

EVALUATING MULTI-SPECIES COVER CROPS FOR FORAGE PRODUCTION

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INTRODUCTION

- There has been a growing interest regarding multi-species cover crop blends to provide supplemental forage for fall livestock grazing.
- Grazing multiple species can contribute to a balanced diet for livestock (fiber and protein).
- Using a mixture of plant types can achieve multiple objectives.
 - Legumes increase forage value through nitrogen fixation, resulting in higher protein content (Gardner and Faulkner 1991).
 - Brassicas have a dense root structure which can create macro pores in the soil.
 - Brassicas and grasses such as cereal rye have been shown to uptake soil nitrogen as they grow and then release it back to the soil as they decompose (Dean and Weil 2009).
- A recent survey of Midwestern farmers shows that 33% of current cover crop users have used a 3-species mix (SARE 2014).
- Data is needed that can be used in extension programming to better assist farmers in the decision making process of cover crop selection.

OBJECTIVES

- Evaluate fall planted annual forage biomass production and feed quality.
- Evaluate species composition resulting from 3-way mixtures, comprised of one legume, one grass, and one brassica species.

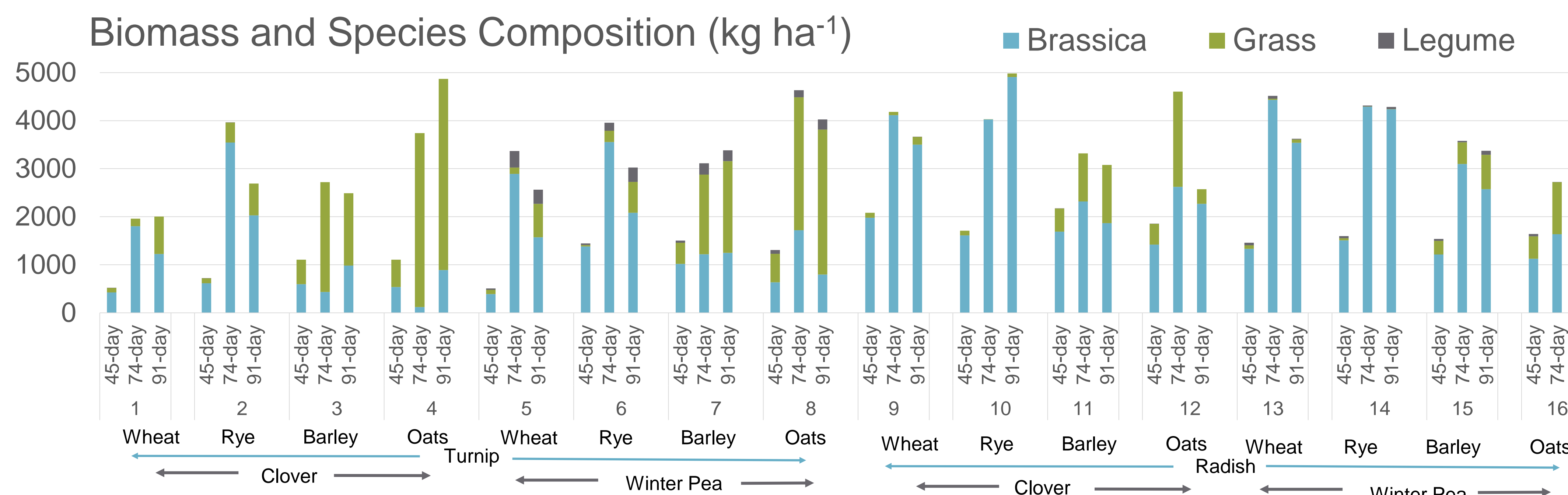
MATERIALS AND METHODS

- RCBD, 16 treatments, 3 reps, 36.58 x 3.05 m plots
- Treatments each consisted of a three-way cover crop mix. Eight species were planted:
 - Brassicaceae: Forage radish (*Raphanus sativus*), or Purple top turnip (*Brassica rapa*)
 - Poaceae: Oat (*Avena sativa*), Rye (*Secale cereale*), Barley (*Hordeum vulgare*), or Wheat (*Triticum aestivum*)
 - Fabaceae: Austrian winter pea (*Pisum sativum subsp. arvense*), or Berseem clover (*Trifolium alexandrinum*)
- Planted August 12, 2014 with a 3 m Great Plains (Salina, KS) no-till drill with two seed boxes.
- Clipped September 26, 2014, October 25, 2014, and November 11, 2014, at 45, 74, and 91, days post planting, respectively.
- Clipped 0.35 m². Forage samples were analyzed for species composition, total biomass, dry matter, acid detergent fiber (ADF), neutral detergent fiber (NDF), and crude protein (CP) content.

Table 1. Analysis of variance (p-values) with treatments as the main effect, analyzed within a cutting date. No treatment comparisons were made between cutting dates.

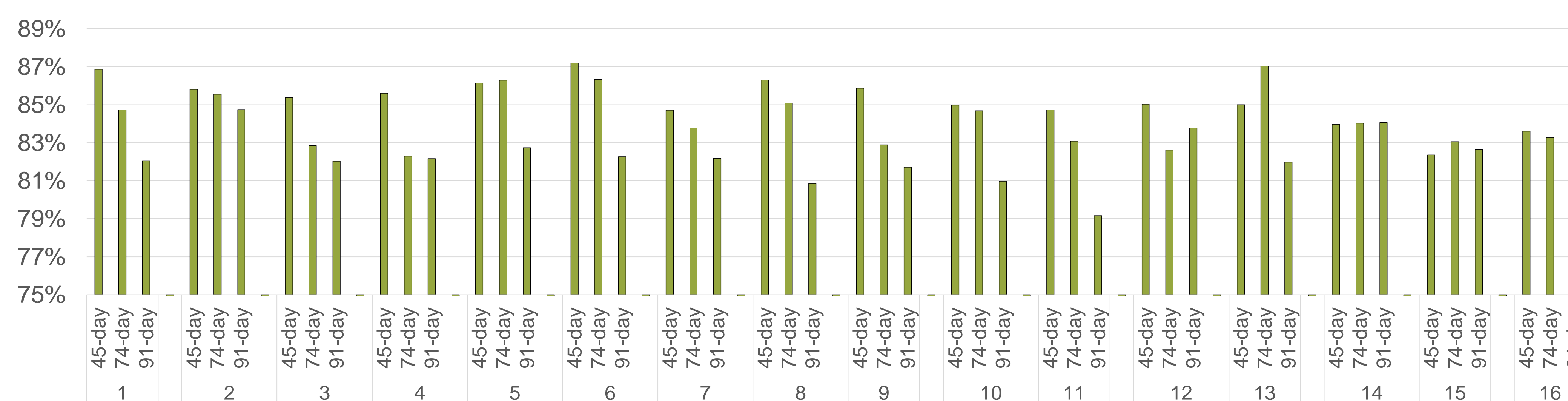
	45-day	74-day	91-day
Biomass	0.04	0.63	0.33
TDN	<0.01	0.08	0.51
NDF	0.08	<.0001	<0.001
CP	0.48	0.03	<0.01

RESULTS



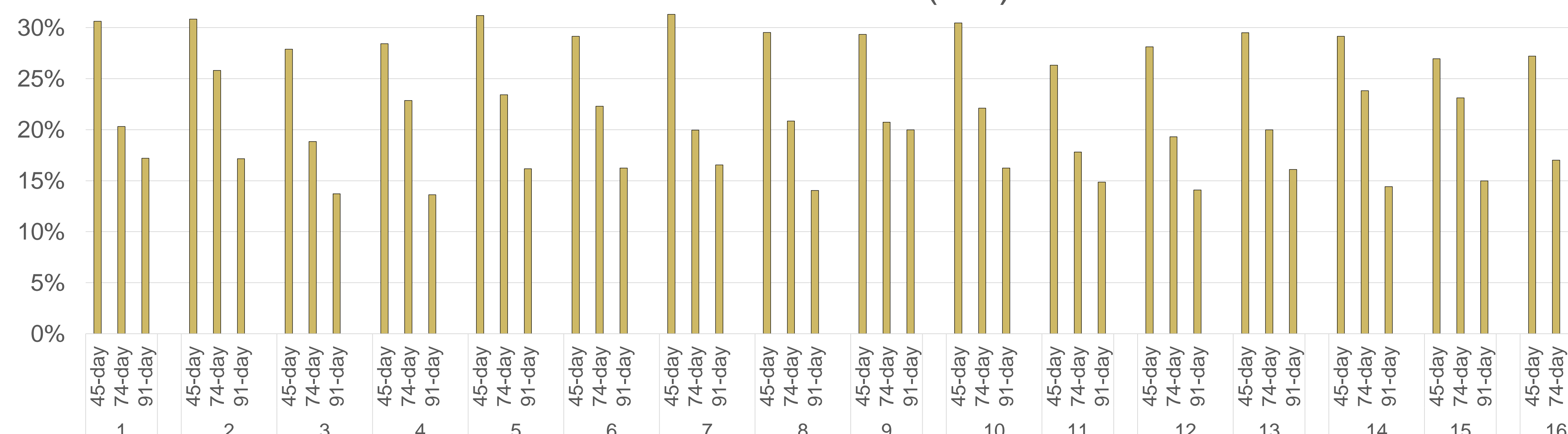
- Biomass differed among treatments at the 45-day cutting.
- On average, biomass was greatest at the 74-day clipping.
- Oat and barley were more prevalent in mixes versus treatments that contained wheat or rye.

Total Digestible Nutrients (TDN)



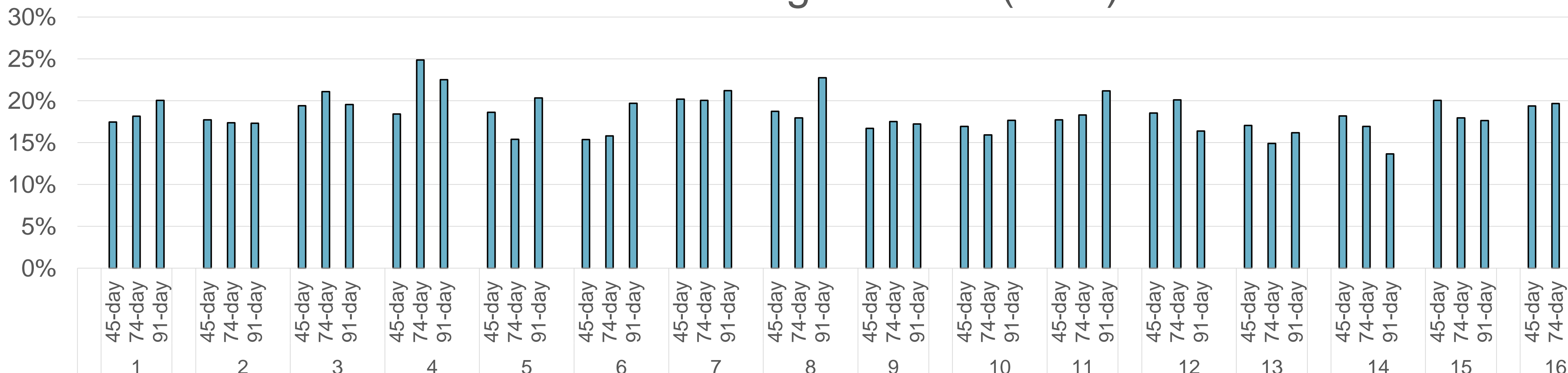
- In general, TDN values declined between the 74- and 91- day sampling periods, due to winter kill. Values $\geq 60\%$ are high-quality forage for ruminants.

Crude Protein (CP)



- At 45-days all treatments exceeded 24% CP which is considered extra premium hay.
- At 74-days half of the treatments had less than 20.5% CP which is the cut off for good quality hay.
- By the clipping at 91-days, all but one treatment contained < 18% CP classifying as fair quality hay.
 - Based on nutritional needs of dairy cattle (Robinson, 1998).

Neutral Detergent Fiber (NDF)



- Differences between treatments are explained by the species composition.
- For example, treatments that contained greater amounts of grass biomass contained more NDF.

CONCLUSIONS

- Cover crop mixtures can provide high quality forage for cattle
 - TDN, CP, and NDF all within ranges for excellent nutritive value
- Species composition of a mix changed during the growing season. At the 45-day clipping, plots contained a mix of the species planted, but by the 90-day clipping, some plots were dominated by radishes, while other plots were dominated by oats, or barley.
- Radishes winter-killed earlier in the season than turnips. At 91-days, the radishes were wilted and decomposing while the turnips were still alive.
- Biomass, on average, declined for most treatments at 91-days, due to frost kill for some of the individual species.
- The best combination of maximum biomass production and nutritional value was achieved at 74-days after planting.

ACKNOWLEDGEMENTS

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- 2013-2014 SARE/CTIC Cover Crop Survey
 - Available on the web at <http://www.sare.org/Learning-Center/From-the-Field/North-Central-SARE-From-the-Field/2013-14-Cover-Crops-Survey-Analysis>



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