# 2022 Corn Cropping Systems to Improve Economic and Environmental Health

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# 2022 CORN CROPPING SYSTEMS TO IMPROVE ECONOMIC AND ENVIRONMENTAL HEALTH

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In 2022 continued a multi-year trial at Borderview Research Farm in Alburgh, VT to assess the impact of corn cropping systems on overall health and productivity of the crop and soil. Management choices involving crop rotation, tillage, nutrient management, and cover crops also make differences in the long term. Yields are important and they affect the bottom line immediately and obviously. Growing corn with practices that enhance soil quality and crop yields improves farm resiliency to both economics and the environment. This project evaluated yield and soil health effects of six

to the development of NDFD. This in vitro digestibility calculation is very important when looking at how Higher rates of digestion lead to higher dry matter intakes and higher milk production levels. Similar types of feeds can have varying NDFD values based on growing conditions and a variety of other factors. In this research, the NDFD calculations are based on 30-hour in vitro testing.

Net energy for lactation ($NE_L$) is calculated based on concentrations of NDF and ADF. $NE_L$ can be used as a tool to determine the quality of a ration, but should not be considered the sole indicator of the quality of a feed, as $NE_L$ is affected by the q
consumed, the contents of the ration, feeding practices, the level of her production, and many other factors. Most labs calculate $NE_L$ at an intake of three times maintenance. Starch can also have an effect on $NE_L$, where the greater the starch content, the higher the $NE_L$ (measured in Mcal per pound of silage), up to a certain point. High grain corn silage can have average starch values exceeding 40%, although levels greater than 30% are not considered to affect energy content and might in fact have a negative impact on digestion. Starch levels vary from field to field, depending on growing conditions and variety.

Milk per acre and milk per ton of harvested feed are two measurements used to combine yield with quality and arrive at a benchmark number indicating how much revenue in milk can be produced from an acre or a ton of corn silage. This calculation relies heavily on the $NE_L$ calculation and can be used to make generalizations about data, but other considerations should be analyzed when including milk per ton o4( )43(o)1ecaty

# RESULTS

**Weather Data**

Weather data were collected with an onsite Davis Instruments Vantage Pro2 weather station equipped with a WeatherLink data logger. Temperature, precipitation, and accumulation of Growing Degree Days (GDDs) are consolidated for the 2022 growing season (Tables 3 and 4

**Table 7. Soil nitrate-N and N recommendations for high yield potential, Alburgh, VT, 2022.**

LSD Least Significant Difference at p=0.10.
NS No significant difference was determined among the treatments.

## Cover Crop Results

On 2-

concentrations in each treatment. Higher yielding treatments also had the potential to produce larger ear size and better quality feed.

**Table 9. Impact of cropping systems on crop quality, 2022.**

| | | | | | | | Milk | |
|---|---|---|---|---|---|---|---|---|
| **Cropping system** | **CP % of DM** | **ADF % of DM** | **NDF % of DM** | **NDFD 30 % of NDF** | **TDN % of DM** | **$NE_L$ Mcal $lb^{-1}$** | **lbs $ton^{-1}$** | **lbs $ac^{-1}$** |
| CC | 8.90[b] | 25.1[a] | 44.3[a] | 57.7[cd] | 62.8[a] | 1.43[a] | 3,301[b] | 30,002 |
| RotYr3 | 8.80[b] | 23.6[a] | 42.7[a] | | | | | |

## DISCUSSION

The goal of this project is to monitor long-term soil and crop health in these cropping systems. Based on In terms of soil quality, the system with the most recent rotation from sod, RotYr3, performed best overall. Continuous corn treatments or treatments recently out of continuous corn (CC, WCCC, & RotYr8) had the statistically lowest soil health scores. This indicates that it may take more than three years of perennial forage to build soil health levels different from continuous corn production or similar to NT production.

No-till plots (NT & NTCC) had the second highest soil health scores. This indicates that there are some benefits from not tilling the soil. The NT and NTCC treatments were transitioned from perennial forage to corn eight years ago and the lack of soil disturbance is reflected in many of the soil quality measurements. These treatments clearly show the potential for no-till corn to maintain soil quality during the corn years of a rotation. Their similar scores indicate that perhaps it takes more than two years for the synergistic effects of no-till and cover cropping to make an effective difference on soil health.

There were no significant differences among the plant populations of the corn treatments and no yield differences among any of the treatments. Typically, we observe suppressed yields in the NT corn treatment compared to other corn treatments with tillage. However, in an unusually cool and wet year, the corn and perennial forage treatments did not perform significantly different from each other. The data presented here only represents one year and data analysis over multiple years provides an opportunity to make observations about long-term trends. In 2023, we will collect more data to inform long-term trend analysis.

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