crops into a Rotation

• Multi Specie Cover Crop Summer mixes need 70-110 days to maximize yield potentials before freezing weather

• Multi Specie Cover Crop Winter Mixes need 50-80 days to maximize growth of legumes and brassicas to get most benefit

• Seeding after wheat harvest works well

• Seed after hay cutting or silage harvest

• Economics don’t justify taking out productive grass pasture
Beef Cow Herd Annual Feed Supply Utilizing MultiSpecie Cover Crop Mixes

**Warm Season Mix Example**
- Oats: 6 Lbs
- Wheat: 6 Lbs
- Barley: 6 Lbs
- Triticale: 6 Lbs
- Hairy Vetch: 2 Lbs
- Austrian Winter Peas: 4 Lbs
- Radish: 1 Lbs

**Cool Season Mix Example**
- Oats: 6 Lbs
- Wheat: 6 Lbs
- Barley: 6 Lbs
- Triticale: 6 Lbs
- Hairy Vetch: 2 Lbs
- Austrian Winter Peas: 4 Lbs
- Radish: 1 Lbs

**Graze Winter Mix**
- December
- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November

**Graze Summer Mix**
- Plant summer blend
- Graze pasture

**Plant winter blend**
- Sorghum/Sudangrass: 6 Lbs
- Millet: 12 Lbs
- Cowpeas/Soybeans/Mung Beans: 6 Lbs
- Sunnhemp: 4 Lbs
- Sunflower: 1 Lbs
- Radish: 1 Lbs
Recommendations for Multi Specie Cover Crops Grazing

• Seed 25-35 lbs of total seed per acre, Summer Blend needs to be seeded by Aug 10, Winter Blend needs be seeded by Nov 1. Don’t plant more than 1” deep

• Seed 4-12 different plant species (do include oats and radish)

• Soil Test and follow recommendations for the oats - may need to add some Nitrogen (20lbs preplant, top-dress 50lbs), Consider 1lb of Boron to help Brassicas, Don’t forget Sulfur to offset high pH.

• Biologicals work great in cover crop situation- adding more microbes to work in symbiosis with plants to increase benefits to soil

• Be aware of herbicide carryover restrictions from previous crop
Livestock Nutrition Center - Chuck Cosgrove

- 30 years in the beef industry
- Cow/calf
- Stockers
- Cover crop experience
- Mob Grazing
- Low Stress Cattle Handling
- Wide geographic experience
- 10 years in feed industry
- Cow/calf
- Stockers
- Background yards
1) Great Gains (and lbs/acre)

2) Extend your pastures

3) Save water & inputs

SIDE BENEFITS
- Awesome health
- No flies

SIDE SUCKS
- No roping
- No riding
GAINS

3.5 – 4.2 lbs./day

No implants

Anything over 2 – 2.5 will deposit intramuscular fat = Prime beef!
1) More of it

Grazing is a more efficient method of harvesting.*

*Source: Jim Gerrish
Keys to SUCCESSFUL Grazing

1) Short duration

GET OFF BEFORE THE NEW GROWTH “STARTS”
1) More of it

2) Longer

Some brassicas grow longer and retain nutrients:
- Turnips
- Beets
- Collards
- Rapeseed
Keys to SUCCESSFUL Grazing

1) Short duration

2) Leave lots of factory

Forget 50% - just leave LOT!
Grazing Animal is the Key to making MultiSpecie Mixes work Better - Gabe Brown

- Keep the soil covered with armor 365 days
- Keep a living root in the soil as much as possible
- Use the grazing animal to graze 1/3 and trample 1/3, let the other 1/3 stand for soil protection and regrowth
- Use no-till, or at least minimum till - why build organic matter just to destroy it
- Try new things - if you don’t fail at least 3x per year you aren’t progressing enough
Keys to SUCCESSFUL Grazing

1) Short duration

2) Leave lots of factory

3) Rest and relax
MIG / Mob Grazing

Negatives

1) Fencing
2) Time
3) Lack of Impact
Time = FENCING / MOVING

Manage several days ahead