

# Nutrient Dynamics in Soils Under a Mixed Cover Crop

Jessica Bearnse, Lauren Taylor, and Paula Gale

Department of Agriculture, Geosciences, and Natural Resources, University of Tennessee at Martin

## Introduction

- There are many factors that must be considered when selecting a cover crop mix including time, location, and end goal.
- Cover crops have been proven to increase soil health by reducing erosion, conserving soil moisture, increasing organic matter and infiltration rates, and enhancing nutrient cycling.
- Nitrogen and phosphorus are easily lost from soil, however cover crops can be planted to prevent leaching of these macronutrients as well as many others.
- Legume cover crops can be used to add N to the soil. Grassy cover crops are used to reduce nitrogen leaching.

## Objectives

- The objective of this experiment was to monitor the levels of various parameters including pH, N, P, and K, in the soil where a mixed cover crop was planted. The overall goal of the larger project is to demonstrate the benefits and limitations of using ½, 1, 1 ½, and 2 times the NRCS recommendation of mixed species cover crops.

## Methods

- A cover crop mix containing cereal rye (*Secale cereale*), wheat (*Triticum aestivum*), crimson clover (*Trifolium incarnatum*), radish (*Raphanus raphanistrum subsp. sativus*), and hairy vetch (*Vicia villosa*) was planted on October 19, 2016 at ½, 1, 1 ½, and 2 times the NRCS recommended rate (Figure 1).
- The NRCS recommended rates were as follows:

| Species  | lb./acre drilled |
|--|------------------|
| Cereal Rye ( <i>Secale cereale</i> )                   | 20               |
| Wheat ( <i>Triticum aestivum</i> )                     | 15               |
| Crimson Clover ( <i>Trifolium incarnatum</i> )         | 4                |
| Radish ( <i>Raphanus raphanistrum subsp. sativus</i> ) | 1.5              |
| Hairy Vetch ( <i>Vicia villosa</i> )                   | 4                |

- 12 plots were planted as follows: 1 pass = ½ recommended amount, 2 pass= recommended amount, 3 passes = 1 ½ recommended amount, 4 passes = double recommended amount. Each treatment was replicated 3 times.
- Cover crops were grown from October 19, 2016 until April 20, 2017, when they were rolled down with a roller crimper (Figure 2).
- On April 26, 2017 the cover crops were burnt down using Roundup and 2,4-D, followed with gramoxone prior to planting of soybeans.
- Soybeans were planted on June 21, 2017, but replanted on July 11, 2017 due to an initial poor stand (Figure 3).

## Acknowledgements

Funding for this project was provided by the Tennessee Soybean Promotion Board.



Figure 1. Cover crops in the spring before being rolled down.



Figure 2. Cover crops were rolled down and UAV photographs were taken on April 20.



Figure 3. Soybeans were planted into plots after cover crop burndown on June 21.

## Results

- The pH measured in ½ the NRCS recommended rate was on average .5 higher than the other three tested rates (Figure 4).
- Overall, the ½ recommended rate left higher levels of nutrients in the soil (Figure 5).
- When considering pH, NH<sub>4</sub>, NO<sub>3</sub>, TIN, P, and K, the data shows that the recommended rate would be the best planting rate in this trial.

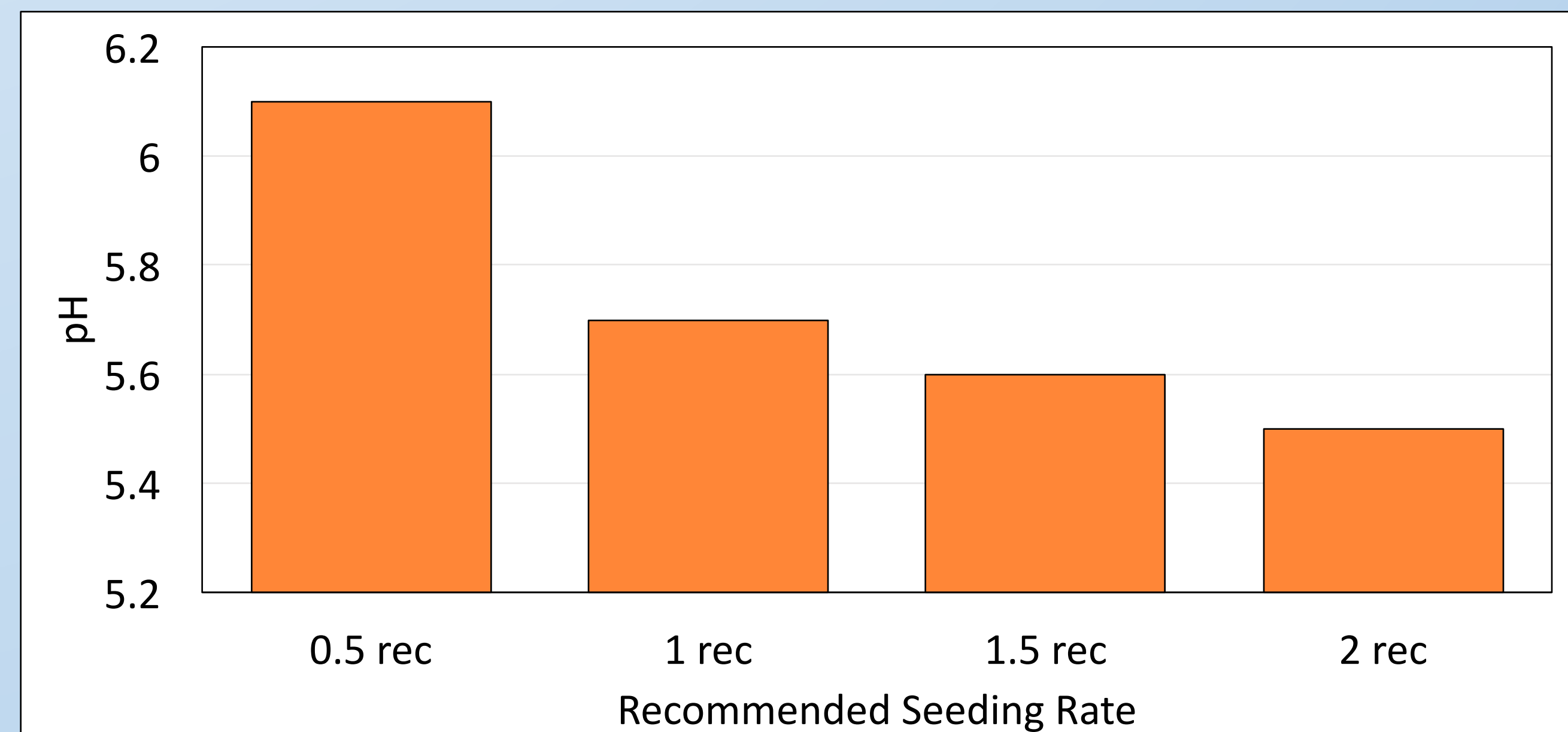


Figure 4. Effect of cover crop seeding rate on soil pH.

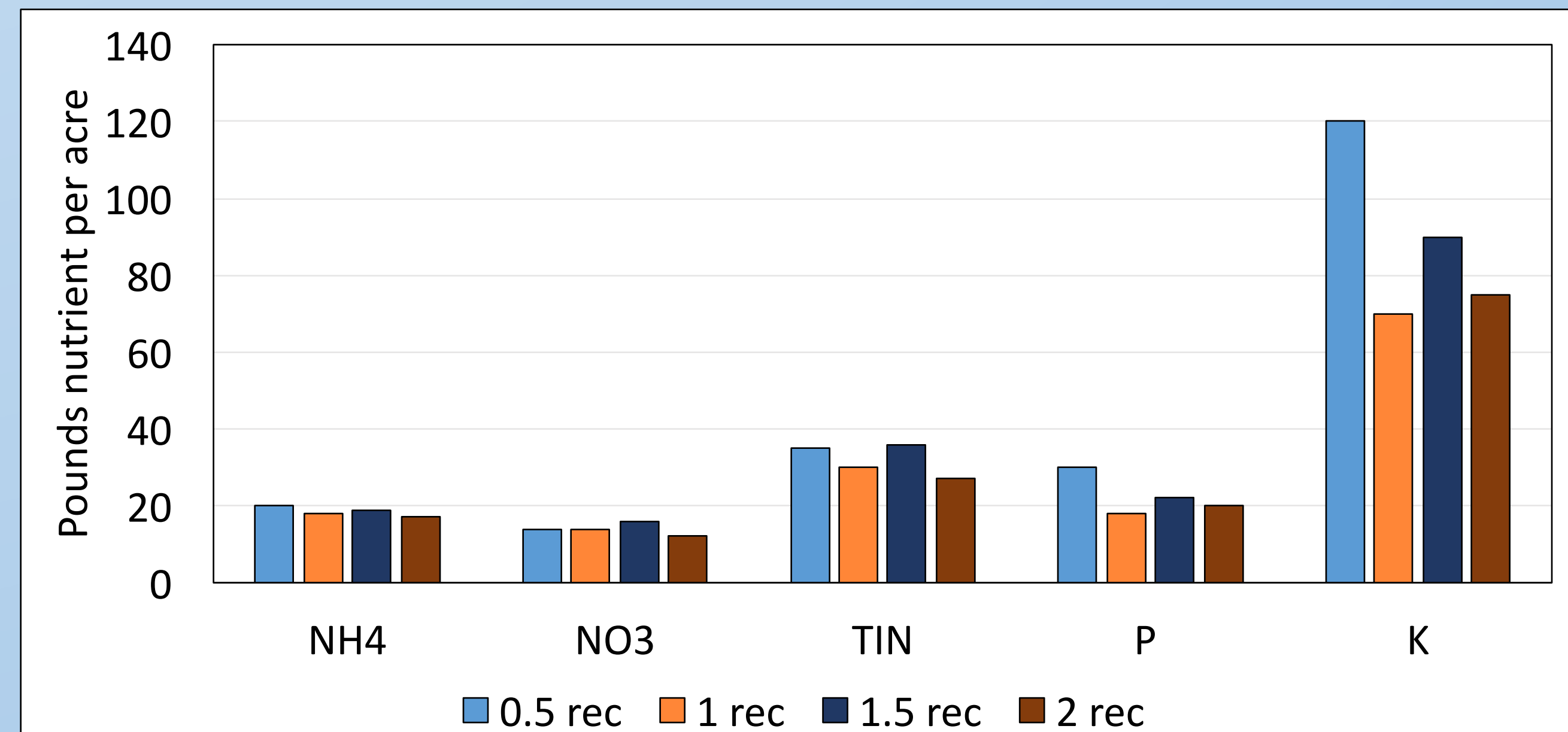


Figure 5. Effect of cover crop seeding rate on nutrient levels.

## Conclusions

- There was no significant change in nutrient levels between the four seeding rates although the ½ rate left more nutrients in the soil.
- pH was the most impacted factor connected to cover crop seeding rate.
- In a managed cover crop system one should pay attention to pH and lime additions.
- Planting the NRCS recommended rate allowed the cover crops to obtain the most amount of nutrients from the soil to prevent nutrient leaching.
- More research needs to be conducted in order to better understand the nutrient dynamics of soil under a mixed cover crop.

## References

- Brust, G. 2010. Soil Fertility and Cover Crops. Chapter 5. University of Maryland Extension.
- Clark, A. (Ed). 2012. Managing Cover Crops Profitably. Third Edition. Sustainable Agriculture Research & Education.