# Irrigating By The Numbers and Understanding the Parameters

Bob Glodt Agri-Search, Inc. Plainview, Texas During the next four sessions, you will learn how to irrigate cotton by using potential evapo-transpiration (PET) data. For the duration of this short course, we will concentrate on cotton irrigation using a center pivot irrigation system For the PET replacement approach to work, there are hard and fast rules we must all agree on.

1. The irrigation system must deliver water efficiently.

## **Efficient Irrigation Systems**

- LEPA low energy precision application (alternate furrow)
- Nozzles must follow the contour of the row.
- The pivot should be nozzled to match well output.



### Broadcast Spray Irrigation is Not Efficient!!!



# New LEPA Nozzles – An Improvement?





- 1. The irrigation system must deliver water efficiently.
- 2. You must irrigate efficiently.

# Irrigate Efficiently

- Apply no less than 1" and no more than 1.5" per irrigation cycle during peak demand.
- Irrigation frequency should be at 5 to 7 day intervals during peak demand
- Count rainfall against PET calculations.
- Push water deep into the soil profile



- 1. The irrigation system must deliver water efficiently.
- 2. You must irrigate efficiently.
- 3. Understand your capacity to irrigate as it relates to crop demand.

#### HYPOTHETICAL WATER USE CURVE FOR COTTON (INCHES PER DAY)



#### CALCULATING YOUR IRRIGATION CAPACITY AS IT RELATES TO PEAK DEMAND (% PET)

- > At peak demand, cotton requires 0.32 inches /day
- > 0.32 inches /day x 7 days per week = 2.24 inches/week
- > Assume irrigation capability of 1.0 inch per week
- > 1.0" per week divided by 2.24" per week = .45 or 45%
- > 1.5" per week divided by 2.24" per week= .69 or 69%

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- 3. Understand your capacity to irrigate as it relates to crop demand.
- 4. Understand the relationship between water and yield potential.

## Yield Potential Versus Water

- More water does not always translate to more yield.
- It is possible to make 4 bales per acre of bolls every year, but it is not likely that you will make 4 bales per acre of lint every year.
- Cotton yield potential is determined by water and the environmental conditions in which cotton is grown.
- ◆ 70% of PET can realistically produce 3 3.5 bales/ ac
- ◆ 60% of PET can realistically produce 2.5 3 bales/ac
- 50% of PET can realistically produce 800 1100 lbs./acre

GPM PER ACRE	ACRE INCHES PER DAY	ACRE INCHES PER WEEK	DAYS TO APPLY 1"	HOURS TO APPLY 1"	% ET @ 0.30" / DAY
1	0.053	0.37	18.9	453	17.7%
2	0.107	0.75	9-3	224	35.7%
3	0.160	1.12	6.3	150	53-3%
4	0.214	1.50	4.7	112	71.3%
5	0.267	1.87	3.7	90	89.0%
6	0.320	2.24	3.1	75	106.7%
7	0.373	2.61	2.7	64	124.3%

## **Parameters of Yield Predictability**

- Irrigation levels above 70% of PET significantly increases the likelihood of immature and unopened bolls at the time of a killing freeze.
- Irrigation levels below 50% of PET or when irrigation intervals are stretched to greater than 7 days increases the likelihood of unpredictable yields.
- Yield goals are not predictable when the irrigation system is inefficient (i.e. broadcast or spray irrigation).
- To achieve consistent results when irrigating at a percentage of PET you must follow the rules.

- 1. The irrigation system must deliver water efficiently.
- 2. You must irrigate efficiently.
- 3. Understand your capacity to irrigate as it relates to crop demand.
- 4. Understand the relationship between water and yield potential.
- 5. Fill the soil profile prior to first flower.

### SOIL MOISTURE HOLDING CAPACITY (INCHES/FOOT)

Texture	Field Capacity	Permanent Wilting Point	Plant Available Water	Initiation of Stress
Clay Loam	4.8	2.4	2.4	1.3
Loam	4.2	2.1	2.1	1.1
Sandy Loam	3.6	1.8	1.8	0.9
Loamy Sand	2.4	1.2	1.2	0.8

#### HYPOTHETICAL WATER USE CURVE FOR COTTON (INCHES PER DAY)



Pushing Water Deep Into the Soil Profile and Banking Water

- Apply no less than 1.0" and no more than 1.5" of water per irrigation cycle at peak demand.
- Irrigate at 5 to 7 day intervals at peak demand.
- The criteria above should be used as a guideline when determining how many acres of a crop to plant under one irrigation source.
- Probe the soil ahead of the pivot to determine the amount of reserve moisture that is present in the soil profile.

## **FUTURE SESSIONS**

- Determining how much and when to pre-water.
- How to use a soil probe to calculate water balance and soil moisture reserves.
- How to access TAWC website to obtain PET data.
- Recognizing opportunities for higher yields.
- How to irrigate with very limited irrigation resources.
- Bring your computer or Ipad to the next session on March 18<sup>th</sup>.

# **QUESTIONS?**