2020 Corn Cropping Systems to Improve Economic and Environmental Health

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Series, Fact Sheet Number 19-05b). Predicted soil protein is used to quantify organically bound nitrogen (N) that microbial activity can mineralize from soil organic matter and make plant-available. Percent organic matter was measured by loss on ignition when soils are dried at 105 to remove water then ashed for two hours at 500 . Total carbon (organic and inorganic forms) is measured using complete oxidation of carbon at high temperature combustion (2000° F). Total nitrogen is measured with DUMAS combustion methodology. It measured organic (living and non-living) and inorganic (mineral) forms of nitrogen. Active carbon (active C mg/soil kg) was measured with potassium permanganate and is used as an indicator of available carbon (i.e. food source) for the microbial community. Soil respiration (CO_2 mg/soil g) is measured by amount of CO_2 released over a four-day incubation period and is ivat9Qq0.0[ )]T3.62 Tm0 g0 G -0.-33(i)6.

Table 2 .

non-protein nitrogen, fats and other highly digestible compounds; and the less digestible components found in the fiber fraction. The total fiber content of forage is contained in the neutral detergent fiber (NDF). Chemically, this fraction includes cellulose, hemicellulose, and lignin. Because of these chemical

means that the yields with these treatments

Soil Test Results

On 29-Apr, before field operations, soil samples were collected on all plots. Overall, treatments that were in RotYr1 had superior soil quality when compared to any of the corn cropping systems. The RotYr1 treatment had significantly higher organic matter, active carbon, total carbon, total nitrogen, soil protein, and aggregate stability. For the last six years, RotYr1 consistently had statistically significantly higher soil respiration than the corn treatments (Tables 5 and 6). The RotYr1 had significantly higher su 792 re.e soil

significantly higher in the NT and WCCC treatments than the CC and RotYr1 treatments. Hence, the nitrogen recommendations were significantly lower for NT and WCCC plots. Nitrogen, in the form of urea (46-0-0) with ContaiN Max was applied to the corn treatments at a rate of 200 lbs ac^{-1} (92 N lbs ac^{-1}) on 23-Jun.

Table 7. Soil nitrate-N and N recommendations for medium and high yield potential, Alburgh, VT, 2020.

† Within a column, treatments with that same letter did not perform significantly different from each other.
‡ LSD – Least Significant Difference at p=0.10.

Cover Crop Results

On 5-May, cover crop samples were taken in the WCCC plots. The winter rye cover plots yielded an average of 820 dry matter (DM) lbs ac^{-1}. On average, cover crop biomass was 43% carbon and 3.75% nitrogen for an average C:N ratio of 14:1. This equivalates to 353 lbs ac^{-1} of carbon and 31 lbs ac^{-1} of nitrogen. This coincides with the PSNT test indicating more available nitrogen in the cover crop plots.

Corn Silage Results

On 1-Sep, data was collected on corn silage populations. CC, NT, and WCCC plots were harvested on 3-Sep and RotYr1 on 29-Sep to determine moisture and yield (Table 8). Although the NT system had statistically significantly higher plant populations at harvest and the RotYr1 corn was planted much later, there was no corn yield or total yield (corn plus perennial forage) differences among the treatments (Figure 1). The RotYr1 had significantly higher percent dry matter likely associated with the fact that the plots were hit by a killing frost prior to harvest.

Table 8. Corn silage population, harvest dry matter and yield by treatment,

Figure 1. Cropping system total yield, Alburgh, VT, 2020.
†

Table 10. Impact of harvest date on perennial forage quality, 2020.

Rotation	Cut date	Cut no.	Yield % DM lb ac^{-1}	CP % of DM	ADF % of DM	NDF % of DM	NDFD48 % of NDF	TDN % of DM	NE_L Mcal lb^{-1}	Milk lbs ton^{-1}
RotYr1	26-									

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