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Forum

Effects of Grazing Pressure on Efficiency of Grazing on North American Great Plains Rangelands

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Abstract

Comparisons of stocking rates across sites can be facilitated by calculating grazing pressure. We used peak standing crop and stocking rates from six studies in the North American Great Plains (Cheyenne, Wyoming; Cottonwood, South Dakota; Hays, Kansas; Nunn, Colorado; Streeter, North Dakota; and Woodward, Oklahoma) to calculate a grazing pressure index and develop relationships for harvest efficiency, utilization, grazing efficiency, and animal performance and production. Average grazing pressures for heavy, moderate, and light stocking across the study sites were 40, 24, and 14 animal unit days $\cdot$ Mg^{-1}, respectively. These grazing pressures resulted in average harvest efficiency values of 38%, 24%, and 14% and grazing efficiencies of 61%, 49%, and 39% for heavy, moderate, and light stocking rates, respectively. Utilization increased quadratically as grazing pressure index increased, whereas grazing and harvest efficiencies exhibited a linear increase with grazing pressure. The latter indicates that nonlivestock forage losses (e.g., weathering, senescence, wildlife, insects) were disproportional across stocking rates. Average daily gain of livestock decreased linearly as grazing pressure index increased across study sites. Prediction equations reaffirm assumptions of 50% grazing efficiency and 25% harvest efficiency associated with moderate stocking. Novel here, however, is that harvest and grazing efficiencies increased at high grazing pressures and decreased at low grazing pressures. Use of grazing pressure index to ''standardize'' stocking rates across rangeland ecosystems in the North American Great Plains should improve communication among scientists, resource managers, and the public, and thus better achieve both production and conservation goals on these lands.

Resumen

La estimación de la presión de pastoreo puede facilitar la comparación de carga animal entre sitios. Se utilizaron datos de máxima biomasa aérea en pie y carga animal de seis ensayos realizados en las Planicies Centrales de América del Norte (Cheyenne, WY; Cottonwood, SD; Hays, KS; Nunn, CO; Streeter, ND; y Woodward, OK) para calibrar un índice de presión de pastoreo y desarrollar relaciones de eficiencia de cosecha, utilización, eficiencia de pastoreo, y performance y producción animal. Las presiones de pastoreo promedio para cargas altas, moderadas, y leves en todos los sitios fueron de 40, 24, y 14 UAD $\cdot$ Mg^{-1}, respectivamente. Estas presiones de pastoreo resultaron en valores de eficiencia de cosecha promedio de 38, 24, y 14% y eficiencias de pastoreo de 61, 49, y 39% para cargas altas, moderadas, y leves, respectivamente. Aumentos en el índice de presión de pastoreo estuvieron asociados a un incremento cuadrático de la utilización, mientras que las eficiencias de pastoreo y de cosecha exhibieron un incremento lineal con el aumento de presión de pastoreo. Esto último indica que las pérdidas de forraje no debidas al ganado (ej., maduración, senescencia, fauna, insectos) fue desproporcional para las diferentes cargas animales. La ganancia de peso promedio del ganado decreció de modo lineal a medida que aumentó el índice de presión de pastoreo en los diferentes sitios. Las ecuaciones predictivas reafirman los supuestos del 50% de eficiencia de pastoreo y el 25% de eficiencia de cosecha asociadas con el pastoreo moderado. Lo nuevo de este análisis es que las eficiencias de cosecha y pastoreo aumentaron con cargas altas y disminuyeron con cargas leves. El uso de índices de presión de pastoreo para ''estandarizar'' la carga animal en todos los ecosistemas de pastizales naturales de las Planicies Centrales de América del Norte debería facilitar la comunicación entre investigadores, técnicos, y el público para mejorar el logro de las metas de producción y conservación de estas tierras.

Key Words: animal performance, forage disappearance, grazing efficiency, harvest efficiency, herbage intake, stocking rate, utilization

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