Mechanical Renovation of Deteriorating Alfalfa Stands

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**Introduction**
Hay fields in northeast Wyoming are typically renovated by costly tillage or by herbicide application followed by no-till seeding. Some producers have historically performed various types of management practices during the lifespan of their fields to rejuvenate existing stands. This project originated from a discussion of the Sheridan Research and Extension Center (ShREC) Advisory Board related to extending the life and productivity of alfalfa hay fields. The goal is to evaluate whether low-cost mechanical methods used each season can improve productivity of an aging alfalfa hay stand over multiple years.

**Objectives**
Our objectives are to (1) compare the effectiveness of various mechanical treatments (harrow, aerate, disc, cultivate) with conventional hayfield renovation techniques (herbicide, plow, reseed with cover crop) and no-till renovation (herbicide, reseed without cover crop); and (2) evaluate the costs and values of each practice.

**Materials and Methods**
This project was established in 2016 in an aging irrigated hayfield on ShREC’s Adams Ranch south of Sheridan. The trial is semi-circular and covers 21.3 acres across three wheel tracks of the center pivot. Each wheel track was split equally using a Global Positioning System-guided tractor to make six equal-width strips. Six treatments were randomized, balanced, and replicated four times resulting in an average of 3.5 acres total for each rejuvenation method. Mechanical treatments included chain harrowing alone or in combination with tandem disc, pasture aerator, or field cultivator. Each treatment will be compared to conventional tillage and no tillage renovation treatments in 2017. The conventional treatments include herbicide, moldboard plow, disc, roller harrow, and seed alfalfa with hay barley cover crop, while the no tillage treatments include herbicide, no-till seed alfalfa without a cover crop. Crop yield comparisons were measured by hand clipping 2.7-ft² plots in four random locations within each plot resulting in roughly 11 ft² of biomass collected from each plot. This allows the large trial to be bulk harvested for hay production along with the remainder of the field. We analyzed 2016 biomass data with a one-way analysis of variance and separated means with Fisher’s protected LSD.

**Results and Discussion**
Unusually warm temps and no snow cover in early March 2016 allowed the alfalfa to break dormancy and grow rather rapidly. It was determined that significant crop damage could result if the four mechanical treatments were performed on a crop that advanced. The decision was made to only do the conventional and no-till renovation treatments when conditions permitted. The remaining mechanical treatments took place in spring 2017 (we plan to present results of this phase of the study in next year’s Wyoming Agricultural Experiment Station Field Days Bulletin). Biomass harvest of three treatments (conventional, no-till, and remainder of field a non-treated check) was performed 10 days past the heading of the seeded barley. Air dried forage biomass was greatest for conventional rejuvenation, although the no-till approach still produced higher biomass than the non-treated check ($p<0.001$; Figure 1). Long-term impacts of these various approaches on alfalfa production remain to be seen.

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Figure 1. Air-dried forage biomass (lb/acre) for two alfalfa rejuvenation treatments (conventional and no-till) and a non-treated check. Points represent means and error bars are 95% confidence intervals about each mean.

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