

## Report SARE Soil for Water

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### Final Report

#### Summary of work:

- During the last reporting period, we concluded our grazing trial (effects of grazing pressure on soil water status)
- Grazing ended in early June of 2024 after 2 full years of the trial
  - Grazing experiment started in April 2022
- Soil sampling for water content and quality was accomplished at the end of the grazing trial in June of 2024

#### *General findings and lessons learned:*

- It is difficult to discern changes in soil water status under real-world conditions when tall fescue is being grazed with sheep
- As the premise was that “correct” grazing will lead to soil water conservation, here are a few take-aways from our experiment:
  - Under a temperate and humid climate, it is difficult to measure a reduction or increase in soil water as affected by grazing of the above-ground biomass
  - Plants respond to lower soil water with reduced growth, and higher soil water with increased growth
  - In soils on the experiment station, soil water remains most of the year within a range that enables perennial forage plants to maintain normal metabolism and water uptake
  - Soil water fluctuates between 3 to 20 percent over the year, within which the plant is able to operate
  - It appeared that the more leaf tissue was present, the higher the transpiration as leaf area relates to the amount of water a plant can transpire, i.e., conduct from the soil into the air. This may result in a slight reduction in soil water.
  - Conversely, a very low canopy (overgrazed) has less leaf area available and thus may transpire less water in comparison.
  - Overall, management of soil water status with grazing intensity (manipulation of the canopy) seems difficult in an environment that is humid most of the time and will result in sufficient year-round soil moisture in silt-loam soils
- There are other findings that relate to soil water management and should be taken into consideration:
  - Overgrazing will result in changing pasture species composition with less palatable, taller weeds, that will eventually outcompete tall fescue
  - Under-grazing (no grazing at all in our experimental case) will result in thatchy, uneven pasture as the non-grazed fescue plants shade out the lower plant parts with the result of senesced material that becomes less palatable over time

- Given the relatively low canopy of tall fescue, the reduction in soil surface temperature is minimal in comparison to an overgrazed area due to the intense heat and humidity during Arkansas summers (humidity readily conducts heat)
- Recommendations to producers as a result from this project:
  - “Take half/leave half” is a good strategy to graze a perennial cool season bunch grass such as tall fescue
  - Sward structure in tall fescue is such as when half of the leaf matter is being removed by grazing, enough leaf matter remains to induce quick regrowth
  - Under overgrazed conditions, the amount of leaf area remaining is insufficient to induce a high photosynthetic activity that helps in regrowth of the forage plant
  - Ideally, grazing pressure should be adjusted permanently to graze forage stands properly
    - This means that there are paddocks on the farm that should be prioritized in spring, summer, and fall, depending on the forage present
    - A different, seasonal forage base will enable producers to graze efficiently depending on animal needs
- Take-aways for the “Regenerative grazing” philosophy:
  - Healthy forage stands (not under or overgrazed) will lead to optimal plant root growth and thus potentially increased carbon sequestration over time, soil type permitting
  - Proper grazing techniques will first and foremost benefit plant health and growth
  - The forage base should be diversified to account for future drought/wet extreme weather events, as those will result in varying soil water contents
    - Perennial native warm season grasses for droughty summers, perennial cool season grasses for wetter fall and spring seasons
  - Establishment of multi-species, ideally multi-canopy grazing systems
    - Grasses and forbs (sheep consume 30% of their diet as forbs)
    - Silvopasture for shade and lowering evapotranspiration
    - Shade important for animal well-being

#### Farm soil sampling activities

- Soil samples were also taken from cooperators in spring of 2024:
  - Farm 1 (Emily Jost)
    - 4 different pastures, Haney test and Mehlich III (total of 4 composited samples)
  - Farm 2 (Ann Wells)
    - 3 different pastures, Haney test and Mehlich III (total of 3 composited samples)

#### Outreach

Soil for Water field day and Pasture Walk, May 18, 2024 (15 farmers)