

## INTRODUCTION

- Sunflower (*Helianthus annuus* L.) production in the U.S.A. has greatly increased since the introduction of hybrids in the early 1970's.
- Most sunflower is produced under rainfed conditions but irrigation is needed in precipitation-limited environments, such as the arid region of Powell, Wyoming where seed yields are often doubled with adequate irrigation.
- Sunflower is categorized as a low to medium drought sensitive crop.
- Frequent drought conditions and the evidences of water shortages at the peak of the growing season in Wyoming call for proper irrigation-water strategies.
- Limited irrigation might be a viable on-farm irrigation management strategy to sustainable sunflower production.

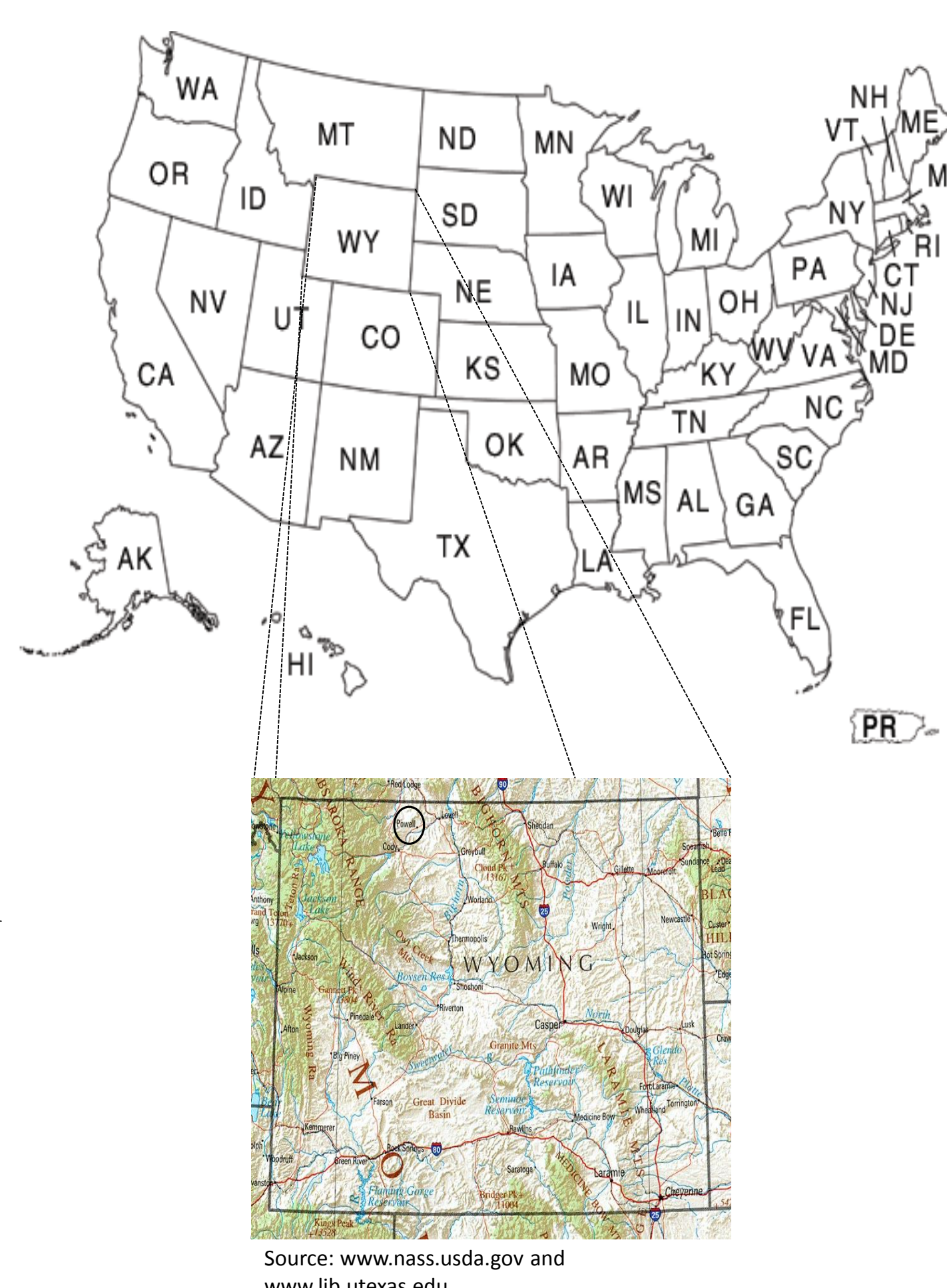
## OBJECTIVES

The objectives of this research were to investigate the effect of limited irrigation strategies on yield and quality of confectionary sunflower and to determine the impact of limited irrigation imposed at critical growth stages of sunflower under conditions of the Big Horn basin of Wyoming, USA.

## MATERIALS AND METHODS

- **Location:** The experiment was conducted at the University of Wyoming Research and Extension Center in Powell, WY, USA (Fig. 1)
- **Period:** 2010, 2011, and 2012 growing seasons.
- **Experimental design:** Randomized complete block design with four replications on a clay loam soil
- **Sunflower genotype:** Hybrid Dahlgreen 9569
- **Treatments:** Full irrigation (FI), establishment irrigation and resume irrigation when a miniature floral head was visible (R1), establish irrigation and resume irrigation when the flowers started to open (R4), and establishment irrigation and then no irrigation (RF).
- **Plant measurements:** The LI-6400XT photosynthesis analyzer (www.licor.com) was used.
- **Environment:** monitored with an automated weather station near the experimental site
- Irrigation was applied as usually scheduled by area farmers.

**Figure 1.** Location of the experimental site



## RESULTS AND DISCUSSION

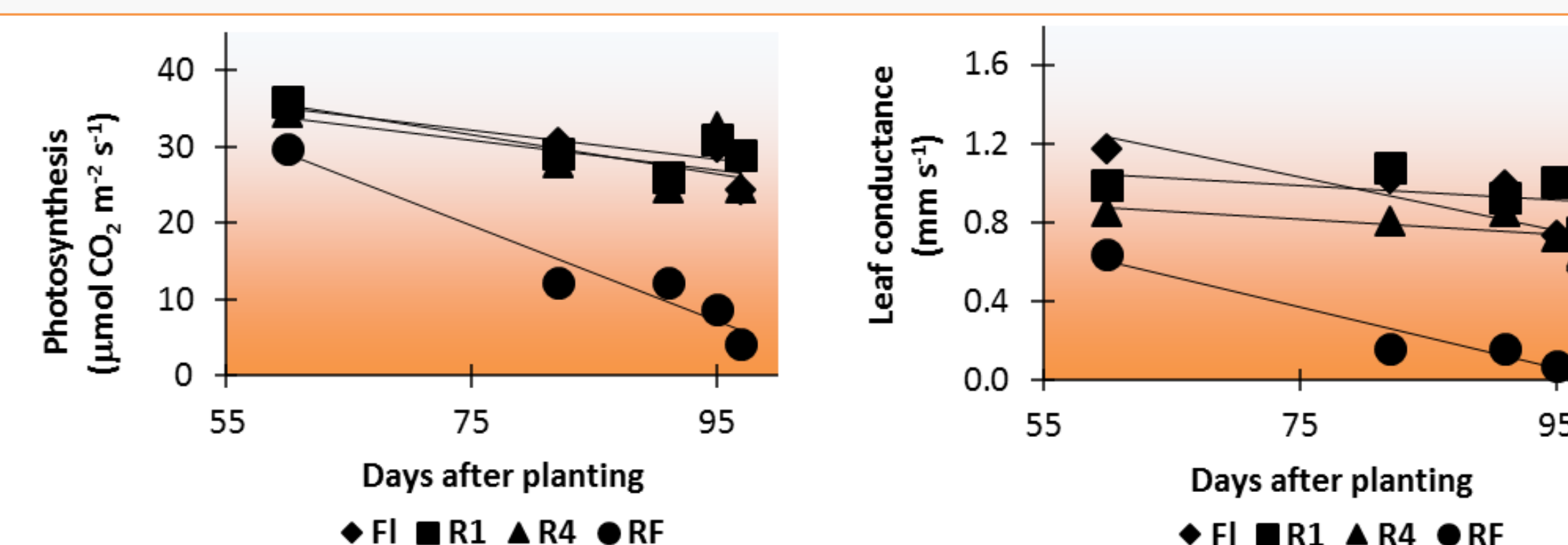
- From May through October, 2012 was the hottest (16.8°C) and driest (41 mm), 2010 was the coolest (15.4°C), and 2011 the wettest (145 mm) (www.wawn.net).
- Irrigation treatments had significant ( $p < 0.05$ ) effect on total and quality (7.94 mm sieve yield) seed yields (Table 1).
- Between years, the maximum total seed yields were observed with full irrigation and irrigation at R1. The rainfed treatment consistently yielded lower.
- Total and quality seed yields of confection sunflower generally increased with increase in irrigation.
- Maximum head diameter did not differ significantly from R1 and R4 in all seasons while minimum head diameter was found in RF treatment in all years (Table 1).

**Table 1.** Effect of limited irrigation treatments on total seed yield, 7.94 mm sieve yield and head diameter of confectionary sunflower.

Treatments	Seed yield (t ha <sup>-1</sup> )		Head diameter (cm)
	Total	7.94 mm sieve	
<u>Season 2010</u>			
FI	4.73 a	1.86 a	17.6 a
R1	4.62 ab	1.92 a	17.2 a
R4	4.11 b	1.88 a	16.0 a
RF	2.48 c	1.00 b	13.4 b
<u>Season 2011</u>			
FI	4.61 a	4.33 a	16.3 a
R1	4.53 a	3.66 b	15.9 a
R4	4.15 b	2.91 c	15.8 a
RF	1.98 c	0.69 d	10.0 b
<u>Season 2012</u>			
FI	3.99 b	2.93 b	16.3 a
R1	4.58 a	3.50 a	15.1 a
R4	3.61 c	2.37 c	15.3 a
RF	1.89 d	0.33 d	11.8 b

Within growing season and column, means followed by the same letter are not significantly different at  $p < 0.05$

**Figure 2.** Effects of limited irrigation on photosynthesis and leaf stomatal conductance of confection sunflower



Both photosynthetic and leaf conductance rates between FI, R1 and R4 treatments were similar, while in the RF treatment were the lowest (Figure 2).

## ACKNOWLEDGMENTS

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