matter yield of herbaceous species. A total of one hectare of range-land which
divided into 12 paddocks in which 0.08ha each paddock and randomly stocked
unit per month/ ha (T1); moderately-stocking-rate of 2.4 animal unity per month
animal unity per month/ha (T3). The higher organic carbon and organic matt
with T3 as compared to plot stocked withT1 and whereas, lower nitrogen conte
with T1 than plots stocked T2 and T3. Likewise, lower dry matter yield of 2.77 t
with T1 as compared to plots stocked withT2 (4.52 t/ha) and T3 (4.81 t/ha). T
were not inþuenced (P>0.05) by di erent stocking rates, but more grass speci
that stocked with T2 than T1 and T3, whereas the lower (P<0.05) grass specie
that stocked withT1 as compared plots stocked withT2 and T3. Overall resu
stocking rate (T3) has the potential to improve forage dry matter yield, soil c
species diversity and richness as compared to heavily and moderately stocking

Keywords: Dry matter yield; Species diversity; Soil composition; Stocking rates

Introduction

***Corresponding author:** Denbela Hidosa, Southern Agricultural Research Institute, Jinka Agricultural Research Center, Ethiopia, E-mail: denbelahidosa@gmail.com

Received: 30-Jun-2023, Manuscript No: jvmh-23-104347, **Editor assigned:** 03-Jul-2023, PreQC No: jvmh-23-104347(PQ), **Reviewed:** 17-Jul-2023, QC No: jvmh-23-104347, **Revised:** 20-Jul-2023, Manuscript No: jvmh-23-104347(R), **Published:** 27-Jul-2023, DOI: 10.4172/jvmh.1000186

Citation: Hidosa D (2023) E ects of Cattle Stocking Rate on Soil Quality and Herbaceous Vegetation Composition in South Omo Zone, Ethiopia. J Vet Med Health 7: 186.

Experimental site and treatments

In 2016, one hectare of rangeland was fenced using locally available woody material for the purpose of studying the e ects of stocking rates on the condition of the range. e fenced area was divided into twelve paddocks, each with an area of 0.08 hectares and similar carrying capacity. e paddocks were carefully fenced o using locally available woody material, with the help of pastoral communities, to prevent the movement of experimental animal units from one paddock to another. Di erent cattle stocking rates were used per each paddock, and the vegetation was completely grazed and the standing biomass trampled down and partially incorporated into the upper soil layer. e cattle stocking rates used in this study as experimental units were: heavy stocking rate of ve animal unit per month/ha (T1), moderate stocking rate of 2.4 animal unit per month/ha (T2), light stocking rate of 1.67 animal unit per month/ha (T3) and control comprised permanent enclosures only (T4) and each grazing treatment was replicated three times per paddock. An experimental site was protected from livestock for three years (2017-2019) a er introduction of cattle with di erent stocking rates and whereas, animals in each paddock were allowed to continuously graze, with unrestricted and uninterrupted access to the grazing unit, for a period of 2 months (December and January).

Soil sample collection and analysis

Within each paddock, three samples every ve meter transects were placed in a Z-shaped orientation, starting at least two meter away from the boundaries of each paddock in order to avoid edge e ects at end of experimental periods (November, 2019). ree 0.5m² quadrats were placed along each paddock, with a distance of one meter between them. Soil samples from the upper 20 cm were collected at the center of each quadrat. ese three soil samples from each quadrat were mixed together to create a composite sample weighing one kg. e soil samples collected from the eld were taken to JARC- soil laboratory. en samples were sieved through a 2 mm mesh to remove stones, roots, and large organic residues. A er that, they were allowed to air-dry and sealed in plastic bags and stored at room temperature for further chemical analyses. e soil sample was analyzed at soil laboratory located at Debere Birhan Agricultural Research Center. e method of [20]so T*(from)0.6(the)0.6(boundaries)5(JARC-se[(covsmg one d orie594br0 -1.y were aocatey aT*)0.7(wegairal)0.5(froJ qum temertrieshhile5 Tw Mac42

Results and Discussion

Impacts of stocking rate on soil chemical composition

The impacts of stocking rate on chemical compositions of soil are presented in Table 1. The nitrogen content was significantly ($P<0.05$) affected by stocking rate, lower value was recorded for the area received T1 than areas stocked T2 and T3. But, the organic carbon and organic matter were not significantly ($P>0.05$) affected by stocking rates but better soil organic matter and organic carbon were observed from plots stocked by T3 and T2 as compared to area stocked by T1. Moreover, the findings from this study revealed that carbon to nitrogen ratio, phosphorus and potassium contents were not significantly ($P>0.05$) affected by three cattle stocking rates (T1, T2 and T3), but the higher carbon to nitrogen ration and available phosphorus were obtained from the area stocked by T1 as compared to areas stocked by T3 and T2. The higher organic carbon and organic matter contents were observed from lightly stocked area than heavily and moderately stocked. This is might be low cattle trampling impact and cattle dunging and urination which promotes massive vegetation cover and this is add more little and hence, high level of carbon and organic matter. The study reported by [15] proved that a lower amount of organic matter was observed for the areas heavily stocked than lightly and moderately stocked. Moreover, [19] examined the effect of different cattle stocking rate on the soil chemical and physical properties, shown that amount of soil carbon was significantly decrease as cattle stocking pressure increased. On the other hand, the lower organic carbon and organic matter was recorded from heavily stocked area, is may be due to decreasing the vegetation cover. The another study with Bermuda grass, a low stocking rate resulted in greater increases in soil carbon and nitrogen than a high stocking rate [28]. However, the higher carbon to nitrogen ratio and phosphorus were noted for heavily stocked area than moderately and lightly stocked. Indeed, carbon to nitrogen ratio is positively associated with cattle stocking rate which demonstrated that stocking rate increased carbon to nitrogen ration increases as consequences. Previous study reported by [29] had demonstrated that the carbon-nitrogen ratio was increased with an increased stocking rate.

Impact of stocking rate on dry matter yield

Table 2 presents the impacts of varying cattle stocking rates on dry matter yield (t/ha). The results indicate a significant ($P<0.001$) difference among stocking rates on the dry matter yield of pastureland. The highest dry matter yield was observed in plots stocked by T2 and

leads reduction in plant species composition. e higher herbaceous diversity and richness of annual and perennial species was moderately and lightly grazed lands. In contrast to this study, [35] reported that areas grazed with light grazing intensity in the desert rangelands does not increase perennial grass diversity and richness.

Conclusion and Recommendation

is study examined how di erent stocking rates of cattle a ect dry matter yield, soil chemical compositions, and herbaceous species diversity and richness. Areas with moderate and light stocking rates had higher levels of soil organic carbon, organic matter, and dry matter yield compared to heavily stocked areas. e study also found that increasing the stocking rate of cattle may lead to a decrease in herbaceous species diversity and richness. Overall, the results of this study showed that heavy cattle stocking rate resulted in lower dry matter yield, soil organic carbon, soil organic matter, total nitrogen, and herbaceous species diversity and richness. e ndings also suggested that a light stocking rate (T3) has the potential to improve forage dry matter yield, soil chemical compositions, and herbaceous species diversity and richness compared to heavy (T1) and moderate (T2) stocking rates. Additionally, future research should consider the potential e ects of stocking rate on the chemical composition of herbaceous species.

Acknowledgement

e author expresses his deep gratitude to the Pastoral, Agro pastoral and Emerging Region Capacity Building Directorate for providing budgetary support, as well as to the Jinka Agricultural Research Center for o ering logistical assistance and monitoring the research activity. Additionally, he would like to acknowledge Mr Bediru Roba from the Adami Tulu Agricultural Research Centre for his expertise as a trained botanist.

References

1. Tadele M, Girma A (2022) The impacts of Land Use/Land Cover Change on Range Land Biodiversity in Ethiopia: Review. J Biodivers Endanger Species 10:1-6.
2. Habtamu TK, Madakadze IC, Angassa A, Hassen A (2013) Nutritive value of grasses in semi-arid rangelands of Ethiopia: local experience based herbage preference evaluation versus laboratory analysis. Asian-Aust J Anim Sci 26:366–377.
3. Kristina M, Pandiangana D, Febby E (2017) Deskripsi jenis-jenis kontaminan dari kultur kalus Catharanthus roseus (L) G. Donnaman. J MIPA UNSRAT 6:47-52.
4. Ho P, Azadi H (2010) Rangeland degradation in North China: Perceptions of pastoralists. Environmental Research 110:302-307.
5. Denbela H, Yidinachachew T, Ayele F (2017) Assessment on Feed Resource, Feed Production Constraints and Opportunities in Salamago Woreda in South Omo Zone, in South Western Ethiopia. Academic Journal of Nutrition 6:34-42.
6. Bo TL, Fu LT, Zheng XJ (2013) Modeling the impact of overgrazing on evolution process of grassland desertiýcation. Aeolian Res 9:183–189.
7. Peters DPC, Bestelmeyer BT, Havstad KM, Rango A, Archer SR, et al. (2013) Desertiýcation of rangelands. Clim Vulner 4:230–259.
8. Reynolds JF (2013) Desertiýcation. Encycl Biodivers 2:479–494.
9. Rutherford MC, Powrie LW (2013) Impacts of heavy grazing on plant species richness: a comparison across rangeland biomes of South Africa. South Afr J Bot 87:146–156.
10. Gamoun M (2014) Grazing intensity e ects on the vegetation in desert rangelands of southern Tunisia. J Arid Land 6:324–333.
11. Mouldi G, Bob P, Belgacem H (2015) Assessment of vegetation response to grazing management in arid rangelands of southern Tunisia. International Journal of Biodiversity Science, Ecosystem Services and Management 11:106-113.
12. Yaregal M, Ayana A, Aster A (2019) E ects of grazing intensity to water source on grassland condition, yield and nutritional content of selected grass species in Northwest Ethiopia. Ecological Processes 8:1-12.
13. Liu H, Han X, Li L, Huang J, Liu H, et al. (2009) Grazing density e ects on cover, species composition, and nitrogen ýxation of biological soil crust in an Inner Mongolia steppe. Rangeland Ecol Manag 62:321–327.
14. Patton BD, Dong XJ, Nyren PE, Nyren A (2007) E ects of grazing intensity, precipitation, and temperature on forage production. Rangeland Ecol Manag 60: 656–665.
15. Thurow TL, WH B, CA T (1986) Hydrological characteristics of vegetation types as a ected by livestock grazing system, Edwards Plateau Texas. J Range Manage 39:505-509.
16. Dormaar JF, Willms WD (1998) E ect of forty-four years of grazing on fescue grassland soils. J Range Manage 51:122-126.
17. Berhanu T, Girma A, Jameroen T, Sayan T, Somkiert P, et al. (2017) Availability of feed resources for goats in pastoral and agro-pastoral districts of south omo zone, Ethiopia. International Journal of Research Granthaalayah 5:154-160.
18. Admasu T, Abule E, Tessema Z (2010) Livestock-rangeland management practices and community perceptions towards rangeland degradation in South Omo zone of Southern Ethiopia. Livestock Research for Rural Development 22:18-25.
19. Denbela H, Shanachew H, O'Reagain J (2020) Goat Feed Inventory and Feed Balance in Hamer and Bena-TsemayWoreda of South Omo Zone, South Western Ethiopia. Act Sci Vet Sci 2:28-43.
20. Walkley A, Black CA(1934) An examination of wet digestion method for determining soil organic matter and proposed modiýcation of the chromic acid titration method. Soil Science 37:29-38.
21.

al. (2012) Plant species composition and soil characteristics around Iranian piospheres. J Arid Environ 82:106–114.

34. Eldridge DJ, Whitford WG (2009) Soil disturbance by native animals along grazing gradients in arid grassland. J Arid Environ 73:1144–1148.

35. Khumalo GJ, Holechek M, Thomas M, Molinar F (2007) Long-term vegetation productivity and trend under two stocking levels on Chihuahuan Desert rangeland. Rangeland Ecology and Management 60:165–171.