



# Five Irrigation Approaches for Improving Alfalfa Yield and Quality

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## RATIONALE & OBJECTIVES

- Trials were conducted across southcentral Utah from 2019 to 2021 on 12 pivot irrigated alfalfa fields.

### Objectives:

Evaluate the level of crop response from replacing worn pivot equipment (head, nozzle, regulator).

Determine if growers could reduce irrigation by 10% and maintain yield and quality.

Compare seasonal irrigation application depths and crop response when implementing a free irrigation scheduling tool, a commercial model, or a soil moisture sensor and water-balance equation to prescribe irrigation amounts.

## STUDY DESCRIPTION

### Plot Layout:

3 degrees of the field circumference constituted one replicate.

### Locations:

12 locations across southcentral Utah.

### Factors:

*New Equipment:* A span of the pivot was divided into a portion with new sprinkler equipment to compare with a portion that had the original equipment.

*10% Reduction:* Another portion of the span had new sprinkler equipment installed with nozzles that would emit about 10% less than the designed output of the pivot.

*Irrigation Scheduling:* Three advanced methods for determining the irrigation amount were compared with the farmer's rate each irrigation by implementing a speed controlled variable rate irrigation plan across the plot areas.

### Analysis:

*Yield:* In-field measurements followed by oven-drying provided dry matter measurements.

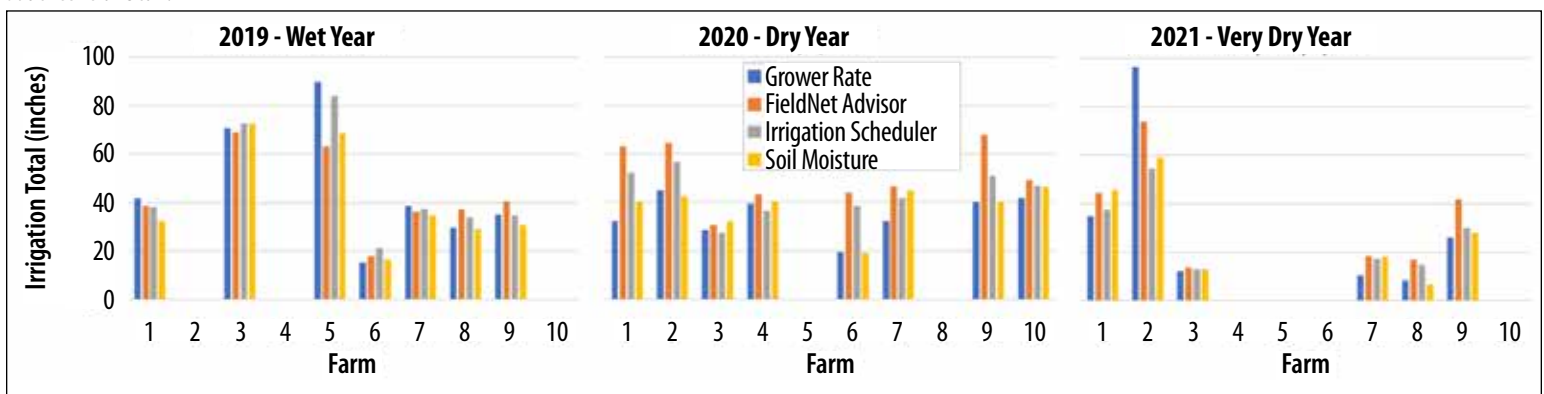
*Quality:* Each sample was analyzed for forage quality using near-infrared reflectance spectroscopy according to the NIRS Forage and Feed Consortium standards.

*Water Application:* Records from the VRI program were used to calculate the seasonal irrigation application depth for each of the scheduling methods.

## RESULTS

- There were no consistent crop effects due to the new sprinkler equipment on pivots.
- In a wet year, many farms were not negatively affected by reducing irrigation by 10%. Yield losses became more apparent from the reduction in the second year.
- Three advanced scheduling tools had no consistent impact on yield or quality. At some farms the tools saved water in the wet year of 2019, but in the dry years of 2020 and 2021 the advanced methods frequently prescribed more water than the growers could apply.

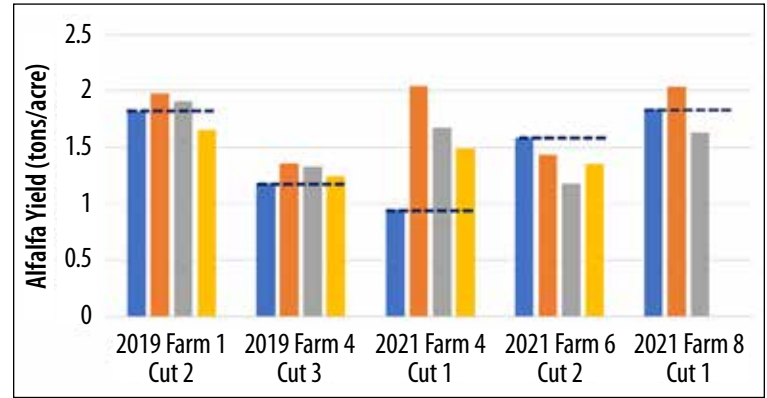
**Figure 1.** Seasonal irrigation amounts applied using the grower rate, FieldNet Advisor, Irrigation Scheduler, and soil moisture sensor recommendations at farms across southcentral Utah.



## RESULTS CONTINUED

- The advanced scheduling methods did not consistently reduce irrigation rates.
- In dry years, growers usually had a more conservative prescription than the other methods.
- The soil moisture sensor often prescribed less water than the other advanced methods.
- Out of 46 alfalfa harvests, yield was affected by the scheduling method five times.
- There were no patterns on consecutive harvests at any farm.

**Figure 2.** The 5 of 46 total cuts across farms and years in the study that the irrigation scheduling method affected alfalfa yield, at a significance level of  $p < 0.05$ .



## MANAGEMENT SUGGESTIONS/CONCLUSIONS

- New irrigation equipment rarely and inconsistently improved alfalfa yield or quality. Growers should still swap out worn equipment, but some may last longer than expected.
- In wet years, irrigation could often be cut by 10% without affecting alfalfa yield or quality. The advanced irrigation scheduling tools help provide confidence in these cutbacks.
- Advanced irrigation scheduling tools could only reduce irrigation without impacting alfalfa production in a few cases likely because growers in the study were conscientious irrigators.