Using Cover Crops and Irrigation Technology

Kelly Kettner – Muleshoe, TX
Jeff Miller – ForeFront Agronomy LLC
Historic Water Conservation Techniques

Surge valves
Pivot irrigation
LEPA system
Drip irrigation
VRD pump panels
Moisture Monitors
Variable Rate Irrigation

All of these are tools used to conserve water, but when it is gone, they don’t do much for you!

I had to start paying more attention to farm practices and less attention to EQUIP tools.

Soil Health practices use the water we have available more efficiently and work very well with the mechanical improvements mentioned above.
Reasons for soil health attention

• We are learning that soils need something growing on them at all times. They do not like direct sunlight.

• The use of cover crops is helping to smother weeds, cycle nutrients and stop erosion.

• Multi species cover crops help to host many beneficial insects that can help reduce insecticide use in nearby cotton fields.

• We are better understanding the role that microbes play in the soil ecosystem.

• Aids in the sustainable production of the soil.
Soil Health benefits

• Increased water holding capacity
• Less erosion
• Increased fertility
• Reduced chemical use
• Increased microbial activity
Principles of soil health

- Not plowing the soil
- Using cover crops during periods of no cash crop
- Using crop rotation to break pest cycles
- Reducing use of synthetic chemicals and fertilizers.
- Try to mimic the original ecosystem in place before human disturbance.
No tillage

- Builds soil structure
- Increased water infiltration
- Increased earthworm and microbe activity
- Begins to return soil to its natural state
How does tillage and residue cover affect water management in a field?

- **Residue**
  - Breaks up the rain (or sprinkler) water droplet instead of having it impact the soil directly and break down the aggregates causing compaction.
  - Creates a barrier that cuts down on moisture evaporation so the soil retains water longer.
  - Reduces runoff so there is less movement of sediment, fertilizers, and herbicides.

- **Tillage**
  - Breaks down aggregates and causes compaction reducing infiltration rates and water holding capacity.
  - There can be as much as 10 times more infiltration into a no till field vs conventional.
Infiltration Rate Comparison

Conventional Till Cotton

No Till Cotton

1:44

18:03
Water Holding Capacity Comparison

**No Till Cotton**

Field Capacity = 19.3" Soil Water Content

**Conventional Till Cotton**

Field Capacity = 18.6" Soil Water Content
Crop rotation

- Breaks pest cycles
- Adds organic carbon to the soil
- Creates greater populations of microbes
- Use water at different times of the year
Reduction of synthetic inputs

- Allows the microbes to behave in their natural state
- Helps to stimulate root growth which makes plants more drought and disease tolerant
- Creates a symbiotic relationship between fungi and plant roots.
Bio Mimicry

- Returning animals to the land
- Maintaining a grass residue
- Trying to restore our fields to their natural state when Buffalo roamed our vast grasslands
- Allows our soil to regenerate
Bio mimicry
Regenerative Farming
Cover crops

- Work to form the mulch needed to protect the soil surface
- Provide the environment for beneficial insects and microbes to thrive in
- Create the diversity needed to regenerate the soil
- Need multiple species
Blends

No perfect blend. I use what is cheap, available and adapted to my climate. Summer mix – Proso millet, German millet, pearl millet, mungbeans, sunnhemp, radish, sunflower.
Winter mix – Rye, barley, black oat, canola, winter pea, triticale, crimson clover, hairy vetch.
Grazing – I try to graze all of my farms if it is convenient, and there is a live root mass.
Cover Crop Water holding ability
Do Cover Crops Use Moisture?

Profile Daily Change

No Till - with multi species cover crop

Profile Daily Change

Conventional Tillage - No Cover Crops
Do Cover Crops Use Moisture?

Profile Daily Change

Profile Sum

Terminated Wheat/Radish Prior to No-Till Cotton

Sensors not included in sum:
- Percentage
- Inches

Forefront Agronomy, LLC
Precision Irrigation

What Determines Success?

- Increased Yields
- Decreased Inputs

Profit
Lloyd Arthur Pivot 12 Field Information
Ralls, TX 2018

- NG 3517 B2XF – 56,557 ppa
- RePlanted – May 31st
- Fertility – 32-0-0 240lb/A
- Herbicide – Trifluralin, Direx, Staple, Engenia, Smoke Helosate
- Harvested - 12-2
Lloyd Arthur
- Ralls, TX

Cotton Planted multiple times due to weather, finally got a good stand the first of June.

Split in half VRI vs Flat Rate of 1”

Flat Rate needed one more irrigation to finish out
<table>
<thead>
<tr>
<th>Irrigation Scheme</th>
<th>Avg Application/Pass</th>
<th>Total inches applied in season</th>
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<tbody>
<tr>
<td>VRI</td>
<td>0.985</td>
<td>9.59</td>
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<tr>
<td>Flat Rate</td>
<td>1.000</td>
<td>10.37</td>
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</tbody>
</table>

10.37” applied

17.24” rainfall
Flat Rate vs VRI Yield Comparison
2 yr – Arthur Farms

- Flat Rate: 801.22 lbs of Lint/A
- VRI: 951.5 lbs of Lint/A
Flat Rate vs VRI Loan Rate Comparisons 2yr – Arthur Farms

- Flat Rate: $0.5000
- VRI: $0.5244

$.024/lb advantage
<table>
<thead>
<tr>
<th>Sector</th>
<th>Yield</th>
<th>Lint</th>
<th>Total</th>
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<tr>
<td>Flat Rate</td>
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<td>$400.62</td>
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<tr>
<td>VRI</td>
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<td>.5244</td>
<td>$498.97</td>
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<tr>
<td>VRI Advantage</td>
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<td>$.0244</td>
<td>$98.35</td>
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<tr>
<td>Probe Cost</td>
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<td></td>
<td>-$13.3/A</td>
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<tr>
<td>VRI Cost</td>
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<td></td>
<td>-$6/A</td>
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<tr>
<td>Controller Cost</td>
<td></td>
<td></td>
<td>-$10.83/A</td>
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<tr>
<td>Water savings of 0.52” @$8/inch</td>
<td>$4.16</td>
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<td>$72.38</td>
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## Nozzle Spacing Comparison

<table>
<thead>
<tr>
<th>Irrigation Type</th>
<th>Yield</th>
<th>Loan</th>
<th>$/A</th>
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<tbody>
<tr>
<td>40” Drop Spacing</td>
<td>793.7</td>
<td>$0.5339</td>
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<tr>
<td>80” Drop Spacing</td>
<td>548.3</td>
<td>$0.5049</td>
<td>$276.81</td>
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</tbody>
</table>

11.86” of irrigation in season  
17.24” of rainfall
Kelly Kettner – Muleshoe, TX

**Corn** – 1” applications early then switched to 1.5” applications

**Cotton** – 0.5” application early then switched to 1” applications

Corn planted at 23K, chopped for silage and made 19 tons

Very consistent plant height, ear size and yield across all regions

Cotton had very even emergence across all zones, 1554lbs/a $0.56 loan
What’s happening below the ground?

What’s the cost of estimating?

The #1 way to SAVE money?

ELIMINATE WASTE

The #1 way to MAKE money?

MAXIMIZE ROI

Return on INPUT!
Technology is **NOT** the Solution

The **ADOPTION** of Technology is the Solution