

Water Profitability: A New Approach for Comparing Alfalfa & Other Forages in Arid Regions

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Arid regions such as the Intermountain West, including Utah, face frequent and intensifying droughts. In these regions, most (70%-80%) of water withdrawals are used for agriculture. Optimizing irrigation under these conditions requires evaluating not only yield but also water productivity (yield per unit water) and water profitability (profit per unit water). This study examined the effects of deficit irrigation on alfalfa, corn silage, and three alternative forage crops (teff, sorghum sudangrass (SS), and forage rye (FR)) across three sites in Utah (Logan, Vernal, and Cedar City) from 2020-2024, with four irrigation levels: full (100%), uniform deficit (75%, 50%), and targeted deficit (50% T), nested within 4-5 irrigation technologies. Results showed that yield responses to irrigation were environment- and crop-specific, whereas water productivity and profitability responded more consistently to deficit irrigation. No single irrigation level consistently maximized all metrics. Deficit irrigation frequently improved performance per unit of water applied; however, some environments favored higher irrigation to protect yield and profitability. Therefore, irrigation decisions should be framed around the producer's goal and local conditions.