A FARMER'S GUIDE TO GRAZING | 2 OF 4

According to USDA-NRCS, research has shown that effective use of grazing practices can improve soil health on grazing lands. Grazing practices refer to a set of grazing patterns and stocking densities. Optimized livestock rotation, improved forage utilization, and adequate forage recovery periods can provide agronomic benefits such as increased soil organic matter, improved soil infiltration, increased forage availability, reduced soil erosion, and carbon sequestration.[1] These practices may also increase the profitability of livestock operations through improved adaptability to environmental conditions, enhanced forage utilization, and improved animal health.[2]

In this series of four Farmer's Guides to Grazing, we will focus on the economic, forage, and soil health benefits of grazing practices. The guides will synthesize relevant literature on the economic, forage, and soil health benefits of intensive grazing (also known as management-intensive grazing), seasonal grazing practices, and grazing cover crops. **This second guide focuses on the forage and soil health benefits of intensive grazing.**

Although intensive grazing practices can improve pasture and soil health, less than half of U.S. cow-calf producers have adopted these methods.[3,4] Limited adoption may be due to an increase in smaller operations (<20 head), regional variations,[3,18] high installation costs, labor shortages, land ownership status,[5] and geo-physical barriers like steep topography, dense vegetation, and locations of waterways. While technologies exist to address these issues, they often raise costs and operational complexity.

Ideal rotation frequency and stocking density differ for each operation depending on forage availability and quality. The table below highlights a few common grazing patterns and how we define rotation frequency, stocking rate, and stocking density.

Healthy soil is vital for grazing systems, enhancing nutrient availability, root growth, drought resilience, and forage supply. We

Maples Stock Farm in Alabama

summarized 13 studies on the forage and soil health impacts of intensive grazing. Key findings include:

- Three studies reported **increased forage availability under intensive grazing conditions.**[4,6,7] Common benefits include even nutrient distribution, increased organic matter, and weed control. One study in southwest Arkansas found that rotational grazing with moderate stocking rates decreased stored forage requirements and increased forage availability during the grazing season compared to continuous grazing.[6] However, Gurda et al. (2018) noted decreased forage quality due to trampling in mob grazing systems in the upper Midwest.[4]
- Two studies in the southeastern U.S. found that **soil organic carbon (SOC) was higher under AMP grazing compared to continuous grazing**: Johnson et al. (2022) reported a 20% increase, and Mosier et al. (2021) reported a 13% increase.[11,12] However, there is insufficient evidence of improved SOC in intensive grazing practices in arid or semi-arid regions.[20]
- Three studies evaluated the effects of grazing systems on soil phosphorus loss.[8,9,10] Haan et al. (2006) found that rotational grazing with 10 cm residual forage cover reduced phosphorus concentration and load compared to continuous grazing.[8] Similarly, Day et al. (2023) found that phosphorus loss increased on grazed rangelands and suggested that phosphorus loss may be reduced in rotational grazing systems with

GRAZING PATTERN	ROTATION FREQUENCY*	STOCKING RATE/DENSITY†
Continuous (Conventional)	No rotation	Set stocking rate and density
Traditional Rotational	Set rotation frequency	Stocking rate and density vary
Adaptive Multi-Paddock (AMP) Rotational	Rotation frequency varies based on forage availability/ quality, which is continuously monitored.	Stocking rate and density vary based on forage availability/quality.
Mob	Rotation frequency varies based on forage availability/ quality, which is continuously monitored (like AMP); cattle often moved more frequently and at higher densities.	Stocking rate and density vary based on forage availability/quality; increased stocking density is possible due to increased rotation frequency.

* Rotation frequency refers to the timing of grazing cattle and rest periods for forage production.

† Stocking rate describes the herd size and grazing units used in a grazing system over a specific period of time. Stocking density refers to the number of acres allocated per animal.[19]

increased residual forages.[9] Toor et al. (2020) indicated that lower stocking rates in rotational grazing systems may reduce phosphorus loss.[10]

- Four studies evaluated the hydrologic response of soils under intensive grazing, showing varied results likely due to soil type and composition.[13,14,15,16] McGinty et al. (1979) found **rotational grazing reduced erosion and improved water infiltration** in Texas's Edwards Plateau with Tarrant stony clay soils.[13] However, other studies in New Mexico and Texas reported no improvement in erosion or infiltration under intensive grazing on Dioxice and Kavett soils.[14,15,16]
- Two studies evaluated the effect of intensive grazing on soil nutrients. Mosier et al. (2021) found that **AMP rotational grazing increased soil nitrogen by 9% compared to continuous grazing** in the southeastern U.S. and resulted in higher quality soil organic matter.[12] Teague et al. (2011) also reported that **intensive grazing improved soil nutrients**, such as magnesium and sodium, in tall grass prairie.[17]

Key Takeaways for Intensive Grazing Management

1. **Intensive grazing may improve forage quality and increase forage availability:**[4,6,7] Intensive grazing with moderate stocking rates may increase forage quality and availability during the grazing season, reducing stored forage requirements and increasing stocking rates.
2. **Intensive grazing may increase SOC in some areas:**[11,12] Intensive grazing results in higher SOC compared to conventional grazing methods in the southeast. Increased SOC results in improved soil and root structure, improving forage quality and reducing input requirements.
3. **Intensive grazing may reduce phosphorus loss:**[8,9,10] Intensive grazing with recovery periods, sufficient residual forage, and reduced stocking rates in rotational systems may reduce phosphorus loss compared to continuous grazing.
4. **There are mixed results for hydrological responses of soils:**[13,14,15,16] The impacts of intensive grazing on soil erosion and infiltration may vary regionally, but potential improvements include better soil infiltration and reduced erosion.
5. **Intensive grazing could increase nutrients in soils:**[12,17] Intensive grazing increased soil nutrient content and higher quality soil organic matter compared to conventional grazing in the southeast. Rotating cattle improves the distribution of nutrients, potentially decreasing fertilizer requirements.

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THIS STUDY IS FUNDED BY A USDA NRCS GRANT: NR203A750013G023. USDA IS AN EQUAL OPPORTUNITY PROVIDER AND EMPLOYER.

Preferred Citation: Day, M.B., Wiercinski, B., & Maples, C. (December 2024). *A Farmer's Guide to Grazing: Forage and Soil Considerations for Beef Producers.* American Farmland Trust.