2014

Comparison of till and no-till agricultural practices on carbon dioxide flux from the soil on an organic farm

A. Coffin

S. Brame

Comparison of till and no-till agricultural practices on carbon dioxide flux from the soil on an organic farm

Ashley Coffin
Scott Brame

Chamber method

Climate change group built chambers
Modeled off of previous studies
6in diameter PVC pipe
3 outlets drilled on top
Middle pulled into CO_2 chamber
One maintained atmospheric pressure
3rd outlet was for gas return
Copper coil inside of chamber dispersed gas

Sampling Procedure

Purge time 20 minutes
Timers set on regular intervals
CO_2 meter at top of the hours
Purge chamber at 00:40:00
Ran from 2:40am to 10:40pm
CO_2 meter took measurements every 10sec
Data samples downloaded every two days
Thermometer left in place

Abstract

The utilization of no-till or conservational tillage practices is widely considered to lower CO_2 emissions. In this study, the effect of till and no-till practices were assessed based on the carbon dioxide (CO_2) flux from the soil on an organic farm located in upstate South Carolina. The measurements were taken over a month long period in late fall. The no-till plot had been recently converted and the till plot had been harvested in the months prior. In addition to studying the CO_2 flux, temperature data was recorded for comparison. At temperatures below 45°F, the CO_2 flux from the till plot was lower than from the no-till plot. While these findings were helpful, they raised questions. The study was repeated with different comparisons. The plots were compared to ambient outputs, and the results favored the no-till plot. Overall, no-till output of CO_2 was lower than the till plot. These findings support the implementation of no-till practices as a method of reducing atmospheric CO_2.

Flux calculations

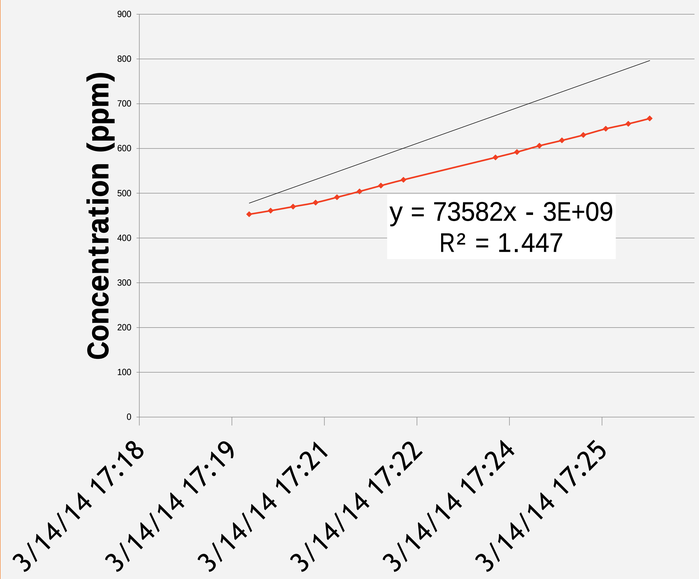
Use ideal gas law
PV=nRT
P= 101325 Pa
V=slope from trendline/(60*60*24)
convert from ppm/day to ppm/secR= 8.314 J/molK
T= 298K

Plug “n” into the flux equation
Flux= (V/A) * (P/RT) * (dc/dt)(P/RT)*(dc/dt)= n
Volume of chamber = 0.07300325 m^3
Area of soil = 0.016692816 m^2
Results in flux (μM/m^2/sec)

Conclusions

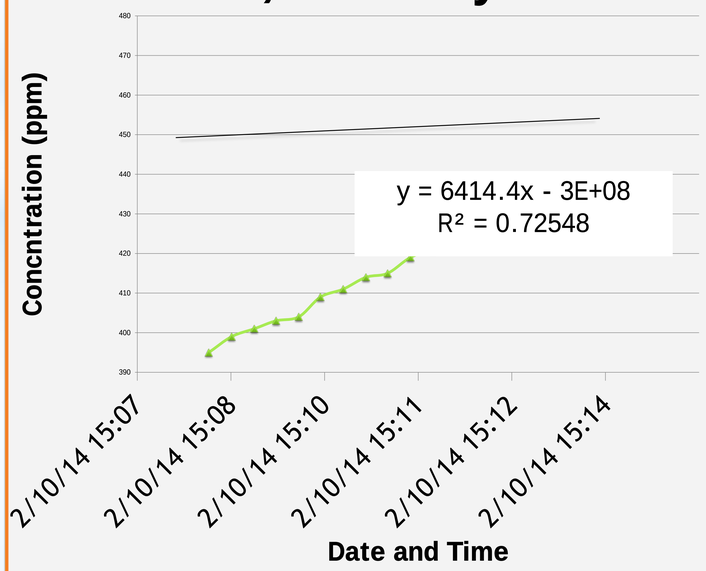
Regardless of temperature, the till CO_2 concentrations remained above ambient while the no-till concentrations remained below ambient for all cases. Additionally, the no-till flux was consistently lower than the till flux which indicated that no-till was not only producing less CO2 but that it was also producing it at a slower rate. These findings support the implementation of no-till as a method for reducing CO2 emissions from agricultural soils.

Till, March 14th, 5pm



Flux: 5.309422494 μM/m²/sec

No-till, February 10th



Flux: 0.69421335 μM/m²/sec