Alfalfa persistence in pastures: An exploratory study

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FARMER-RESEARCHER

Ken Laing, Orchard Hill Farm

FUNDING

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IN A NUTSHELL

Ken was curious about an observed correlation between alfalfa persistence and soil nutrient status in his pastures. Taking an exploratory approach, he sampled soil in areas of high and low alfalfa persistence.

- Soil Mg, Zn, Cu and Na could be playing a role in alfalfa persistence, and thus density over time.
- There were no consistent trends in plant tissue nutrient levels in high or low density alfalfa stands.

MOTIVATION

At Orchard Hill Farm there are strips of pasture that have different degrees of alfalfa persistence. Ken thought it was related to past fertility applications of micronutrients (in particular boron, molybdenum, and sulfur) and compost in vegetable plots that were converted to pasture, vs plots that received no amendments. He was also curious if the alfalfa, a perennial with deep roots,makes micronutrients at depth more available. With this observation, he performed an exploratory study to find out more.

METHODS

Ken located five side-by-side areas in his pastures that received fertility applications in the past beside areas that have not. All sites were sandy-loam soil that are fairly level and free draining. Ken performed a visual evaluation of the alfalfa density to determine areas of greater alfalfa persistence.

MEASUREMENTS

SOIL NUTRIENT STATUS

- From each of the five paired areas, for a total of ten sampling sites, he took a representative soil sample at 0-15 cm that he sent for analysis at A&L Laboratories with their S1B + S7 test packages for %OM, pH, Ca, Mg, Mn, K, P, B, S04, Cu, Zn, Fe, % base saturation and K:Mg.
- He also dug two pits at site one with a mini excavator and took samples at 30 cm, 60 cm, 90 cm and 120 cm. He sent the samples to to A&L Laboratories for analysis with their S1B + S7 test packages.

PLANT NUTRIENT STATUS

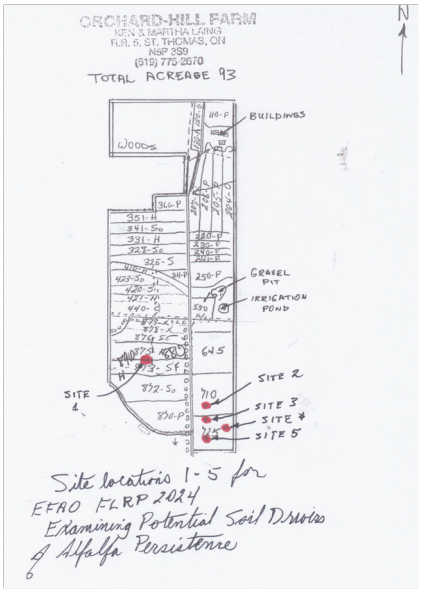
- Ken took representative samples of the alfalfa biomass during alfalfa bloom and sent them to A&L Laboratories for analysis with their PT1 test package and for molybdenum.

STAND DENSITY

- Ken counted the number of plants inside a 81 cm hoop from three randomly selected locations within each plot and averaged their numbers.

DATA ANALYSIS

We used a paired t-test to compare the nutrient status between areas of persistent and less persistent alfalfa.



Orchard Hill Farm field layout

Alfalfa and grass matrix

FINDINGS

STAND DENSITY

Ken detected a higher alfalfa density in the pastures with visibly more alfalfa (P=0.03) as seen in **Figure 1.**

PLANT NUTRIENT STATUS

There was no consistent differences detected in nutrients present in plant tissue harvested in bloom between the high and low density density areas (data not shown).

SOIL NUTRIENT STATUS

Magnesium, sodium, zinc, and copper were higher in areas with greater alfalfa density **(Figure 2).**

%H, %K, and K:Mg ratio were higher in areas with lower alfalfa density **(Figure 2)**.

For the other nutrients Ken was unable to detect consistent differences between stand density (P>0.1).

There was no consistent trend in nutrient status at depth.

Pit sampling to analyze soil nutrients at depth

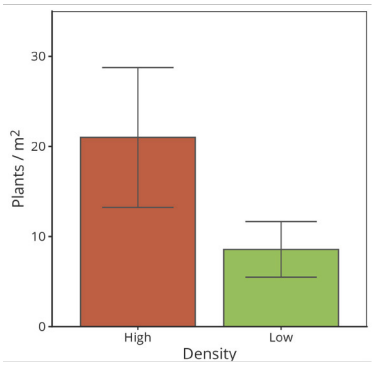


Figure 1. Mean number of plants counted for sites with high and low alfalfa density.

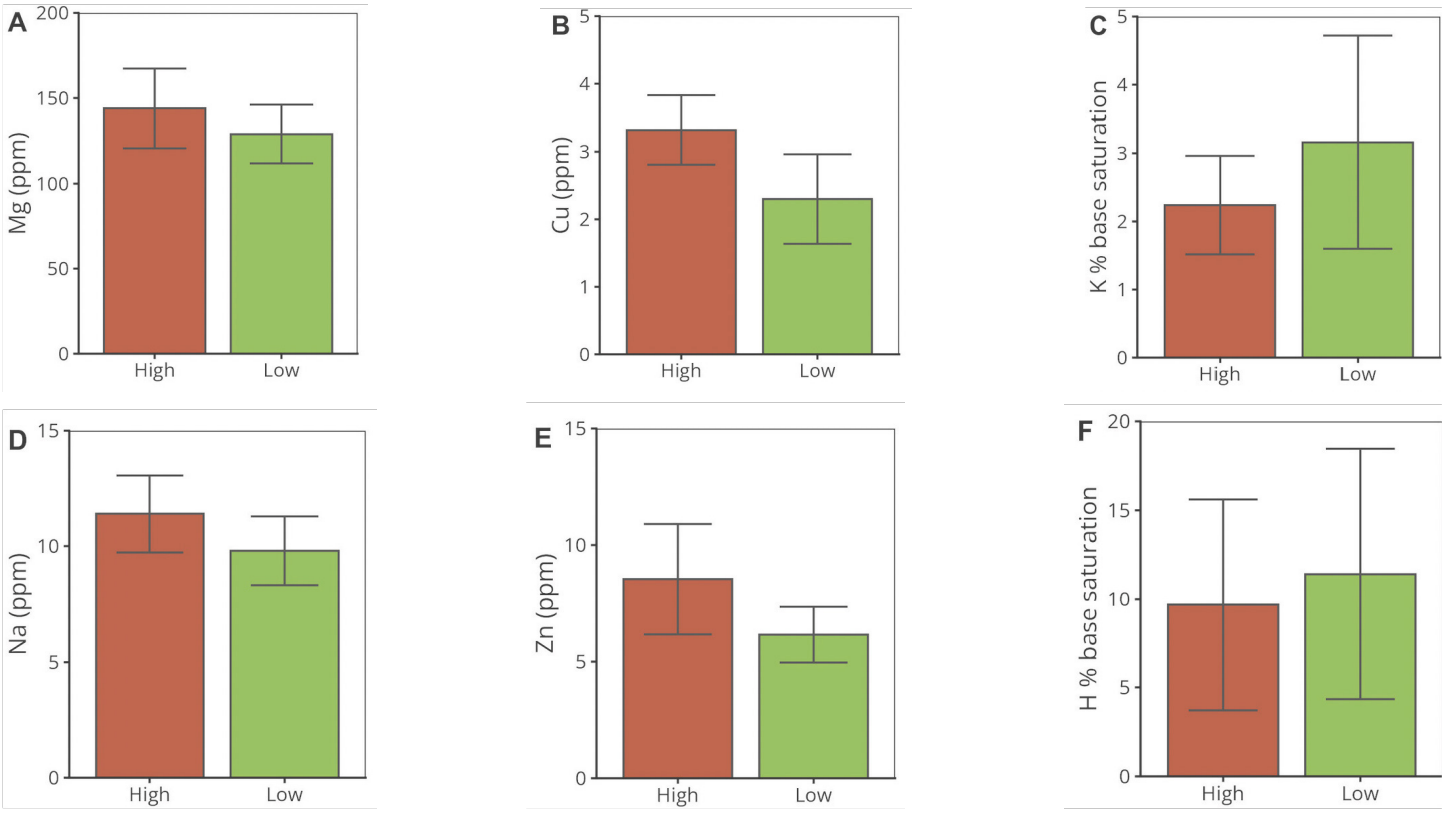


Figure 2. Mean soil nutrient levels for sites with high and low alfalfa density.

TAKE HOME MESSAGE

This exploratory study indicates that soil Mg, Zn, Cu and Na could be playing a role in alfalfa persistence, and thus density over time. Ken feels the result that Cu and Zn correlated with alfalfa persistence is interesting given he has not read about them being critical for alfalfa production.

The inverse relationship with %K and K:Mg is easier to explain as alfalfa is known to easily take up K from the soil. Therefore, areas with low alfalfa density would show higher amounts of K and areas with higher density would show lower amounts of K.

Ken was disappointed that these scientific measurements could not show the reason for the clear differences seen on the ground. His records of amendment applications demonstrate fields with the highest alfalfa density previously received more and higher rates of both compost and mineral amendments preceding vegetable production in the past and the effect persists even after the field was rotated into pasture. He also notes that the oldest stand of alfalfa had the highest density stand. Overall, it was an exploratory study that left him with more questions than answers to effects seen on the ground.