Using Winter Rye as a Forage for the Integration of Crop and Livestock Production

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Winter rye is an extremely hardy winter cereal crop that can handle a wide range of environmental conditions. Winter rye germinates and grows at very low temperatures and can be sown quite late in the fall; providing a wide window of opportunity to plant. Rye is the earliest, of the winter cereal grasses, to initiate growth and produce forage/biomass in the spring. Winter rye tends to require less inputs to raise, competing excellent with weeds and performing well under low fertility or moisture conditions along with providing reliable cover for erosion control. These traits are the impetus for the increasing popularity of rye as a major component in cover cropping, double cropping forages, or integrated crop-livestock systems in many regions, including North Dakota.

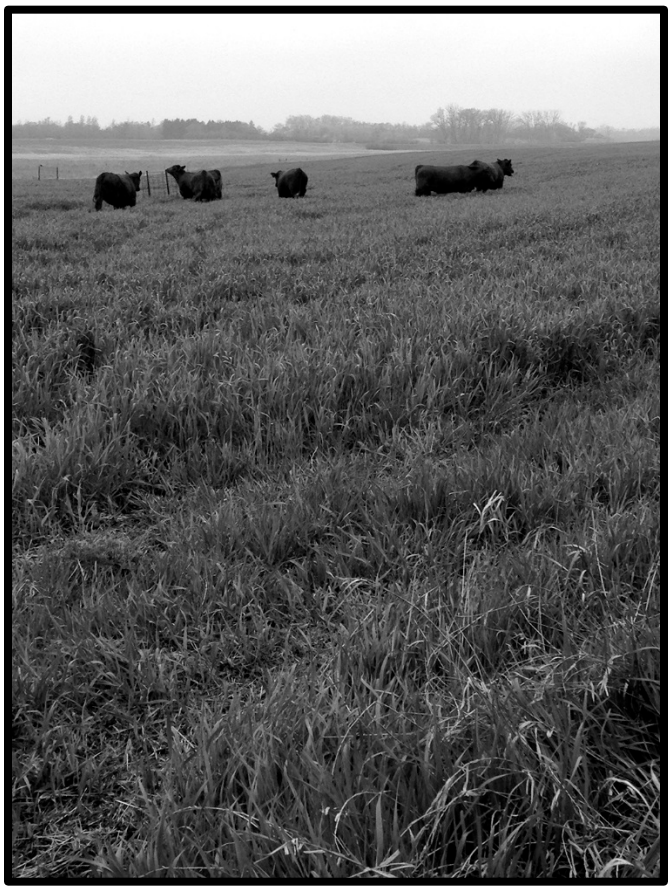
The winter rye focus at the Carrington Research Extension Center (CREC) is quite broad, ranging from small plot research related to grain, forage, cover crop, weed control, and variety development to field scale seed and forage production. Winter rye has been evaluated as a forage crop at the CREC, demonstrating its value as a reliable forage crop that provides cover and can extend the haying/grazing season. The use of winter rye for forage is a method of integrating cropland into a livestock system. The CREC has evaluated winter cereals as forage or cover crops for a number of years and has found rye to be a very reliable winter crop in south central North Dakota. Data gathered from multiple years demonstrate an average dry matter forage yield of 2.5 tons/acre as compared to triticale, wheat, and spelt at 2.5, 2.6 and 3.2 ton/ac DM, respectively (https://www.ag.ndsu.edu/carringtonrec/documents/annual-reports/2012-annual-report; page 24). Average harvest dates for these crops illustrate rye reaches maturity sooner compared to other winter cereals. Harvest dates gathered from multiple years show rye maturity at June 12, compared to June 21 for triticale, June 24 for wheat, and July 5 for spelt.

The data demonstrating the early growth habit and forage production of rye, made it apparent there is ample time to raise a second forage crop following a rye crop. These observations directed further research exploring options utilizing rye and Sudangrass, as the double crop, after harvesting rye for forage produced consistent early maturity and tendency for higher yields of the subsequent forage crop. (https://www.ag.ndsu.edu/carringtonrec/documents/annual-reports/2014-annual-report; page 31). These higher yields from double cropping the rye are related to the earlier harvest dates and the associated earlier planting date of the Sudangrass.

After evaluating the small plot research trials conducted with rye forage and double cropping, an evaluation to take the proof of concept from the plots to a field-scale model was initiated.

In the fall of 2015, a 30-acre field at the NDSU Carrington Research Extension Center was seeded to “Rymin” winter rye at a rate of 70 lbs/acre, following a buckwheat crop. The fall soil test indicated 40 lbs/acre available N. An additional 80 lbs/acre N was applied in the fall. The goals were to harvest the rye crop in the spring as silage for comparing winter rye and corn silage in feedlot finishing diets for yearling steers; and to follow by double cropping with an annual forage crop for fall grazing. Additionally, one acre of the field was fenced with temporary fencing for rye grazing observations.

On May 10, ten yearling heifers and three dry, mature beef cows, averaging 1155 lbs, were grazed for 10 days on the one acre of rye designated for grazing. The estimated average available dry matter was 1.14 tons/acre. The re-growth on June 10 was an estimated at 1.5 tons dry matter/acre and was grazed with six yearling steers for 15 days. Initial observations indicate grazing sooner and with higher stocking densities to more fully utilize the rye forage, would have been more effective for both grazing timings.



Heifers grazing winter rye forage in the spring.

On June 16, the remaining 29 acres were cut, wilted, chopped and bagged for silage. The average yield was estimated to be 3.5 tons dry matter/acre. The forage quality measured was 8% crude protein, 37% ADF, 61% NDF, and 62% TDN. The rye was a few weeks past anthesis at the time of harvest. Quality will be higher if rye is cut at anthesis. While timing is critical for rye harvest and re-seeding of the second crop to maximize forage quality and production from both crops, logistics and weather conditions can cause delays in both harvest and re-seeding windows. The field was re-seeded to German millet at a rate of 20 lbs/acre on June 24. The double crop was sown as a monoculture due to dry conditions no favorable for seed multiple species (turnips, lentils, and radish), as originally planned. On September 15, the German millet was swathed, allowed to dry, and three windrows were combined to be used for fall and winter grazing of mature beef cows. Although not determined, estimated forage yield from this second crop was approximately 2 tons dry matter/acre. The forage quality of the German millet was 8% crude protein, 51% ADF, 69% NDF, and 47% TDN. The German millet was cut when the crop was in the seed development stage; again, quality would be higher if cut in the early heading stage. In hindsight, moisture was not limiting as we had anticipated. Due to extended excellent fall growing conditions, it would have been advantageous to have other plants growing in the field during swath grazing. This could have been accomplished with the addition of turnips to the original seeding mix.

The rye silage is currently being fed in a feedlot trial to evaluate rye silage compared to corn silage in steer finishing diets. Seventy one head of 990 lb steers are being fed diets with either corn silage (19% of the diet dry matter) or rye silage (11% of the diet dry matter) as the forage base. The steers have gained an average of 5 lbs/head/day. Animal performance, feed efficiency, and carcass data will be evaluated and summarized at the end of the feeding trial. Amazingly, we were able to harvest the rye crop in the spring and start feeding it in the feedlot within a few weeks. The corn silage used in this trial was harvested the previous fall. In addition to feedlot research, a year-round drylot cow herd is maintained at the research center. Production yielded more rye silage than was needed for the feedlot trial, so rye silage was fed in drylot cow rations throughout the summer. Rye can fill the gap to provide forage between corn silage harvests.

Rye silage.

Following weaning on October 31, 109 head of mature cows were placed on the field to swath graze the millet crop that was re-seeded following the rye harvest. The field was split into four sections. Cows grazed for approximately one week per section for approximately 30 days. Additionally, the one-acre area that was used for rye grazing observations in the spring was re-seeded to winter rye in the fall. The cows have been allowed to graze and use this area to travel to access water while grazing the millet swaths. We will observe how hoof traffic and grazing in the fall will affect the spring growth of this fall-seeded rye.

Overall, this demonstration project has allowed us to take research from the plots to a field-scale proof of concept, demonstrating the dual cropping role rye can play in utilizing a small number of cropland acres for harvested forage and grazing production. Additionally, the project demonstrated how feedlots and drylot cow/calf operations can utilize a small number of cropland acres as a forage base for silage, hay and grazing. The quantity and quality of forage can be improved in a semi-arid short growing season when winter rye is a key component of the production system.