

# PLANTING CONFIGURATIONS AND IRRIGATION REGIMES AFFECT YIELD, QUALITY, AND ECONOMIC RETURNS OF ALFALFA-GRASS MIXTURES

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## ABSTRACT

Alfalfa is the most important forage crop grown globally and constitutes more than half of all forage produced in the US, contributing significantly to the nation's economy. Alfalfa is highly productive, provides great animal performance, and has superior nutritive value. However, alfalfa growers face several challenges with growing alfalfa such as high and inefficient use of water, alfalfa weevil infestation, and bloat problems in livestock grazing. A field study was conducted at the University of Wyoming James C. Hageman Sustainable Agriculture Research and Extension Center in 2020-2021 and 2021-2022 growing seasons to compare forage productivity, nutritive value, alfalfa weevil abundance, and economic returns of monocrop alfalfa and different seeding ratios of alfalfa-grass mixtures planted at different planting configurations under full and deficit irrigation. Treatments included monocrop alfalfa, 75-25% mixture, 50-50% mixed row planting, and 50-50% alternate row planting of alfalfa with each of three perennial cool-season grasses (orchardgrass, tall fescue, and meadow bromegrass) under full and deficit irrigation. Full irrigation plots received 100% ET<sub>c</sub> (crop evapotranspiration) for the whole season while deficit irrigation plots received 100% ET<sub>c</sub> for the first harvest and 60% ET<sub>c</sub> for subsequent harvests. The study was laid out in a split plot design with irrigation as the whole plot factor and cropping system (monoculture and mixtures) as the subplot factor. Results show that intercropping alfalfa with grasses irrespective of planting configurations produces similar forage yield to monocrop alfalfa. Deficit irrigation reduced forage yield. Forage nutritive value was generally higher in monocrop alfalfa, however some mixtures produced similar nutritive value as monocrop alfalfa, which appears to be dependent on grass proportion in the mixtures. Intercropping alfalfa with grasses reduced alfalfa weevil numbers. The 75-25% mixture of alfalfa and tall fescue under full irrigation produced the highest net present value. Deficit irrigation reduced costs associated with irrigation, however this did not result in high net present value compared to full irrigation. Alternate row planting with orchardgrass under deficit irrigation produced similar net present value compared to the treatments under full irrigation. Increasing unpredictability of the weather due to climate variability can make deficit irrigation more viable and sustainable in the future.

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