"Planting Green – Extending the Growing Season to Get More Payback from Cover Crops"

Progress Report – Feb 2022

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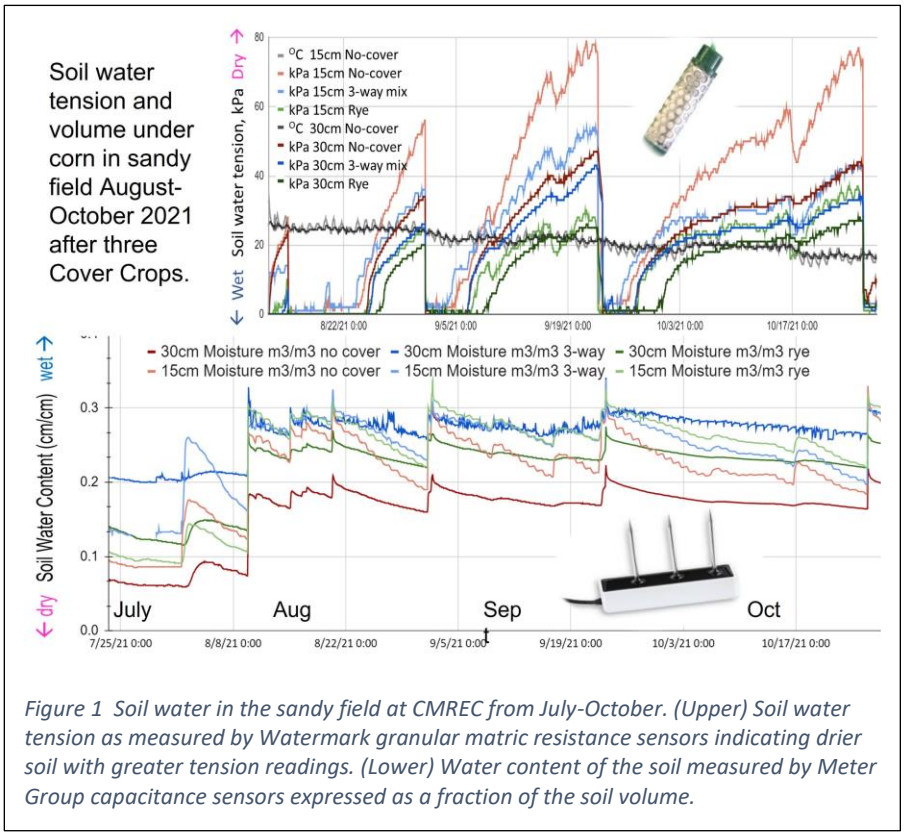

Figure 1 Soil water in the sandy field at CMREC from July-October. (Upper) Soil water tension as measured by Watermark granular matric resistance sensors indicating drier soil with greater tension readings. (Lower) Water content of the soil measured by Meter Group capacitance sensors expressed as a fraction of the soil volume.

Field research work continued at the three sites at Central Maryland research and education center. During the summer soil moisture and temperature sensors were installed into replications at each site for each of the treatments. Shallow trenches were dug to bury the wire so that the installation could be permanent and the data loggers that received the signals were installed just outside the field where they would be out of the way of field operations. Therefore we anticipate being able to monitor soil conditions continuously even during harvest and planting without having to remove and reinstall the sensors.

Data logged between July and October 2021 was downloaded and is summarized for the field with sandy soil in figure 1. The figure presents two kinds of data collected by two different kinds of soil water sensors placed in the no cover, three-way mixture, and rye cover crop treatment plots during the corn growing season. These cover crops were inter-seated into soybeans in the fall of 2020. The upper part of the figure shows the data from watermark granular matrix resistance sensors that indicate soil water tension with greater tension indicating dryer soil and lower tension indicating water soil with saturated soils near zero. This type of sensor becomes more sensitive in the moisture stress range and less sensitive in the very wet soils so is ideal for monitoring drought stress on crops but not great for monitoring saturated conditions that might induce denitrification losses of into gas or conditions too wet for good root growth. The lower graph presents data from a completely different type of sensor installed in a different replication block of the field but the same cover crop treatments. These data are collected by capacitance probes which determine the volumetric water content of the soil. With this data, the higher water content is wetter soil and low water contents are dry soil. In the data from both types of sensors in both parts of the experiment, the patterns were similar even though the graph is the mirror image. The brown lines represent the no-cover control plots with the darker brown being the

water measurements at 30 cm deep and the lighter brown being the water measurements at 15 cm. With both types of sensors and in both parts of the field these no cover control plots became significantly drier than the cover crop plots and both depths. Having very similar results from two completely independent types of measurements in different parts of the field heads to the confidence was which we can say that cover crops conserved moisture drink the dry. Of the summer. In both graphs we can especially see that the shallow soil in the no cover plot that had minimal residue on the surface dried out more rapidly than the other soils after each rainfall. This cover crop effect on soil moisture produced visible differences in corn growth and leaf morphology during dry periods in the summer but we're not reflected in the final corn yields.

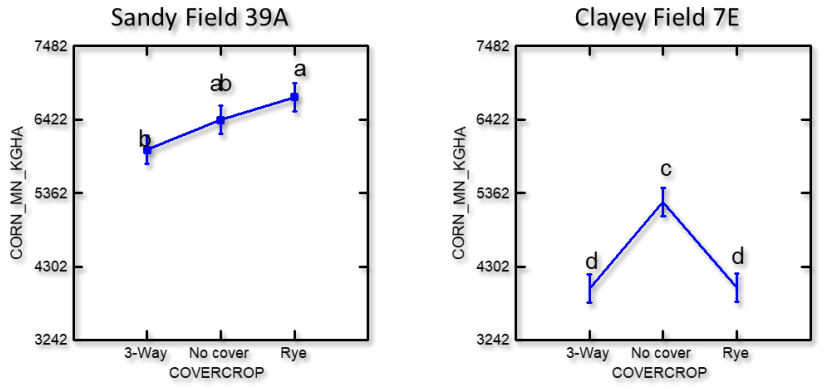

Figure 2 Effect of cover crop treatment on corn yields as measured by combine yield monitor on two fields of contrasting soi texture at CMREC. The lower yield in the rye and 3-way cover crop plots in the clayey field (Right) was mainly due to damage caused by the interseeder drill operation performed when the soil was excessively wet in June.

Similar data (not shown) was collected in the soybean plots where the cover crop residues originated from cover crops interseeded into corn in fall 2020.

The spring of 2021 was much cooler and wetter than normal and these conditions resulted in significantly lower yields on the clay field compared to the Sandy field (figure 2). The clay field had long periods with standing water in places and was excessively wet at the time of cover crop interseeding by the high clearance drill method at corn lay by. These wet conditions led to some damage to the corn seedlings during the cover crop inter seating drill pass and also led to very high weed pressure. The combination of weeds and damage were probably responsible for the lower yields and the lack of damage from the inter-seater drill in the no-cover plots probably accounts for the somewhat higher yields under that treatment in the clay field. Yields were significantly higher in the Sandy field across the board and there the rye cover crop plots yielded more corn than the three species cover crop plots did with the no cover crop but in between and not significantly different from either (figure 2, left side). The three cover crop treatments were split into three rates of nitrogen applied to corn its high dressing and these nitrogen effects will be discussed later.

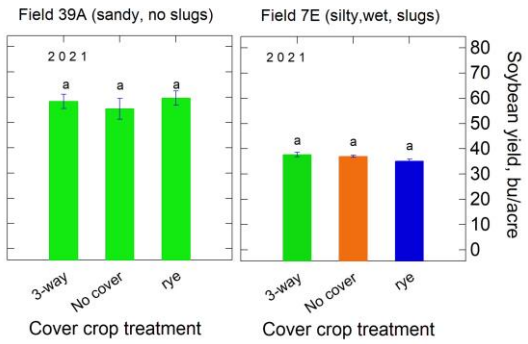

Figure 3 Soybean yields were much higher in the sandy field than in the silty clay loam field, mainly because of early slug damage and excessively wet spring conditions in the latter. Cover crop treatment had no effect on soybean yields in either field.

Soybean yields were significantly higher in the Sandy field than in the clay field. In the case of soybeans, the lower normal yields in the clayfield were due to a combination of the above-mentioned cool and

excessively wet conditions as well as damaging slug infestation. The effect of cover crops and termination date on slug damage was discussed in a previous progress report. Neither the wetness nor the slug problem was present in the Sandy field and yields averaged near 60 bushels per acre for all cover crop treatments.

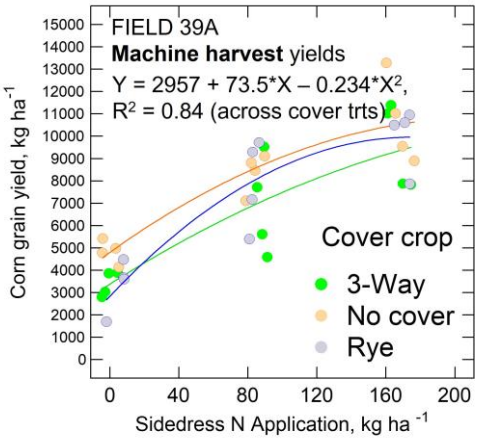

Figure 4 Fall 2021 corn yields at three N rates following three cover crop treatment inter-sown into 2020 soybeans. Cover crop treatment did not affect the corn response to nitrogen fertilizer.

Figure 4 shows the corneal response to side-dress nitrogen rates as affected by the cover crop treatment. There was a good response to applied nitrogen on both fields. Only the data for the Sandy field is shown in figure 4. Nitrogen nearly tripled the yield with the highest rate of nitrogen being 168 kg per hectare or 150 lb of nitrogen per acre. There was no significant effect of cover crop on the response curves, even though the three-way cover crop had large amounts of clover in it and termination in May.

At the first leaf drop in the soybean plots, the 2021 - 2022 cover crop was planted using the highboy air seeder. In the corn plots, the cover crops were interseeded with the highboy air seeder in August. Cover crop biomass accumulated in Fall was measured in late November and early December and the dry matter values are presented in figure 5 (note the different y-axis scales for corn versus soybean). Cover crop dry matter was less than half is large in the soybean as compared to cover crops sown into corn. This is largely due to the later planting date since we had to wait until leaf drop on the soybean crop which occurred in early to mid-September. The earlier interceding in the corn allowed more growing degree Days for the cover crop as the sunlight began to penetrate the senescing corn canopy in late August and early September. There was also a marked difference in the species composition even though the same seating mixtures were used in the two crops. For the cover crop interceded into the soybean canopy, the dominant species was rye with radish second and then clover. In the corner in the dominant species was radish and in the sandy field, clover was nearly as large. In both fields, very little rye was present in the cover crop. There were more weeds in the corn than in the soybean plots.

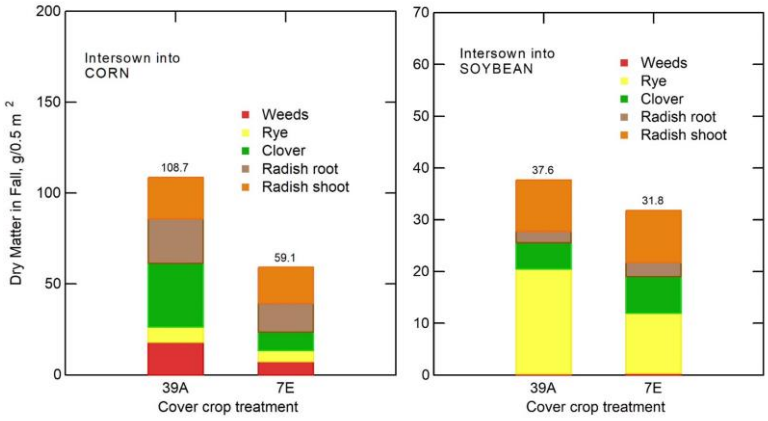

Figure 5 Fall 2021 cover crop dry matter (gram per 0.5 m²) by species for sandy and clayey fields in corn (left) and soybean (right). Note the different scales.

The hundreds of dry matter samples have been collected, dried, and ground from the cover crops and will soon be analyzed for their nitrogen content. We intend to rotate between corn and soybean crops in the spring and apply the differing termination date treatments. We also hope to study slugs in the clay field again in the spring as we're confident that that field is infested with slugs.