

DRAGON-LINE[®]

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MOBILE DRIP IRRIGATION

TRANSFORMS

PIVOT IRRIGATION

THROUGH

DRIP TECHNOLOGY

THE ***CONCEPT AND PROCESS*** OF
MOBILE DRIP IRRIGATION
COMBINES THE ***EFFICIENCY*** OF DRIP
TECHNOLOGY WITH THE ***ECONOMICS***
AND ***FLEXIBILITY***
OF PIVOT AND LINEAR IRRIGATION

What is MDI? (Mobile Drip Irrigation)

- **MOBILE DRIP IRRIGATION, not another new type of sprinkler head! MDI is a drip system that is mobile!**
- A placement of drip tubing that drags behind the pivot, in precise row placement, ranging in lengths from 1' - 100' w/ pressure compensating emitters.
- It can be adapted to end of hose or rigid drops w/o sprinkler head or pressure regulators
- Germination, chemigation, or fertigation is also possible in conjunction with traditional sprinklers
- Water application is precisely and uniformly distributed directly to predetermined soil surface.

Dragon-Line Systems can be combined with a conventional irrigation application package (sprinkler) to provide germination, chemigation and fertigation.



MDI & DRAGON-LINE Advantages

- Accuracy of water management and greater efficiency than std. pivot nozzling (down to ½ size of nozzle)
- Accuracy of watering for small GPM wells (100-400 GPM) Eliminates overwatering in beginning spans. Saves >10% of total water to utilize in the balance of system
- Traditional sprinkler heads deliver application greater than 90% , but losses occur after water leaves the nozzle due to **evaporation, wind, sun, unlevel terrain, and soil conditions**

- Saves overall 20-50% of water applied.
- Banks water rather than evaporating or running it off. Increases soil moisture.
- Reduces plugged nozzles & frozen plugged drops (5/8" tube)
- Reduces or eliminates wheel track problems & slippage of muddy tires (more accurate %)
- Delivers water and fertilizers directly to soil surface not foliage

- Delivers water to a larger area to promote low impact and better infiltration rate, usually greater than 50% more area.
- Low impact application means soil stays mellow with little or no soil compaction which often develops or forms a hard pan during watering season.
- Professional and exact sprinkler chart produced by the WISH Group for precise water application and placement of lines.

MDI — CONCERNS

- 80 Mesh filtration is needed for sands, contaminants, and organics that can plug emitters (Remember, it is a drip system)
- Water may need treated for algae, etc. (Water Sample test must be taken)
- May not be able to germinate, chemigate, or fertigate ***without*** traditional sprinkler heads or valving of secondary system w/shut off valves
- May have to manage differently during harvest and tillage operations
- May have possible rodent or animal damage

Problems Caused Without Filtration



Possible Rodent or Animal Damage



FILTRATION METHODS



**80 Mesh Filtration And A Water Sample Are Required On All Systems.
Filtration Methods Vary Based On Water Quality.**



AUTOMATIC

SEMI-AUTOMATIC

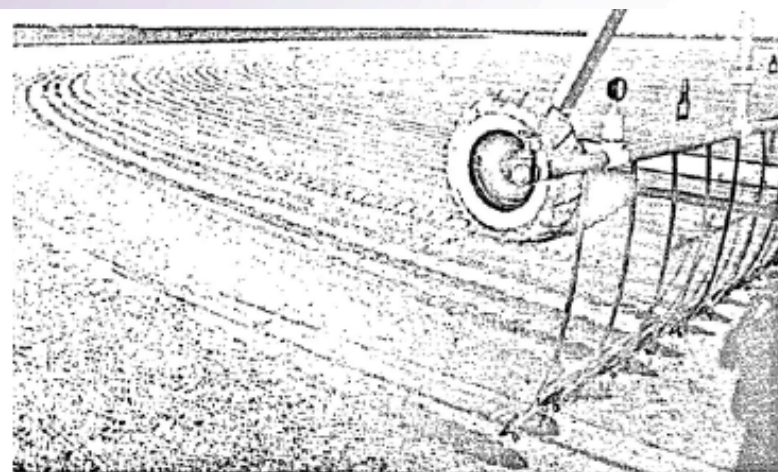
MANUAL



Mobile Drip Irrigation



Howell and Phene, 1983 in Fresno California



Helweg (1989) in Saudi Arabia



Sourcel (2003) in Germany



Olson and Rogers (2008) in NW Kansas

2008 University Study PMDI Before Precise Placement



PMDI System with Manifold Not DRAGON-LINE



Original (*Old Style*) PMDI without precise placement of drops



MOBILE DRIP IRRIGATION

---MDI---

NOT A NEW IDEA

DRAGON-LINE

JUST PERFECTED IT

AS TECHNOLOGY EMERGED

What is DRAGON-LINE Video

DRAGON-LINE[®]



**TRANSFORMING
PIVOTS INTO
DRIP TECHNOLOGY**

WWW.DRAGONLINE.NET

DRAGON-LINE (New Style)

2016 / 1300' System / 375 GPM
30" High Line Dual Cable Manifold



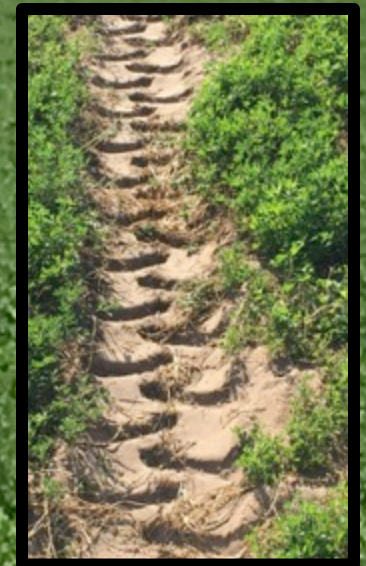
Dragon-Line

2017, 2nd Year Alfalfa Crop

Low-Line Manifold 40"/400 GPM

Wheel Track After 4th Cutting

8.4 tn/acre Yield



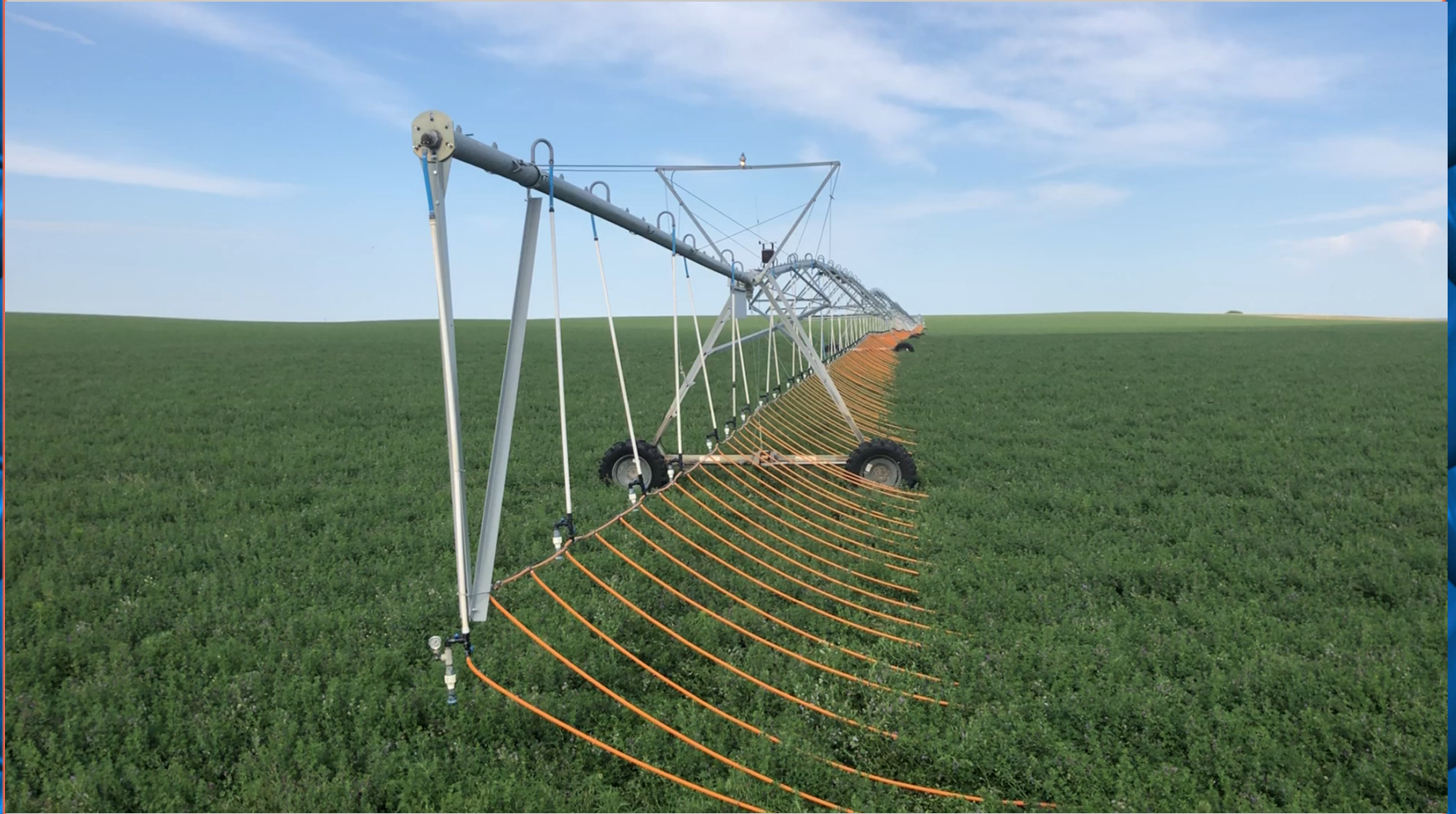
2017 Soybeans /550 GPM /125 acres



2017 Soybeans /550 GPM /125 acres



400 GPM Alfalfa SW Kansas





400 GPM/ Alfalfa /125 Acres/SW Kansas



Watering 2017 Cotton Crop

200 GPM Spray --- VS --- Dragon-Line **125 ACRES**

Wetting Soil Surface, Plants, Wheel Tracks -VS- Precise
Watering



Cotton Mid Season Watering
Low-Line System 200 GPM-125 ACRE



30" High-Line Manifold
200 GPM on 75 Acres

High Line System 30" Spacing on
Cotton 550 GPM
Mid 70's Pierce System



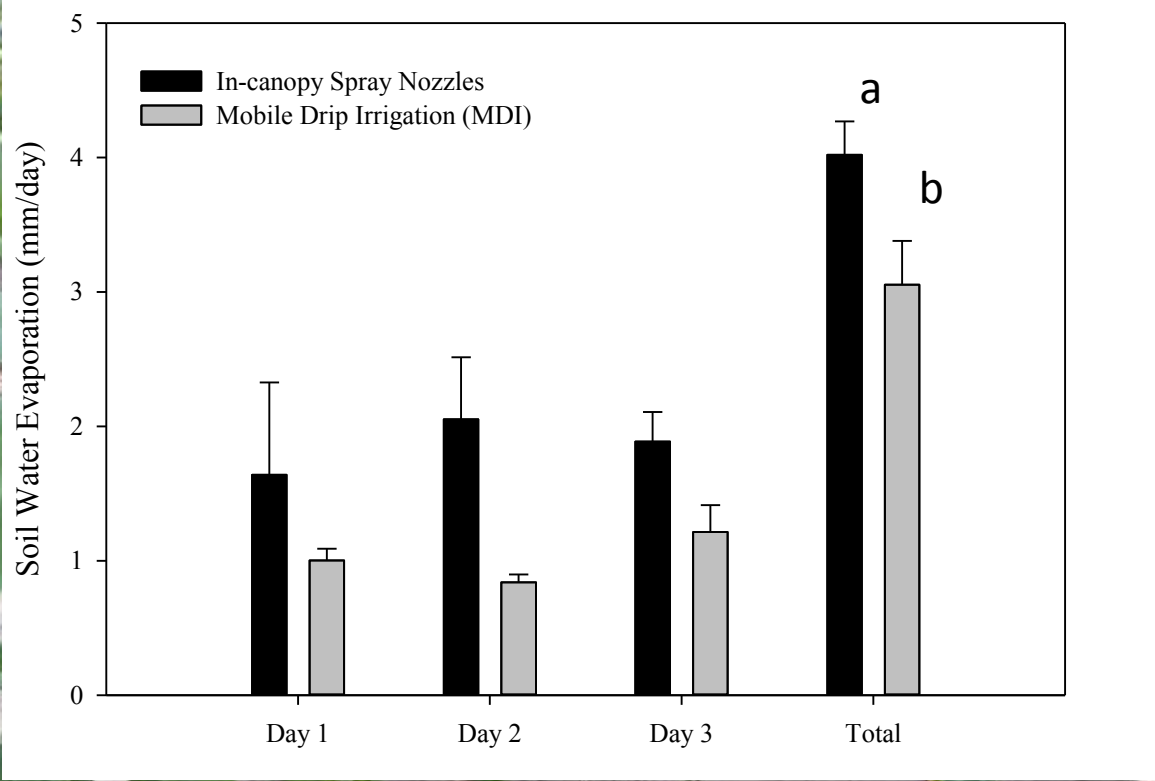


30" High-Line Manifold
Dual Shut-Off Valves on 120"
"New" Truss Rod Clip Assembly

Potential Sources of Water Loss for Irrigation Systems

- **Air Losses**
 - Air Evaporation
 - Drift
- **Foliar Losses**
 - Plant Interception
 - Net Canopy Evaporation
- **Ground Losses**
 - Surface Evaporation
 - Surface Run Off
 - Deep Percolation

Soil water evaporation under LESA and MDI (mm/day)



Dry

Wet

Percent difference in soil water evaporation ~27%

Mobile Drip Irrigation



www.dragonline.net



K-State SWREC

Conventional Sprays

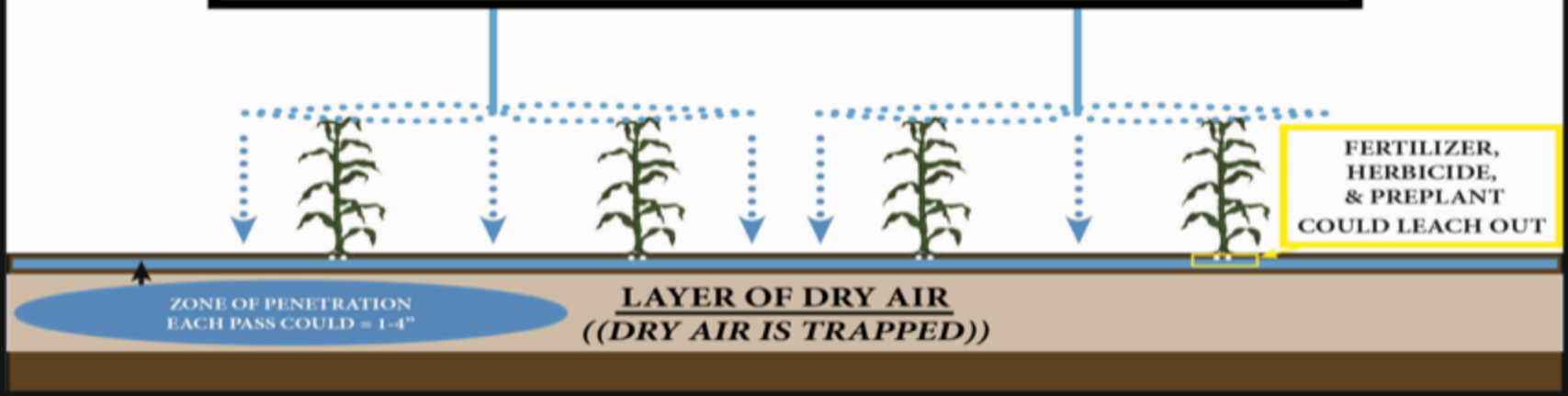


Dragon-Line



1.25" IRRIGATION APPLICATION

CONVENTIONAL IRRIGATION

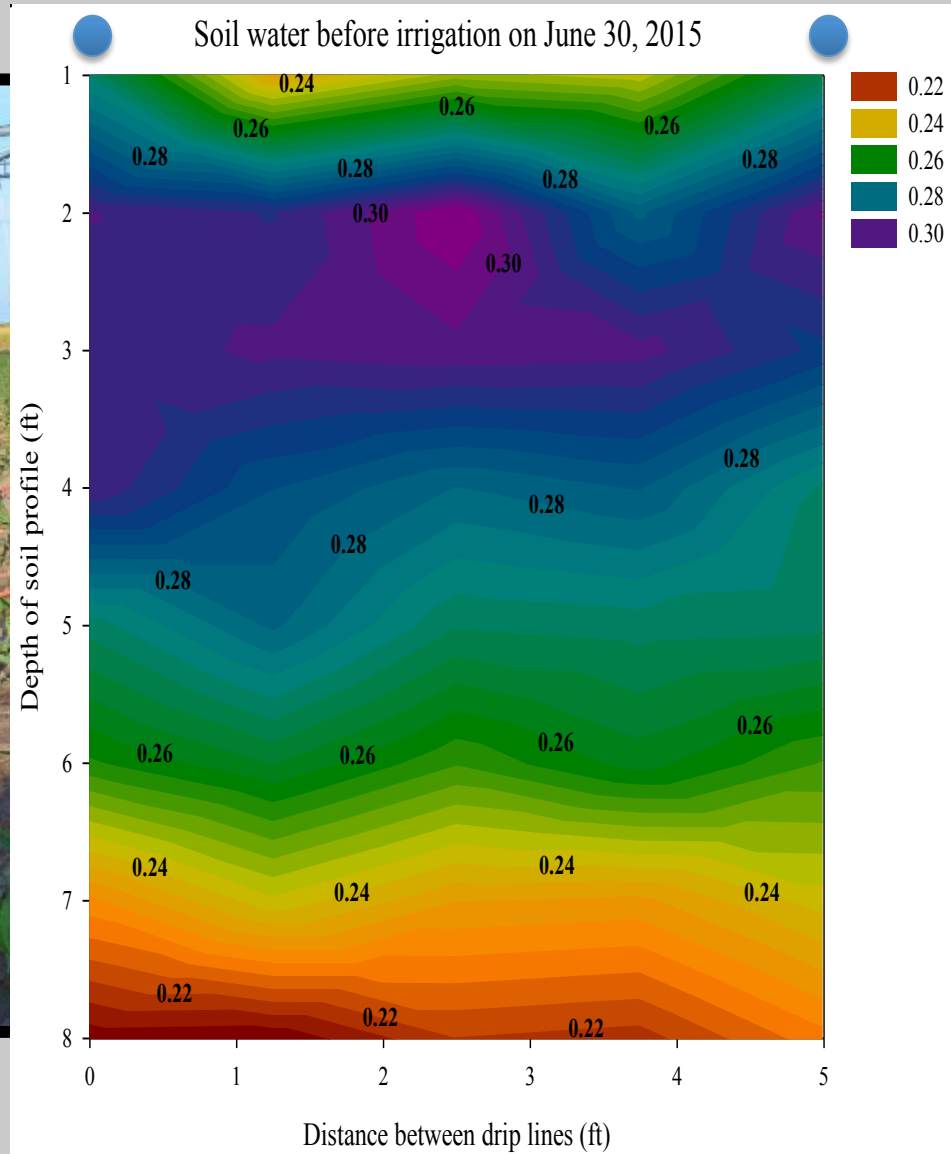


DRAGON-LINE® IRRIGATION



MDI Allows Water To Penetrate Soil, Moving Dry Air Out, Promoting Capillary Action

Soil water redistribution under 60 inch spacing





***SOIL CRACKS BETWEEN WATERING
ALLOWING PROFILE TO FILL W/O SEALING***

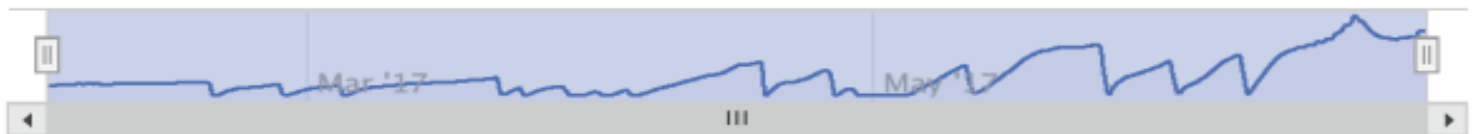
38614 6th Span LDN

Crop: Corn, Seed, Device Soil Type: Silt Loam

Zoom 1dy 1wk 2wk 1m 3m All



Feb '17 Mar '17 Apr '17 May '17 Jun '17 Jul '17

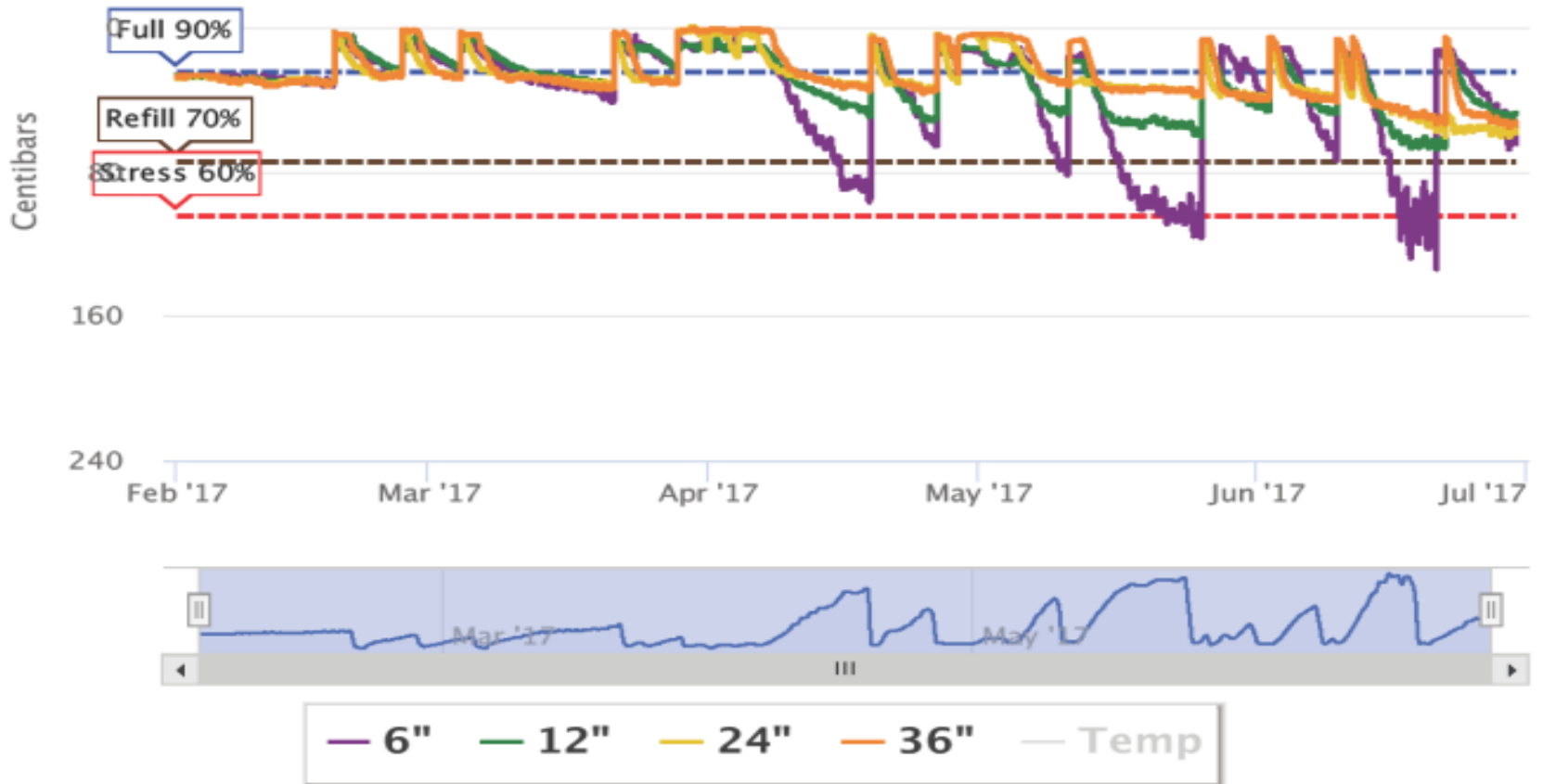


- 6" 12" 24" 36" — cur rain ● day rain — Temp
- Notes

53546 5th Span Dragonline

Crop: Wheat, Winter, Device Soil Type: Silt Loam

Zoom 1dy 1wk 2wk 1m 3m All



Evaporative Loss by Soil

Texture & Irrigation

Amount Surface Applied on Bare Soil

*Applying 1.2" of water per irrigation then measure the loss
Readily evaporable water (1 to 2 days)*

- Clay loam (Pullman) , Bushland 0.67 to 0.79 inch
- Silt loam (Ulysses), Garden City 0.60 to 0.70 inch
- Sandy loam (Amarillo), Big Spring 0.47 to 0.60 inch
- Fine sand (Vingo), Dalhart) 0.27 to 0.32 inch

Total evaporable water (on average)

47% loss of water with irrigation application more than 1.2 inches
72% loss of water with irrigation application less than 1.2 inches

Source: Tolk, J.A. and S.R. Evett. Field-measured, hourly soil water evaporation stages in relation to reference ET and soil to air temperature ratio. Submitted to Vadose Zone J.

**Researchers Have Proven That Up To
50% Percent of Water Is Lost To The *Atmosphere* Every Time
It Is Distributed To The Soil Surface
*Due To Wind, Sun, Run Off, Nozzle Atomization, &
Evaporation***





EVAPORATIVE
LOSSES DURING
IRRIGATING ON A
WINDY DAY ARE
ESTIMATED
EXCESS OF 50%

Field Day At Elberta Utah



Field Day At Elberta Utah

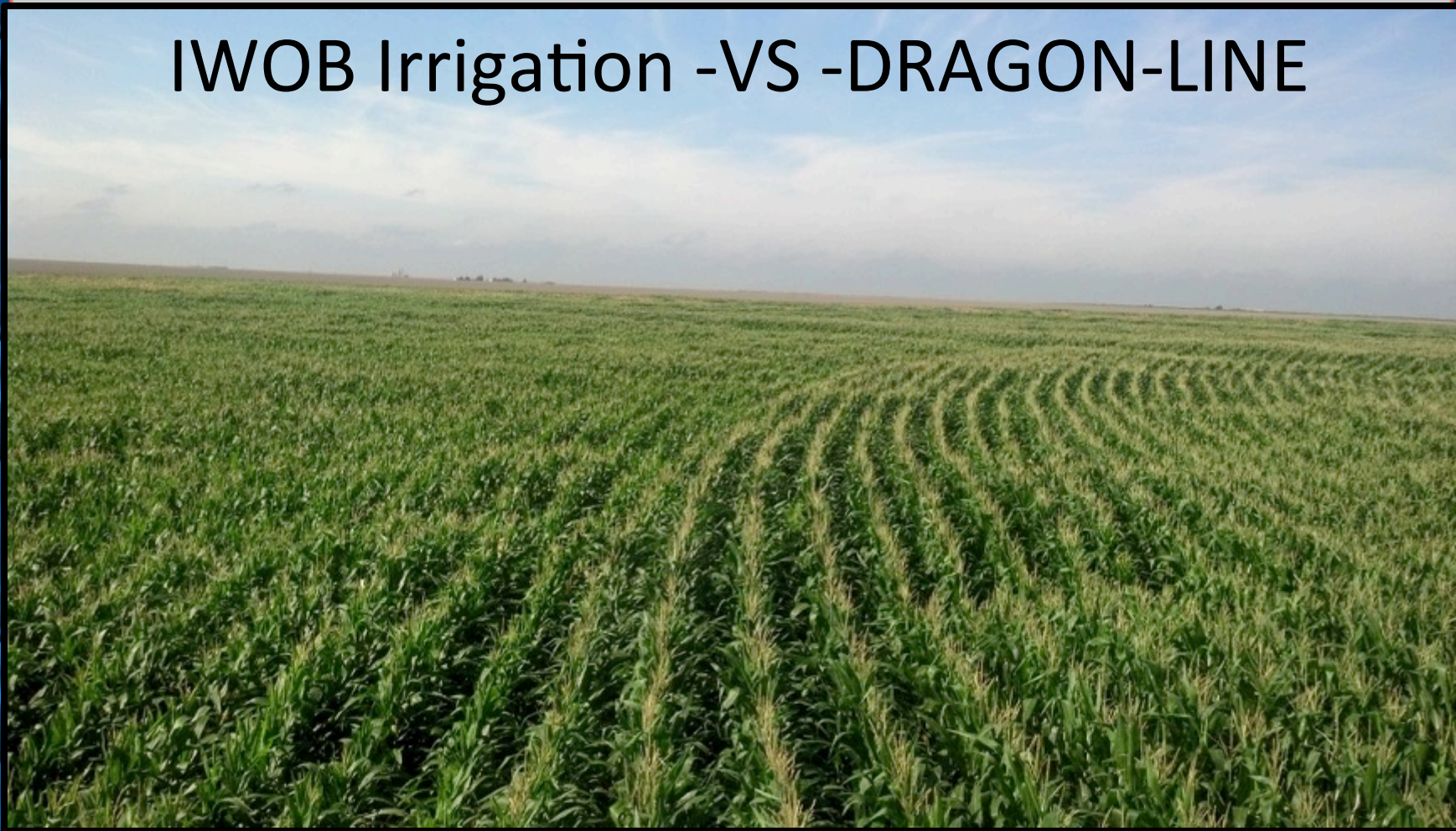


2015 Prewatering / 2.08" Application 30" Dragon-Line



2013 First Corn Crop / 125 Acres
200 GPM / Drought / 25% More
Yield

IWOB Irrigation -VS -DRAGON-LINE

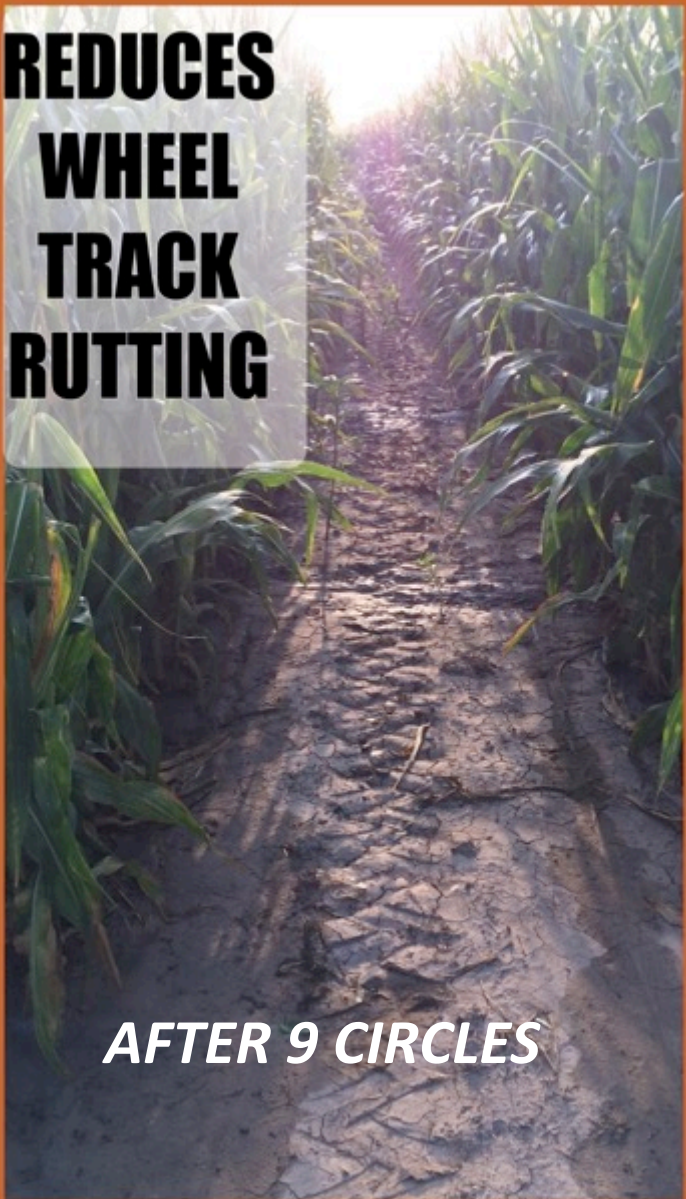


2016 Fourth Corn Crop / 75 Acres / 200 gpm / 248 Bushel Yield



Diamond Tail Farm
Dragonline
75 acres 200gpm
2016.08.16

**REDUCES
WHEEL
TRACK
RUTTING**

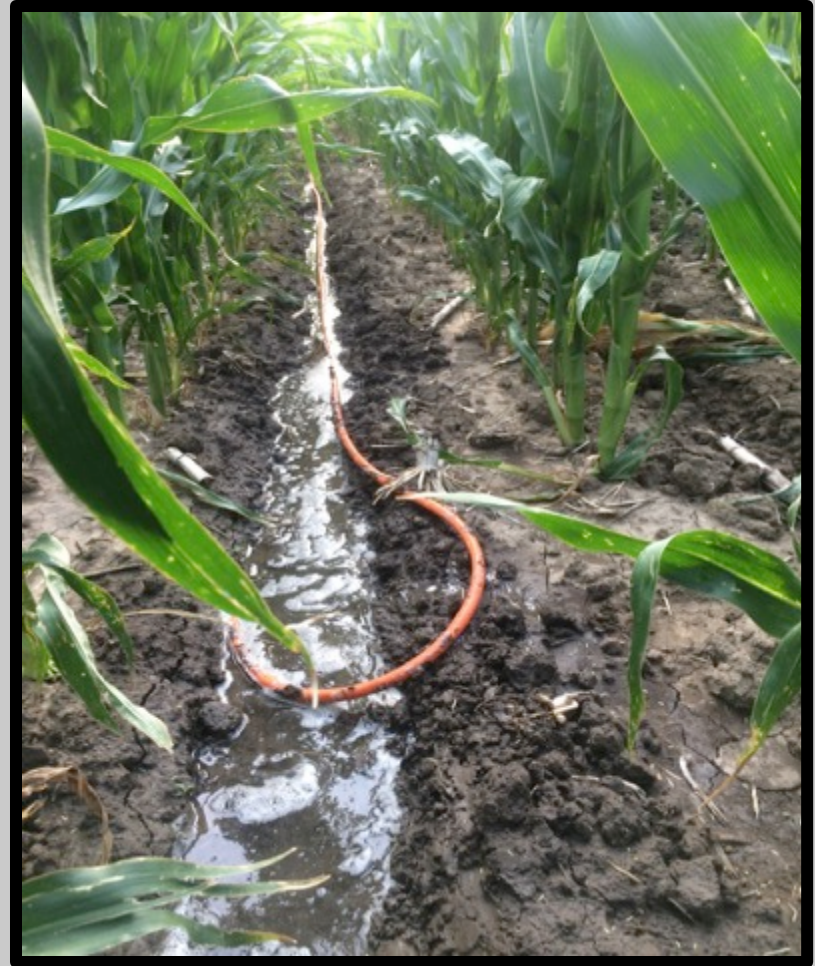


AFTER 9 CIRCLES



END Of SEASON WHEEL TRACK

Reversing in 30" Corn Row



First Year Wheat / 30" Spacing / Drought 6.2" Water Applied / w/o Germination



(M) 2013 Watering Wheat in Wind



80% OF IRRIGATION WATER CAN BE LOST WHEN WATERING ON A WINDY DAY WITH LOW GPM WELL

Dragon-Line 30" Low-Line Manifold Compared to IWOBBS



2017 Hard Red Winter Wheat
75 Acres / 200 GPM / 90 + Bu.



Winch Assembly For Single Cable Dragon-Line



Conventional Watering vs. Dragon-Line Watering



BANKING WATER FOR THE FUTURE