Agricultural producers commonly place livestock to graze on cornstalk residue during winter months. While the cost of this feed is low, forage quality may not provide adequate protein for cattle in the last trimester of pregnancy. Forage crops can provide additional protein in livestock diets already utilizing corn residue.

Objectives
The objective of this study was to determine planting date effect on forage crop biomass production for winter grazing by cattle.

Materials and Methods
A field study was conducted at the James C. Hageman Sustainable Agriculture Research and Extension Center near Lingle in 2013 and 2014. A species mixture of annual ryegrass (42%), crimson clover (25%), rapeseed (17%), turnip (8%), and radish (8%) was aero-seeded at 12 pounds/acre into a standing corn crop between September 2 and October 30, 2013, and between July 14 and October 13, 2014. Plots were 15 by 50 feet. Aboveground biomass was collected from two quadrats from each plot during the winter both years. Green biomass was clipped at soil surface, separated by species, and dried. Digital images were acquired monthly using a nadir-oriented digital camera approximately 4 feet above ground level. SamplePoint software was used to quantify ground cover. Experimental design was a randomized complete block with four replicates. Biomass and ground cover data were analyzed using four-parameter log-logistic model.

Results and Discussion
Image analysis highly correlated with biomass (r=0.86, p<0.01), indicating it provides a non-destructive method for quantifying forage pro-

Figure 1. Ground cover by sample month: 2014 (top) and 2013 (bottom).
duction. As expected, later planting dates reduced biomass available for grazing. Biomass production from the earliest planting date was not significantly different between 2013 (72 lb/ac) and 2014 (78 lb/ac) when collected on similar dates in December. When sampled in November 2014 (144 lb/ac), the earliest planting date produced twice as much biomass as either December sampling date. Green forage crop biomass declined nearly 50% between November and December, and cover continued to decline throughout winter (Figure 1). Mid- to late-summer planting dates are necessary to obtain adequate production for livestock grazing. Grazing early in the season may provide a greater benefit as more forage is available for grazing.

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