

Soil Moisture and Cover Crop conditions.

The equipment used to generate this report includes: 12 soil moisture sensors, 4 temperature sensors, two end node stations, two relay node stations, one base station and one data logger model # 975, from the Irrrometer Company in California. And various wood posts and galvanized pipe. Each soil moisture station included 3 soil moisture sensors, and a temperature sensor, a solar electronic relay station. The sensors were wired to the relay station. The moisture sensors were buried at depths of 12, 24 and 36 inches, the temperature sensor was at a depth of 12 inches.

Soil moisture sensors, base station and data logger were installed on a producers fields, 30 miles south and southeast of Baker Montana on June 16, 2015. Ann Fischer - District Conservationist, Robert Mitchell – Resource Soil Scientist, and Randy Pierce – State Irrigation/Water Management Engineer installed 4 sets of soil moisture stations in two different fields. Two stations on each field. One field was soon to be planted in a cover crop mix, and the other field was planted with emerged crop of corn. The soils were all classified as Sandy loam in both fields.

Soil moisture readings were sent automatically from the relay station to a Base station which collected all information from all stations. The Base Station would organize this data and send it to a data logger station. The data logger information is then down loaded to a laptop or tablet. Ann Fischer, downloaded data monthly throughout the growing season.

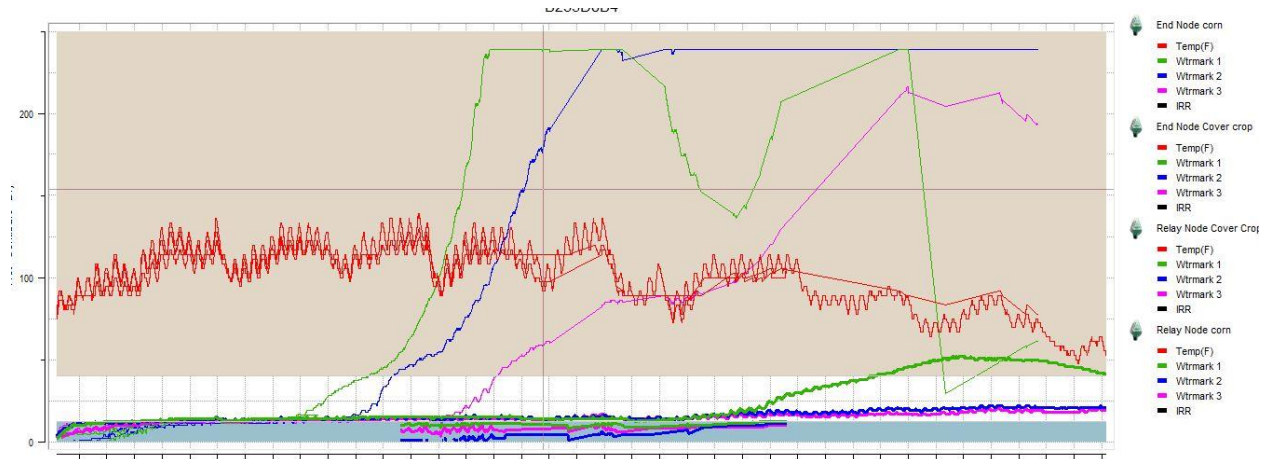
Observations between cover crop and corn field:

1. Temperatures were relatively the same between both crops, since both crops provided shade to the soil surface.
2. All sensors were installed in very moist soil, less than 10% soil water depletion.
3. One station in the corn crop stopped reporting on 7/14/2015, due to line of site from the relay station to the base station was compromised by the tall crop.
4. The reporting station in the corn showed the moisture use rate rapidly increasing due to the crops Evapotranspiration rate. The data shows corn went into stress when the Centibar reading goes above 40. This crop continued to use moisture in the soil until the sensors read 240 centibars which is the maximum value they can read. This Centibar value equates to approximately 80% of depleted soil moisture.
5. Soil temperatures started to drop slightly when the crops reached maturity.
6. Cover crop soils stayed in a moist condition on both stations until August 28th. On September 3rd one of the relay station stopped sending data to the base station due to line of sight compromised.
7. The 12 inch moisture sensor in the cover crop reached a maximum value of 53 Centibars on September 23, 2015, then started to go down as the crop started using less water. The other two sensors (24 and 36 inch depth) always stayed below 20 Centibars which is always in good soil moisture for a crop.

So a question to ask is why in a cover crop field, soils always showed moist conditions verses a corn field that showed moisture used at an expected rate and cause depleted conditions.

Does the cover crop, which may have more plants per square foot, trap relative humidity which is not measured by a rain gage? Or does a cover crop mixture just not use the same evapotranspiration rate as a single type crop?

Soil moisture on 10/01/2015, interpreted from graph. On Corn field 1.5 inches of water remaining in a soil that would hold 5.3 inches. Cover crop field, 5.11 inches of water remaining in a soil that would hold 6.25 inches.



Highlighted areas in dark blue is very moist, in the lighter brown start of crop stress. Red line is soils temperatures, green line represents 12 inch moisture sensor, dark blue line 24 inch moisture sensor, and magenta line 36 inch moisture sensor. Bolded lines represent cover crop tracking.

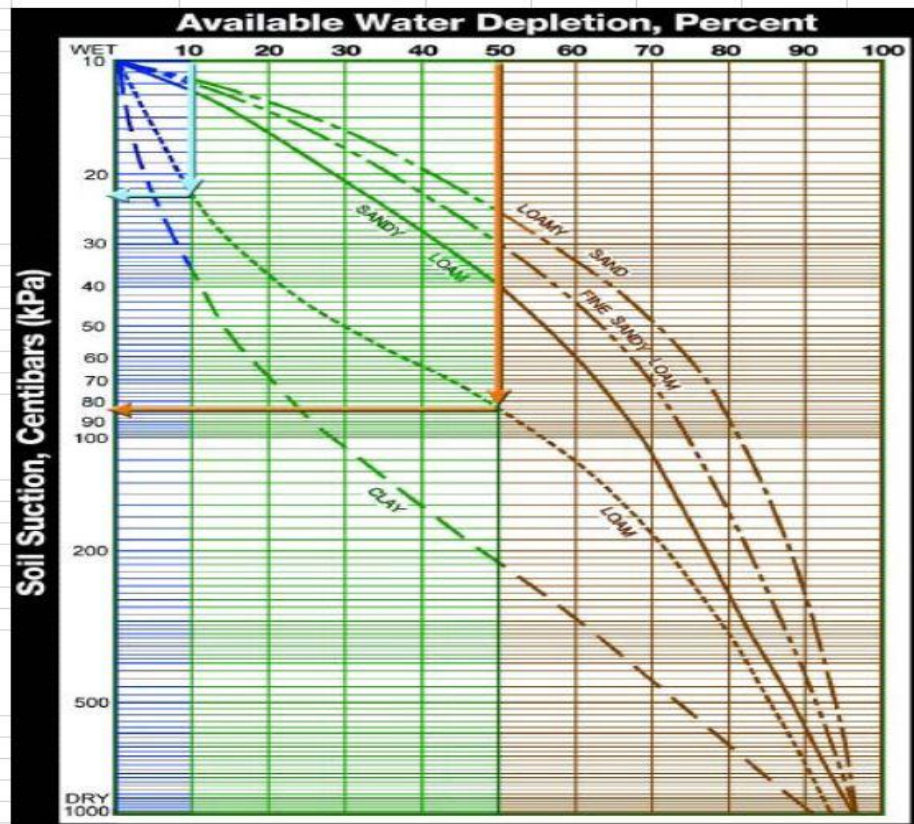


Chart from Irrrometer company on centibars and AWD based on soil textures.

Photos from Ann.



Height of cover crop field



Beneficial insects in cover crop field



Nodules on Pea plant



Corn field crop

Ann also reported three hoops clippings on the cover crop averaged 25,400 lbs of wet weight per acre. Which should be roughly 7620 pounds of forage per acre if using 30% for dry weight.