Abstract: This project explored the use of a time-of-flight sensor (ToF) as an alternative to the plate meter (PM) for estimating forage mass. The ToF configuration included a single beam TFmini Plus LiDAR Module (Benewake Co., Haidian District, Beijing, China), an Arduino Uno (manufactured by Arduino S.r.l., Torino, Italy), and either a PC or cellular phone for datalogging transmitted serial values sent over a USB connection. The ToF configuration was attached to a utility vehicle drawn sled with a ground to sensor distance of 84 cm. A reflective mat was attached to the sled that floated atop the forage canopy to create a height area to compensate for the narrow field of view of the sensor beam (≤ 5 cm). Six comparisons were conducted between the ToF and PM including warm-season and cool-season forage stands. Both the ToF and PM were calibrated by clipping 10, 14, or 20 calibration squares each to a 5 cm residual forage height followed by drying clipped forage at 55°C. Calibration coefficient of determination ranged from 0.86 to 0.95 and 0.86 to 0.96 for ToF and PM, respectively. Pearson’s correlation and Lin’s concordance coefficients ranged from 0.45 to 0.95 and 0.36 to 0.92, respectively. While both the ToF and PM demonstrated a predictable relationship between their respective height measurements and clipped area forage mass, the concordance between the two methods was weak for some comparisons, likely due to within field sample point variation between the two methods. Further research is needed to better understand mat density, sampling intensity, and plant density and height on the potential use of the ToF as an alternative to the PM.

Keywords: forage mass, plate meter, time-of-flight sensor

Abstract: This study evaluated the impact of nitrogen (N) application rate and forage species of intercropped corn for potential grazing of beef cattle in late fall/early winter. A split plot design (4 replicates/treatment) was used at 2 experimental sites in Manitoba, Canada with 2 treatment factors: 1) N application rate as the main plot and 2) forage intercrop species as the sub plot. Nitrogen application rates were 45 kg N/ha and 112 kg N/ha. Forage species were: Italian ryegrass (Lolium multiflorum), hairy vetch (Vicia villosa), graze forage radish (Raphanus sativus), red clover (Trifolium incarnatum) and a mix of all 4 forages. Intercropped treatments were compared with corn only control treatments with no intercrop at both N rates. Plots were seeded in 2019 with corn from May 8-10 and intercrops seeded from June 17-25. Chemical composition of intercropped forages and corn were determined in early October. Averaged over sites and intercrop treatment, increasing N application increased (P < 0.004) CP of the intercrops from 20.5% (low N) to 22.3% (high N), with CP similar at both sites. On average, radish had the greatest CP (29%), clover least (13.2%), with the remaining crops intermediate (mean 21.7%). Corn CP increased (P < 0.01) with N application (6.6 to 7.5% averaged over treatments), with no effect of intercrop species. Intercrop TDN was not affected by N rate, with greatest concentrations observed in radish (68.2%), least in hairy vetch and red clover (53.6%) and intermediate in the mix and Italian ryegrass (mean 60.2%). Dry matter yield for all intercrop and corn treatments were less than expected at both locations due to exceptional drought conditions. Intercrop treatment and its interaction with N rate did not impact corn yield. In conclusion, intercrop CP ranged from 12-29%, thus offering the potential to increase the feeding value of corn for overwintering cattle.

Keywords: beef cattle grazing, corn, intercropping