Introduction to Section 1 (1f – Making the Transition to Minimum-Till and No-Till in Irrigated Agriculture)

Top ten critical factors for no-tillage adoption:

- (1) Improve your knowledge about the system, especially weed control
- (2) Analyze your soil (aim at a balanced nutrient and pH status)
- (3) Avoid soils with bad drainage
- (4) Level the soil surface
- (5) Eliminate soil compaction
- (6) Produce the highest amount of mulch possible
- (7) Buy a no-till seeding machine
- (8) Start on 10 percent of your farm
- (9) Use crop rotations and green manure cover crops
- (10) Be prepared to learn constantly and stay up to date with new developments

Key Words: Biodiversity, Minimal Soil Disturbance & Integrated Cropping System

Data-Set (West ABQ)

<table>
<thead>
<tr>
<th>Year</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Precipitation (inches)</td>
<td>0.47</td>
<td>0.43</td>
<td>0.59</td>
<td>0.51</td>
<td>0.59</td>
<td>0.67</td>
<td>1.26</td>
<td>1.73</td>
<td>1.06</td>
<td>0.98</td>
<td>0.63</td>
<td>0.47</td>
<td>Total = 9.48</td>
</tr>
<tr>
<td>Avg. High Temp. (°F)</td>
<td>48</td>
<td>55</td>
<td>62</td>
<td>71</td>
<td>80</td>
<td>92</td>
<td>89</td>
<td>82</td>
<td>71</td>
<td>57</td>
<td>48</td>
<td></td>
<td>Hardiness Zone 7b</td>
</tr>
<tr>
<td>Avg. Low Temp. (°F)</td>
<td>24</td>
<td>28</td>
<td>34</td>
<td>40</td>
<td>50</td>
<td>59</td>
<td>65</td>
<td>63</td>
<td>56</td>
<td>44</td>
<td>32</td>
<td>24</td>
<td>Total = 5,019 GDD</td>
</tr>
<tr>
<td>Heat Units (GDD)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>93</td>
<td>315</td>
<td>620</td>
<td>885</td>
<td>1,038</td>
<td>961</td>
<td>720</td>
<td>387</td>
<td>0</td>
</tr>
<tr>
<td>Crop Rotation (Cash Crop &amp; Cover Crop)</td>
<td>1st yr.</td>
<td>Cover Crop</td>
<td>Sweet Corn</td>
<td>2nd yr.</td>
<td>Cover Crop</td>
<td>Pinto Beans</td>
<td>3rd yr.</td>
<td>Cover Crop</td>
<td>Green Chile</td>
<td>4th yr.</td>
<td>Cover Crop</td>
<td>Squash</td>
<td>5th yr.</td>
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<tr>
<td>Irrigations for 1st year</td>
<td>in.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Growing Degree Days (GDD) = (max daily Temp. + min. daily Temp.)/2 minus base Temp. of 45 °F (if answer is negative, assign zero GDD). Average Method used.

Soil Health

Integrated Cropping System (ICS) for irrigated agriculture includes conservation practices such as:

1. Irrigation System (drip, hi-flow, sprinkler, etc.)
2. Irrigation Land Leveling
3. Irrigation Water Management
4. Cover Crop Cocktails (grasses, legumes & brassicas)
5. Residue Management (Minimum- and No-Till)
6. Integrated Weed Management
7. Nutrient Management
8. Crop Rotation (warm & cool-season crops of both grass and broad-leaved plant families)
9. Prescribed Grazing (if it fits in the ICS)
10. Pollinators and Insectaries
11. Integrated Pest Management

Weed Control: In No-Till, herbicides replace tillage. The more diversity in the rotation, the easier it is to control weeds. Cover crops compete with weeds (some produce allelochemicals, while decomposing, that inhibit weed growth). Different planting and harvest dates among crops provide additional opportunities to prevent either plant establishment or seed production by weeds. Crop residue serves to suppress establishment of the weeds (NOTE: Straw & chaff must be uniformly spread over the Entire surface at harvest).

Also, use various different modes of action when applying herbicides to prevent development of herbicide resistant weeds.

Nutrient Management: Take irrigation water, soil and plant tissue samples/tests for developing nutrient budget. Estimating crop demand for nitrogen based on yield potential is the first step in determining application rate. Initially, tie-up of N in the soil organic matter will increase, until new equilibrium is established (i.e., higher OM).

Managing Diseases and Insects: Crop rotations are the most effective way of reducing many pest populations (e.g., rotating between broad-leaved crops & cereal crops can break the disease pathogen’s cycle on the residue). Choose disease-resistant plant varieties, use certified seed & apply seed treatments if needed.

Monitor environment, weather and crop growth stage. Because disease pathogens can develop resistance to pesticide, be sure to rotate with different modes of action, from different chemical classes.

Additional Planning Considerations: Implement an intensified (i.e., manage soil water for optimum use) and diversified production system that utilizes deep- and shallow-rooted plants.

Producers must use a dynamic cropping approach, where management decisions are adjusted annually based on changing climatic and economic conditions. Use a net return per rotational acre to measure profitability of various crop rotations. It is important to evaluate the rotation effect and to optimize the crop synergy of your ICS. On-farm research and demonstrations is essential to determine what will best work on your farm (detailed record keeping is a must).

Restoring Soil Health to achieve Economic and Environmental Ag Sustainability: Remember that biodiversity with minimal soil disturbance drives soil health. Therefore, growing diverse crops will develop a diversity of organisms in the soil. Also, bringing livestock into the operation will add additional diversity into the system (grazing returns most of the nutrients harvested in feed back into the soil). Surface residue left by no-till/minimum-till conserve moisture and protects soil from wind and water erosion. There are many benefits when implementing an ICS based on soil health, such as: saving time, labor, equipment and money (i.e., reduced fuel and inputs); improved wildlife habitat, restored watersheds, etc.


Agronomy Tech Note 76 (http://www.nm.nrcs.usda.gov/technical/handbooks/iwm/nmiwm.html)