An Apparatus for Measuring Pasture Forage Mass

J. L. Moyer
Kansas State University

D. W. Sweeney
Kansas State University

K. W. Kelley
Kansas State University

M. D. Schrock
Kansas State University

R. R. Price
Kansas State University

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An apparatus for measuring pasture forage mass

J . L . Moyer , D . W . Sweeney , and K . W . Kelley (Kansas State University-Southeast Agricultural Research Center , P .O . Box 316 , Parsons , KS , 67357 USA ; jmoyer@ksu .edu)
M . D . Schrock , and R . R . Price (Biological & Agricultural Engineering , Kansas State University , Manhattan , KS 66506 , USA) .

Key words : forage estimation , sward mass , digital paddock evaluation

Introduction Measurement of forage mass (FM) is crucial in evaluating grazing strategies and setting appropriate stocking rates . Pasture variability usually requires multiple samples for accurate FM evaluation , a labor-intensive process . Rapid , nondestructive techniques can provide reliable FM estimates , but accuracy depends on multiple point readings from an unbiased operator . Continuous measurement of compressed forage height may be more representative . A forage estimator was designed to measure and digitally record georeferenced data . This study evaluates estimator data from two dissimilar grasses .

Materials and methods The forage estimator" sled" is based on a pressure plate attached to a pivoting arm that connects to a potentiometer . Output of the potentiometer and a GPS unit are recorded each second to an Excel ® spreadsheet . The forage estimator is mounted on sled runners to maintain a uniform reference to the soil surface (Moyer and Schrock , 2007) .

Plots of' Kentucky 31' tall fescue (*Festuca arundinacea* Schreb .) and' Midland 99' bermudagrass [*Cynodon dactylon* (L .) Pers .] that received different amounts of nitrogen were used to relate plate height of the sled with harvested FM . On 20 June , 2006 , the sled was pulled the 12-m length of 42 tall fescue plots and 24 6-m bermudagrass plots . A flail-type forage harvester was used to cut FM at 5-cm height from bermudagrass plots and tall fescue plots on 21 and 22 June , 2006 , respectively . The average plate height from each plot was paired with the FM of that plot for regression analysis .

Results and discussion Tall fescue FM ranged from 1660 to 11430 kg ha^{-1} with a linear relationship between FM and plate height (Equation 1) .

$$Y=711X-2810 ; R^2=0.90 \quad \textbf{(1)}$$

where Y is FM in kg ha^{-1} and X is plate height in cm .

Bermudagrass FM ranged from 2240 to 19900 kg ha^{-1} with a quadratic relationship between FM and plate height (Equation 2) .

$$Y=1540X+206X^2-2604 ; R^2=0.76 \quad \textbf{(2)}$$

The quadratic relationship may have been due to the lower growth habit of bermudagrass that allowed lodging at the higher nitrogen rates . When plots with FM> 15 Mg ha^{-1} were omitted , a linear relationship was obtained (Equation 3) .

$$Y=2367X-3609 ; R^2=0.92 \quad \textbf{(3)}$$

Conclusions The forage estimator sled calibration obtained with tall fescue FM was satisfactory for this application . However , calibration for bermudagrass with FM>15 Mg ha^{-1} , was not suitable , likely because of more prostrate growth .

Reference

Moyer , J .L . , Schrock , M .D . , 2007 . Automating measurement of forage mass in pasture . *Forage and Grazinglands doi* :10 . 1094/FG-2007-04XX-01-RS .