Irrigation Water Management with Dataloggers and Soil Moisture Sensors

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What will we cover?

- ✓Types of soil moisture sensors
- ✓Why SWT is important
- ✓Cost
- ✓Installation
- ✓Data logging
- ✓SWT irrigation criteria
- ✓Use of SWT criteria

1st Point

Types of soil moisture sensors:?

- **Soil water *content* sensors**
- **Soil water *tension* sensors**

Types of Soil Moisture Sensors

A. Soil Water Content

1. Feel *method*
2. Gravimetric *method*
3. Neutron probe
4. Time domain reflectrometry (TDR) probes
5. Capacitance probes
6. Heat transmission sensors


CPN
CPN


ECHO
Dielectric Moisture Meter

Types of Soil Moisture Sensors

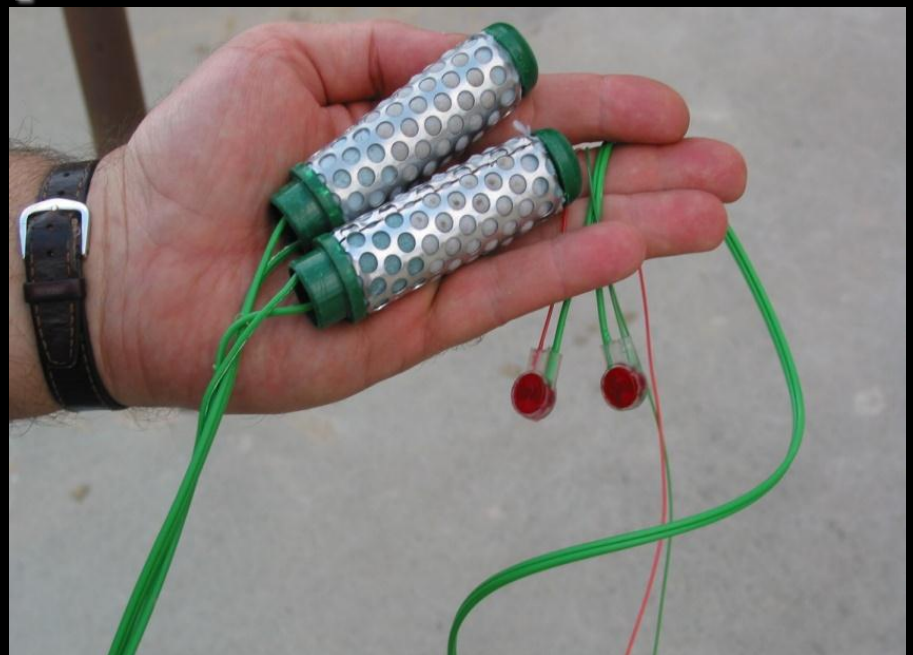
A. Soil Water Potential

1. Tensiometers
2. Gypsum blocks
3. Granular matrix Sensors
4. Irrigas

2nd Point

Why is "Soil Water Tension" (SWT) important?

It is economically and environmentally important.



Why is SWT important?

- ✓Measures how tightly water is held by the soil.
- ✓Plant performance is related.
- ✓Indicates the best moment to irrigate to assure yield and quality.
- ✓Irrigating too soon wastes time & water, causes nutrient losses.

3rd Point

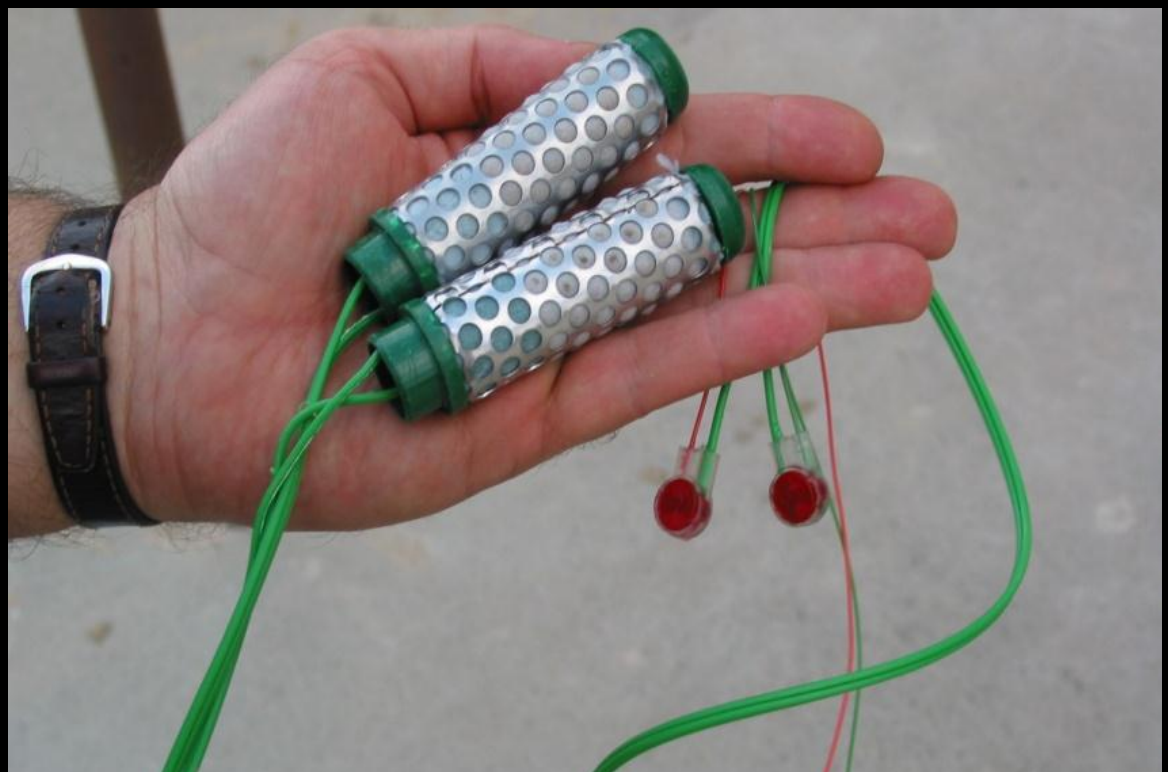
Cost?

Watermarks $30

Datalogger with sensors $600

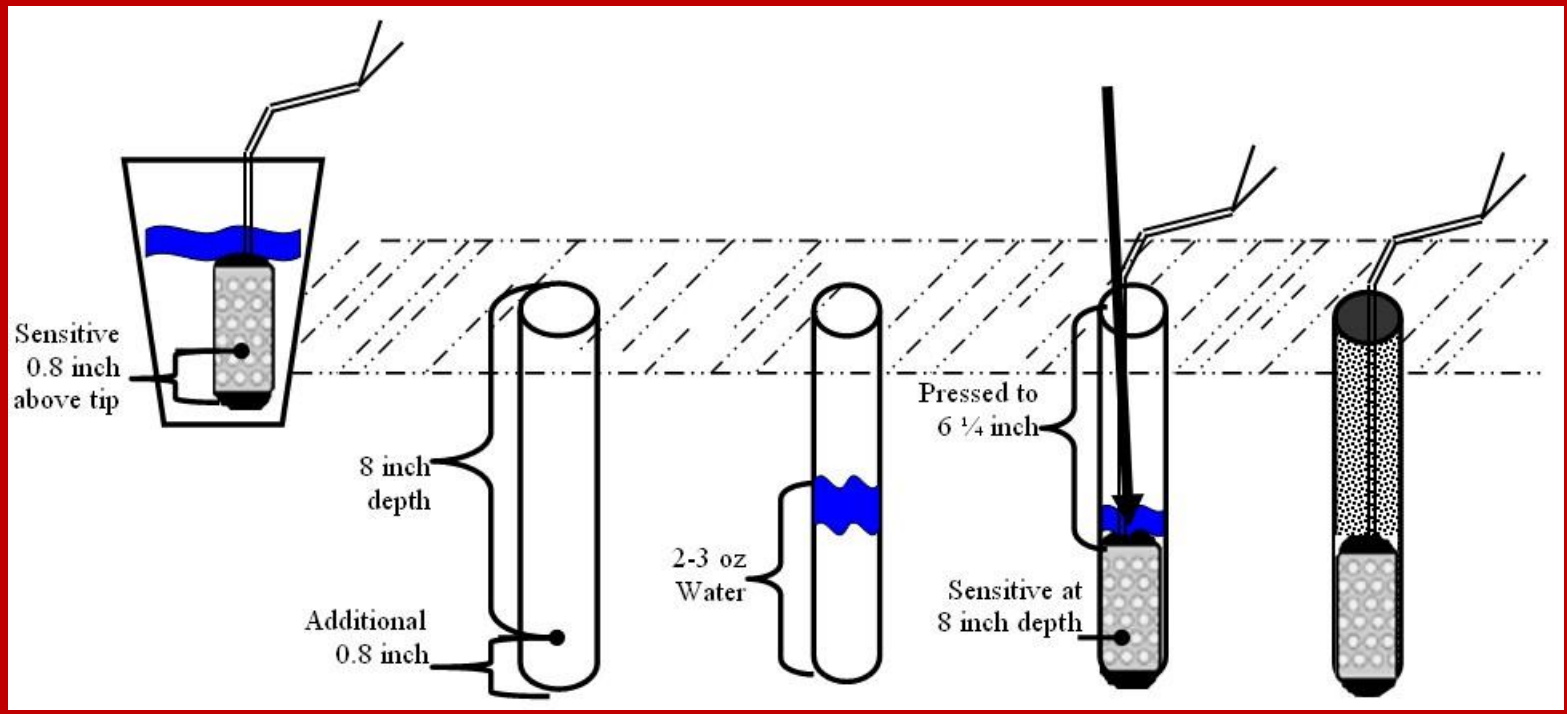
4rd Point

Installation of Watermark soil moisture sensors.



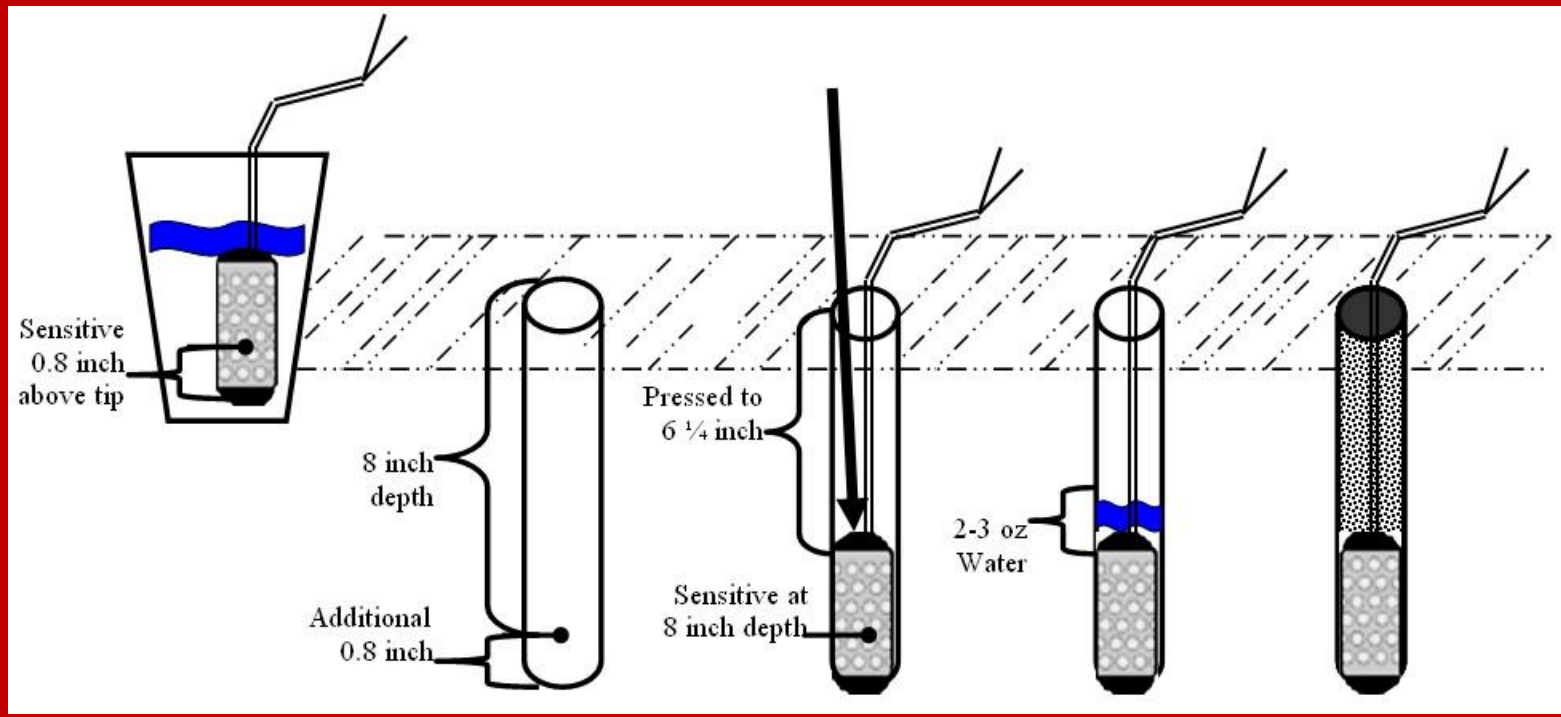
Installation of Watermarks in *sandy* soil

1. Soak
2. Hole with soil probe or sharp probe
3. Add water
4. Insert sensor with rod
5. Fill hole with soil



Installation of Watermarks in *silty* soil

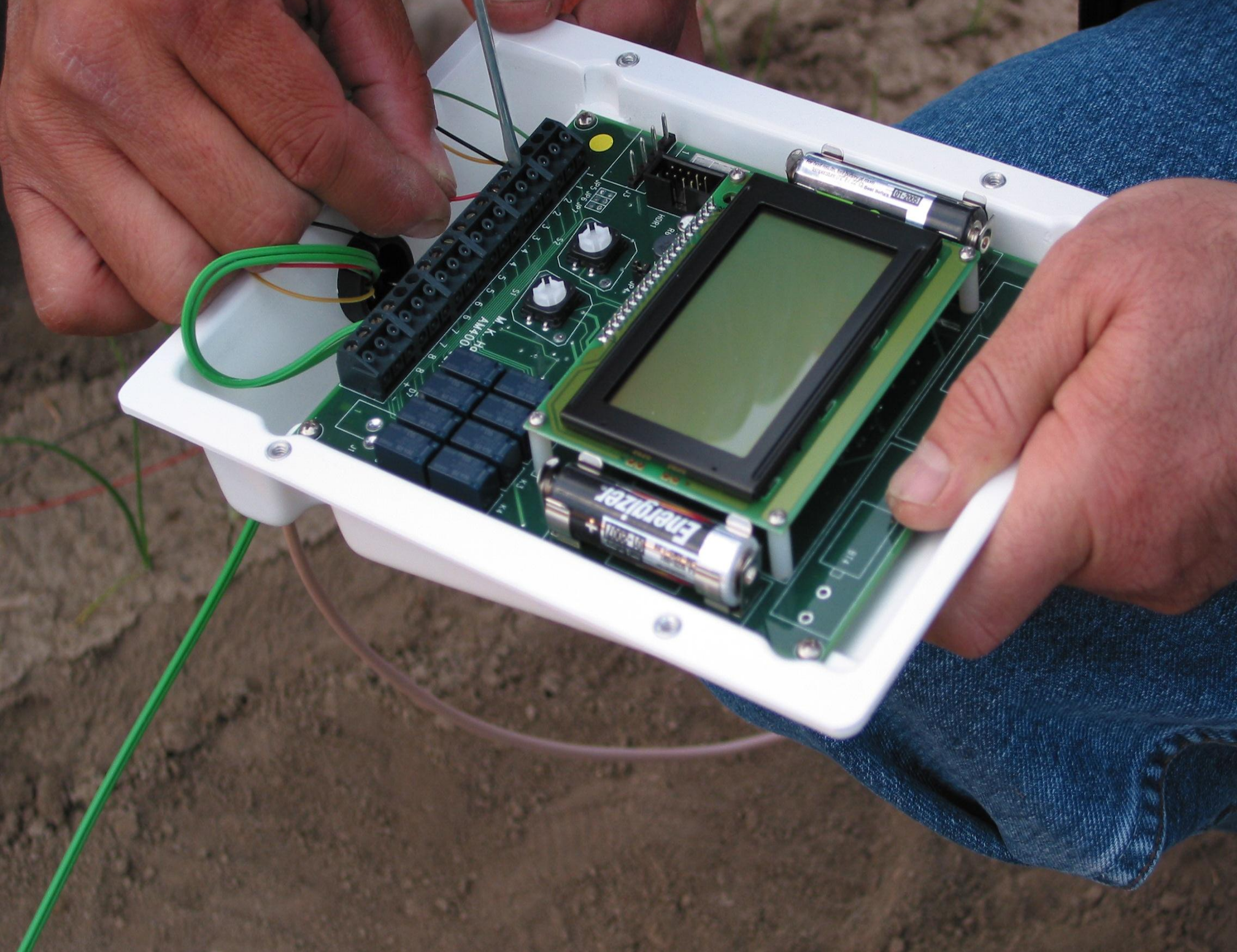
1. Soak
2. Hole with soil probe
3. Insert sensor with rod
4. Add water
5. Fill hole with soil



5th Point

Data logging options:

- AM 400
- Watermark monitors
- Greater automation soon


Energizer


WATERMARK
MONITOR
IRROMETER COMPANY, INC.
RIVERSIDE, CA

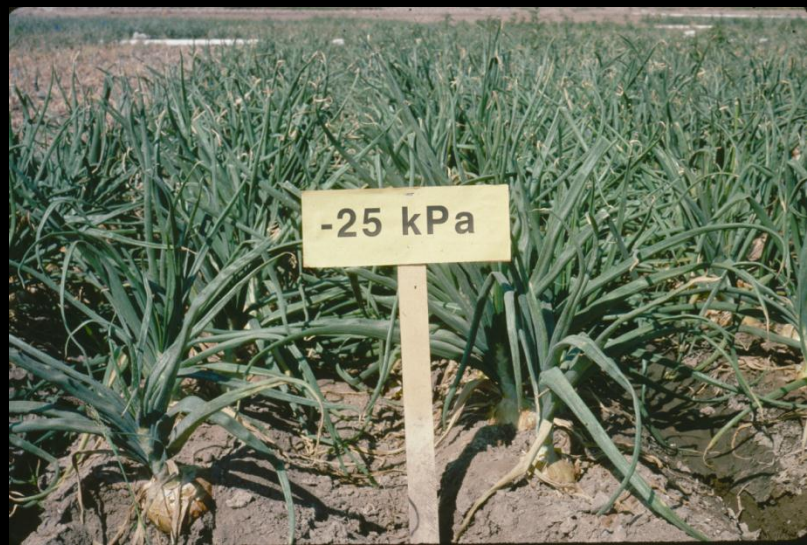

STAHLIN
ENCLOSURES
INDUSTRIAL CONTROL PANEL ENCLOSURE
INDUSTRIAL CONTROL PANEL ENCLOSURE
No. BE - 148059
CAMPBELL SCIENTIFIC INC.
SDMX50
50 OHM MULTIPLEXER
Oregon State University

6th Point

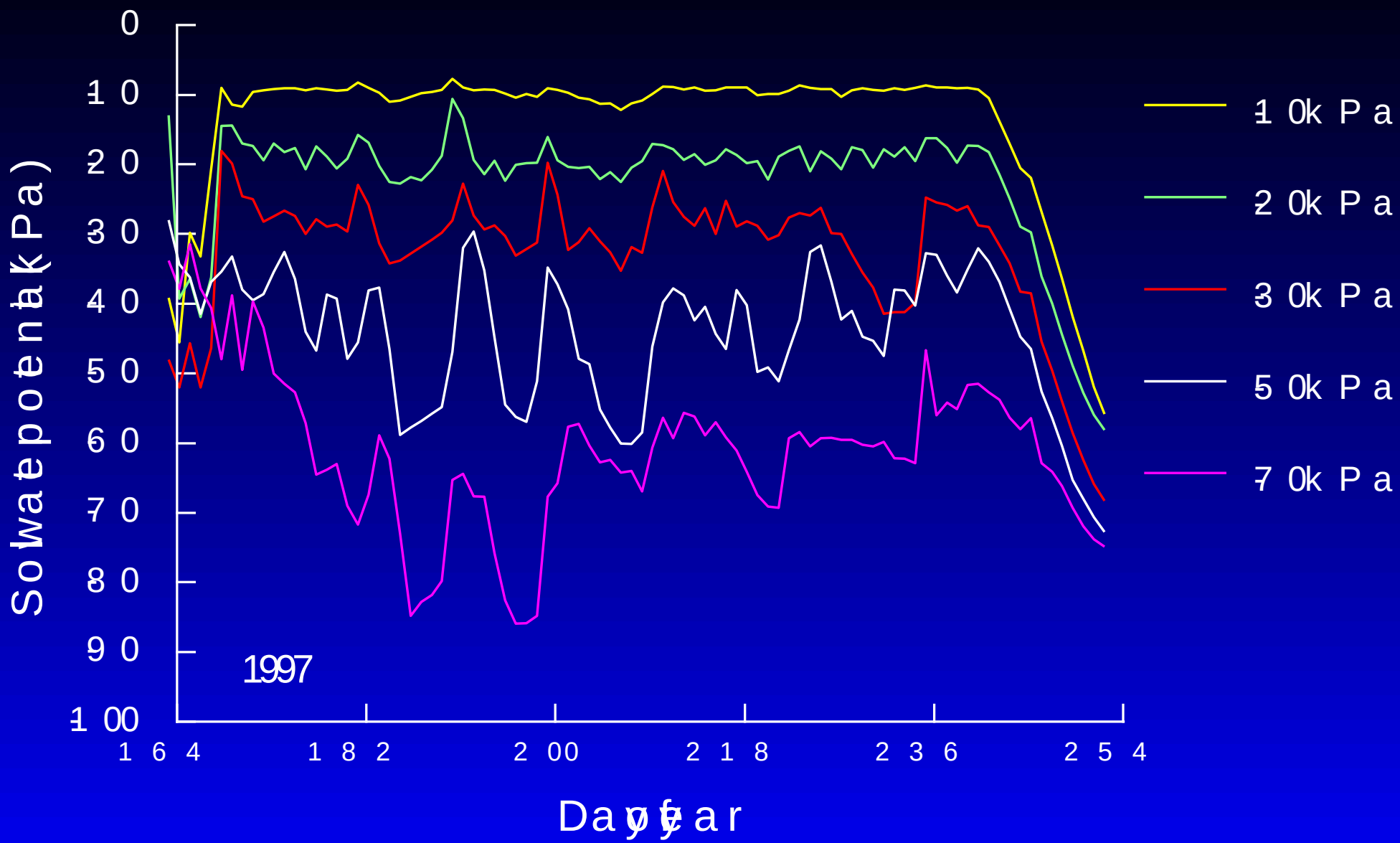
What SWT irrigation criteria?

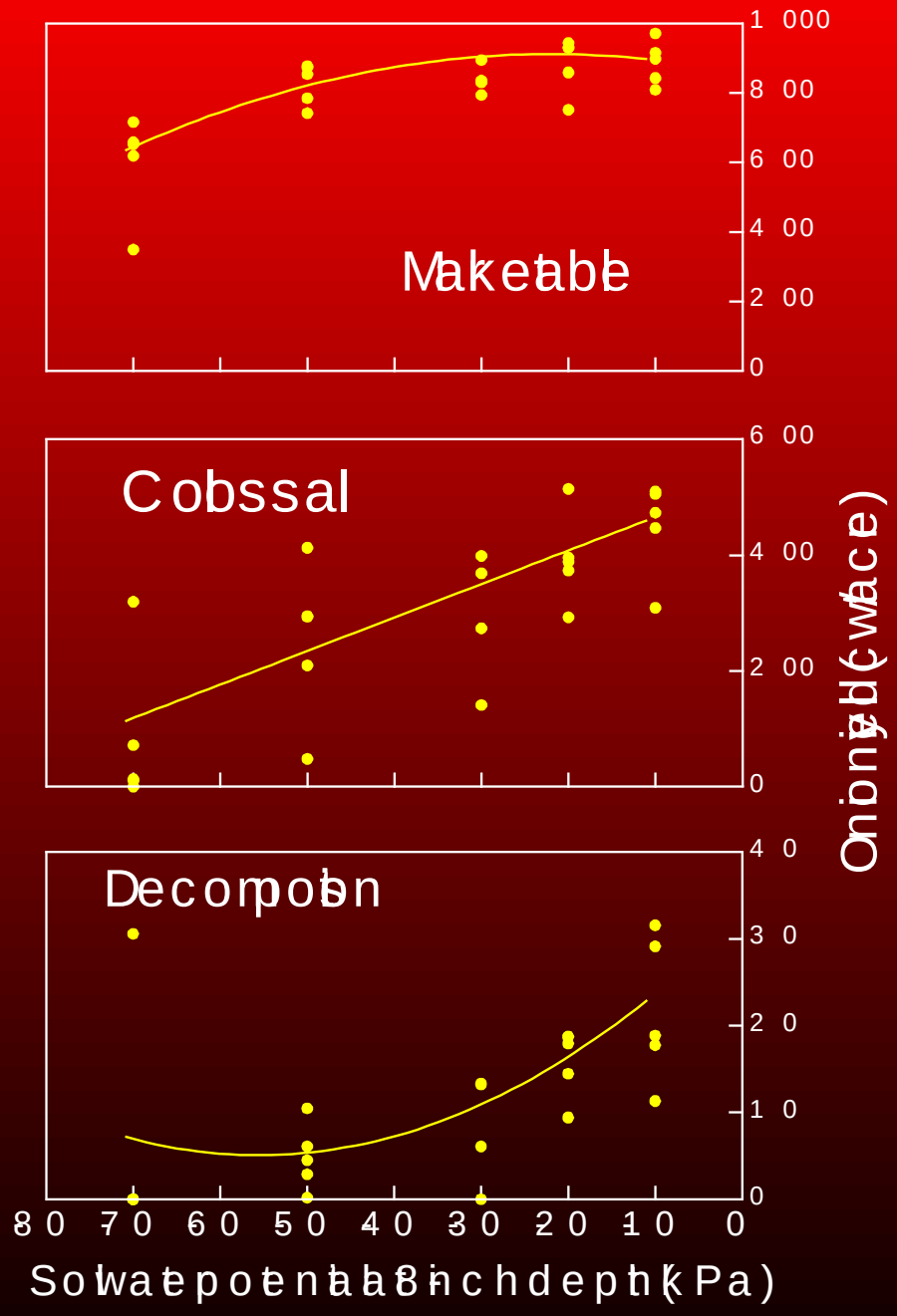
Based on crop.

Influenced by soil, irrigation system and climate.

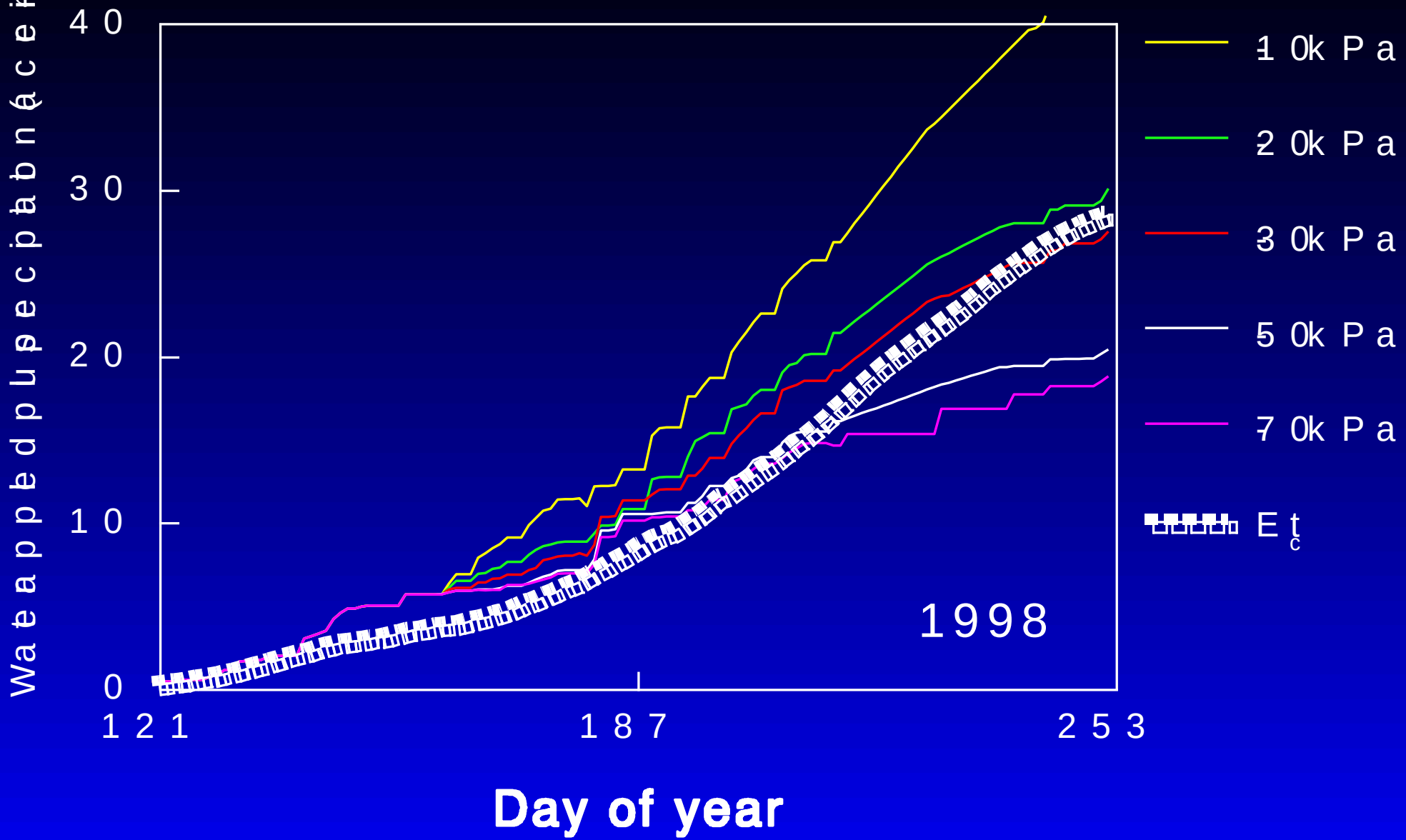


Irrigation Criteria for Drip-Irrigated Onion

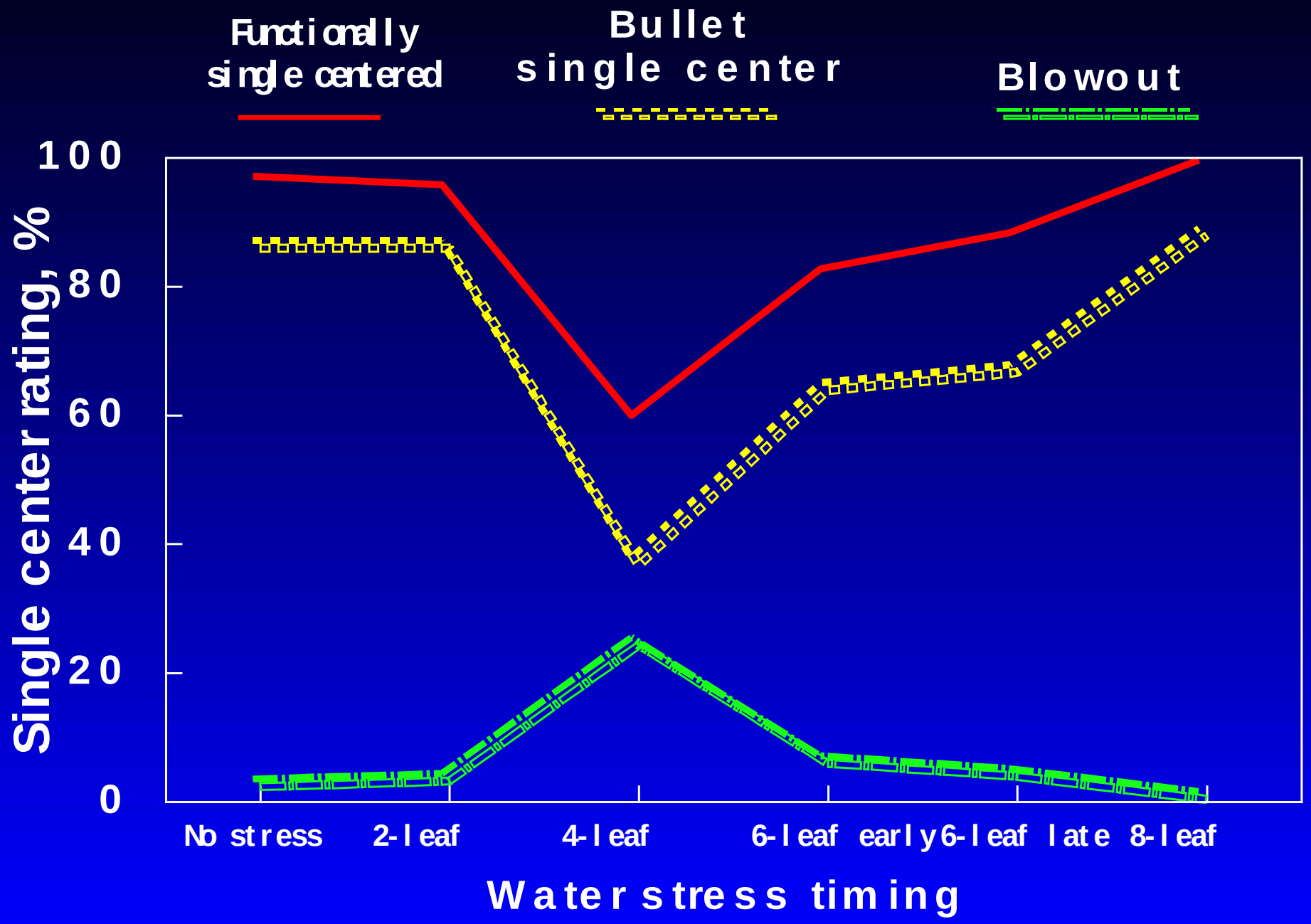



Maketable
Cobssal
Decomposn
1 000
8 00
6 00
4 00
2 00
0
6 00
4 00
2 00
0
4 0
3 0
2 0
1 0
0
80 70 60 50 40 30 20 10 0
Soil water potential at 8 inch depth (kPa)
Onion yield (cwt/acre)

Water Applied for Onion Irrigation Criteria



Onion single center response to water stress timing in 2005 for Vaquero

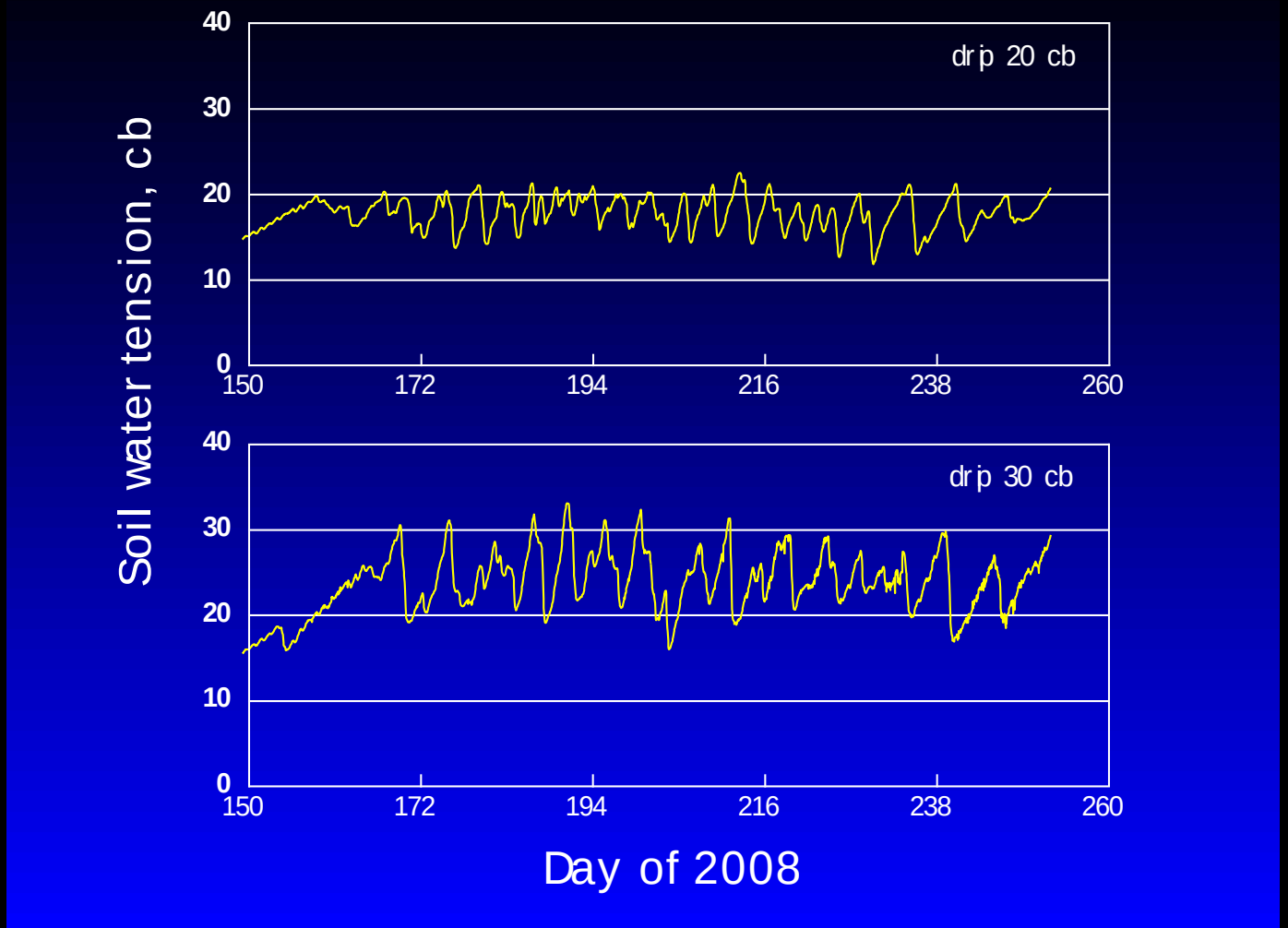


SWT criteria by T.V. crop?

- Onions on drip 20 cb
- Onions on furrow 27 cb
- Potato 50-60 cb
- Poplar trees 25 cb
- Beans 50 cb
- Corn 60 cb
- Sweet potato 50 cb

7th Point

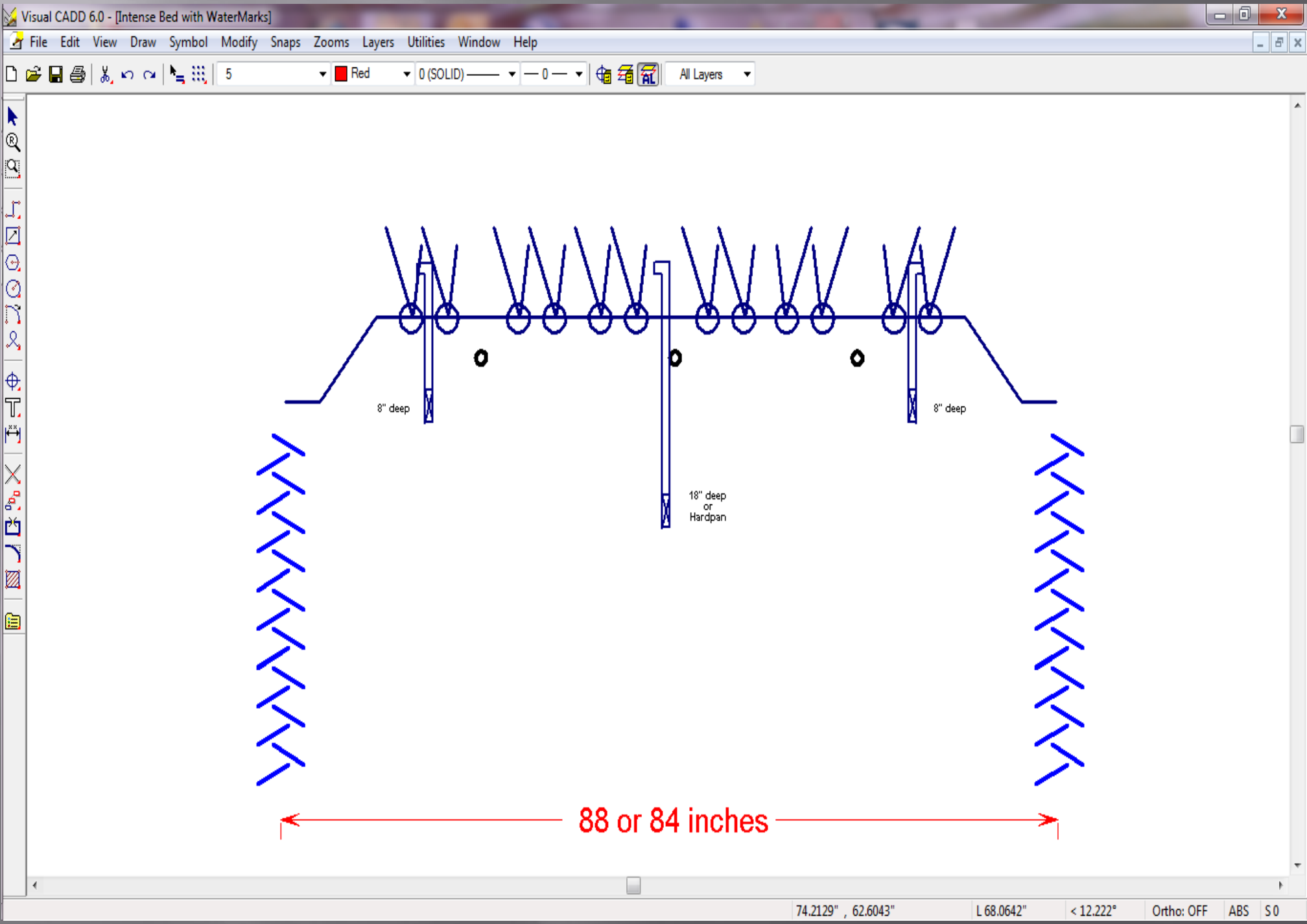
✓Use of SWT criteria

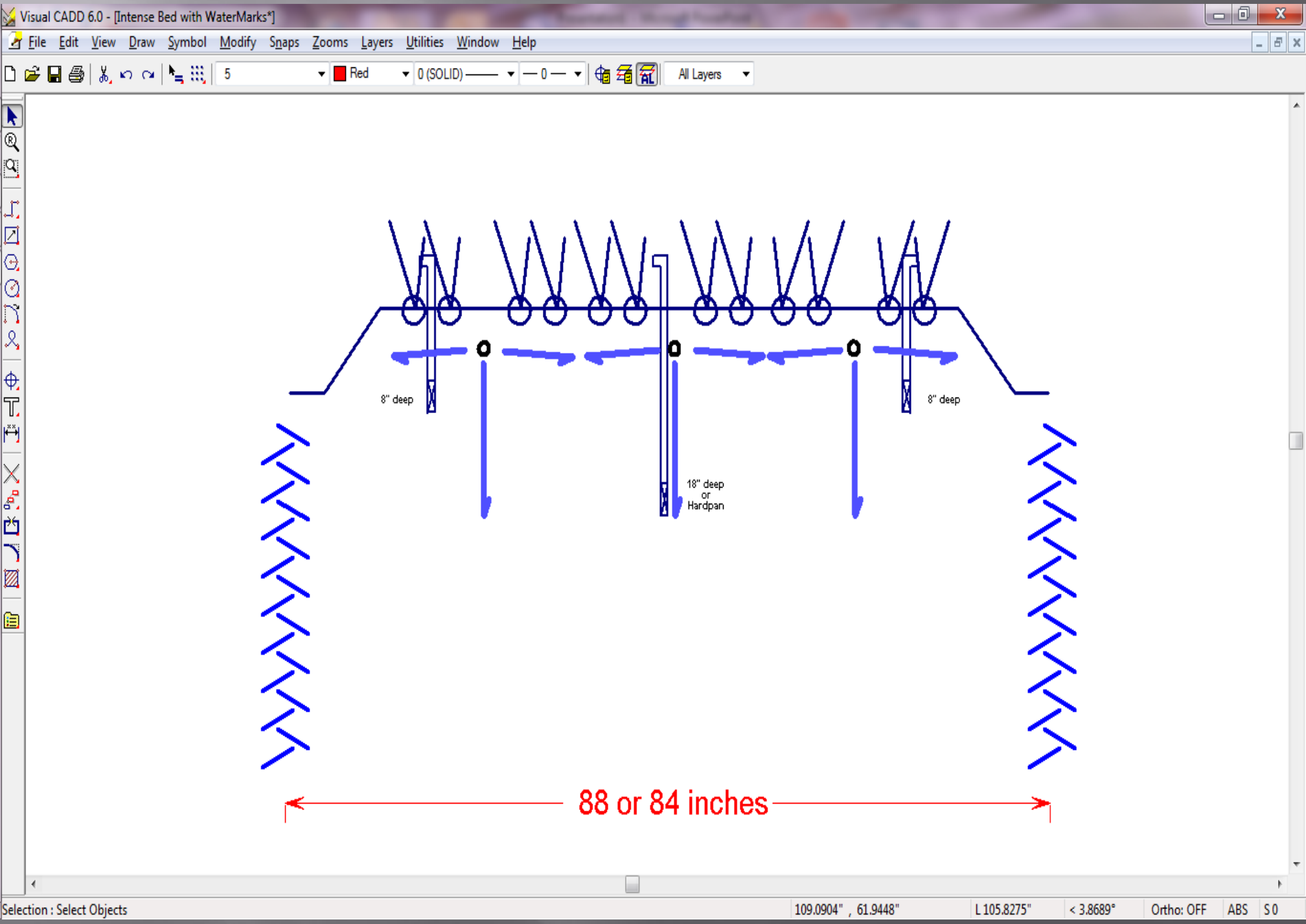


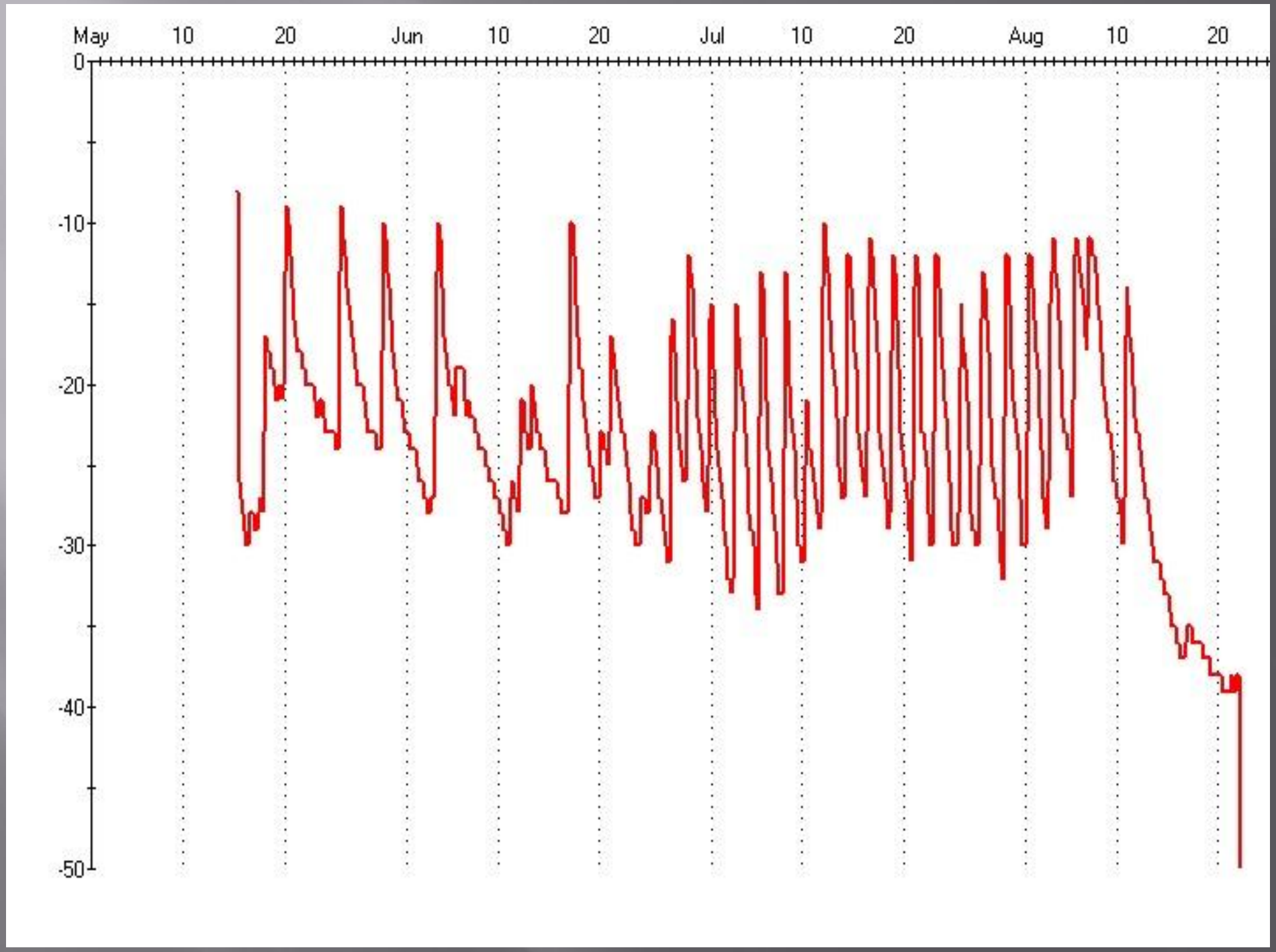

More results from the last 16 years
www.cropinfo.net


HANSEN


SI 12C 16CB
HANSEN


Visual CADD 6.0 - [Intense Bed with WaterMarks]
File Edit View Draw Symbol Modify Snaps Zooms Layers Utilities Window Help
5
Red
0 (SOLID)
0
All Layers
8" deep
18" deep
or
Hardpan
8" deep
88 or 84 inches
74.2129" , 62.6043"
L 68.0642"
< 12.222°
Ortho: OFF
ABS
S 0


Visual CADD 6.0 - [Intense Bed with WaterMarks*]
File Edit View Draw Symbol Modify Snaps Zooms Layers Utilities Window Help
5
Red
0 (SOLID)
0
All Layers
8" deep
8" deep
18" deep
or
Hardpan
88 or 84 inches
Selection : Select Objects
109.0904" , 61.9448"
L 105.8275"
< 3.8689°
Ortho: OFF
ABS
S 0


May
10
20
Jun
10
20
Jul
10
20
Aug
10
20
0
-10
-20
-30
-40
-50

Clearwater Supply

	Date ====>	August 24 Thur.	August 25 Fri.	August 26 Sat.	August 27 Sun.	2/4/2007 Today's Forecast Mon.
	Onion Et (in.) ====>	0.25	0.30	0.35	0.40	0.45
Tape flow	Tape Spacing	Hours of Run Time per set				
170	28	3.6	4.3	5.0	5.7	6.4
170	29.3	3.7	4.5	5.2	6.0	6.7
220	29.3	2.9	3.5	4.0	4.6	5.2
220	40	3.9	4.7	5.5	6.3	7.1
220	42	4.1	5.0	5.8	6.6	7.4
220	44	4.3	5.2	6.1	6.9	7.8
220	48	4.7	5.7	6.6	7.6	8.5
220	67.2	6.6	7.9	9.3	10.6	11.9
340	44	2.8	3.4	3.9	4.5	5.0

Confirmation of actual field moisture level should be made routinely by soil moisture monitors and/or sampling by hand. Do not rely solely upon Et values as various individual field factors, such as soil type, variety, direction of slope and planting date, can alter anticipated results.

Calculations based on AgriMet data, available at http://www.usbr.gov/pn/agrimet/chart/ontoch.txt, based on an onion emergence date of 4/10/06 at the Malheur Experiment Station (Ontario, OR).

Management of Furrow Irrigated Sugarbeets for Maximum Production and Environmental Protection

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Canyon County Extension Educator

Steve Reddy
Washington County Extension Educator

Dr. John Gallian

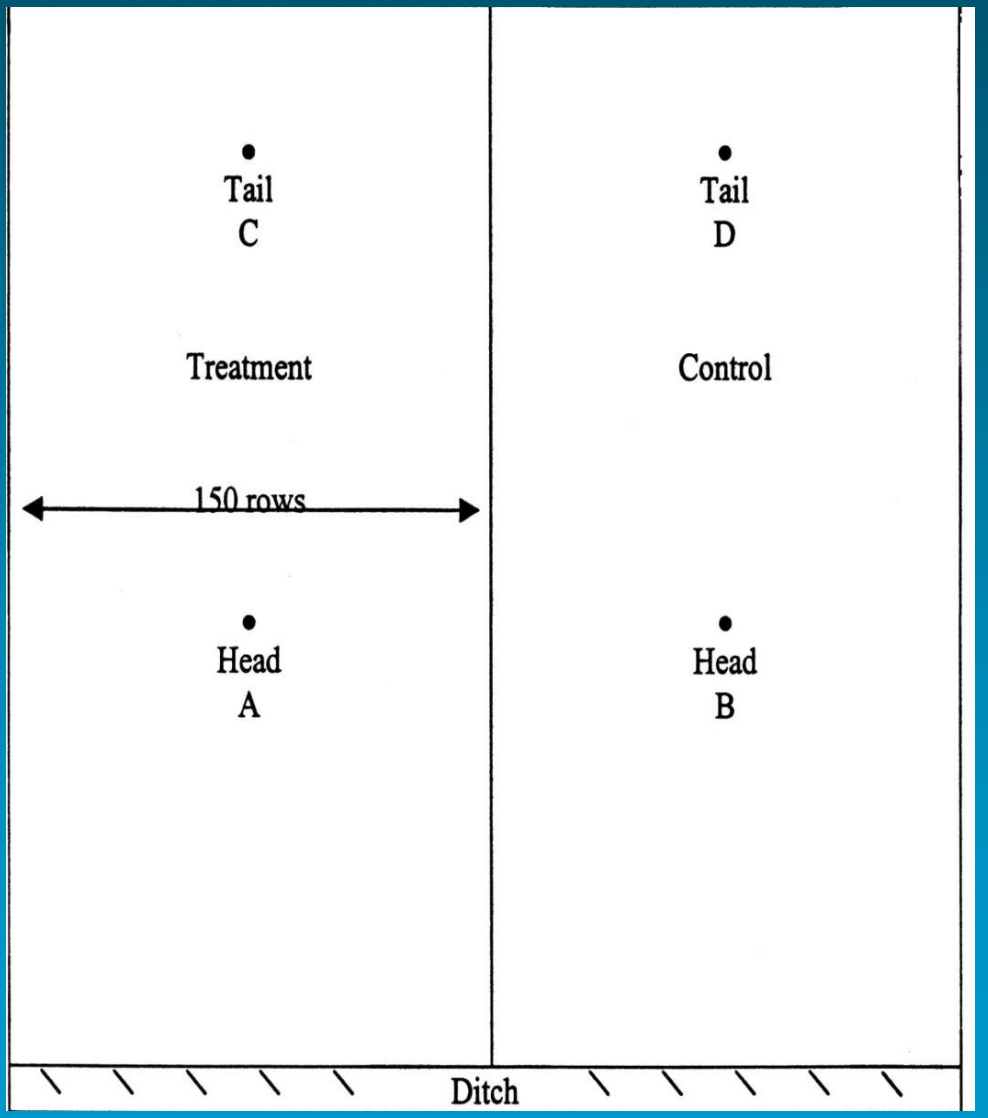
UI Sugarbeet Specialist

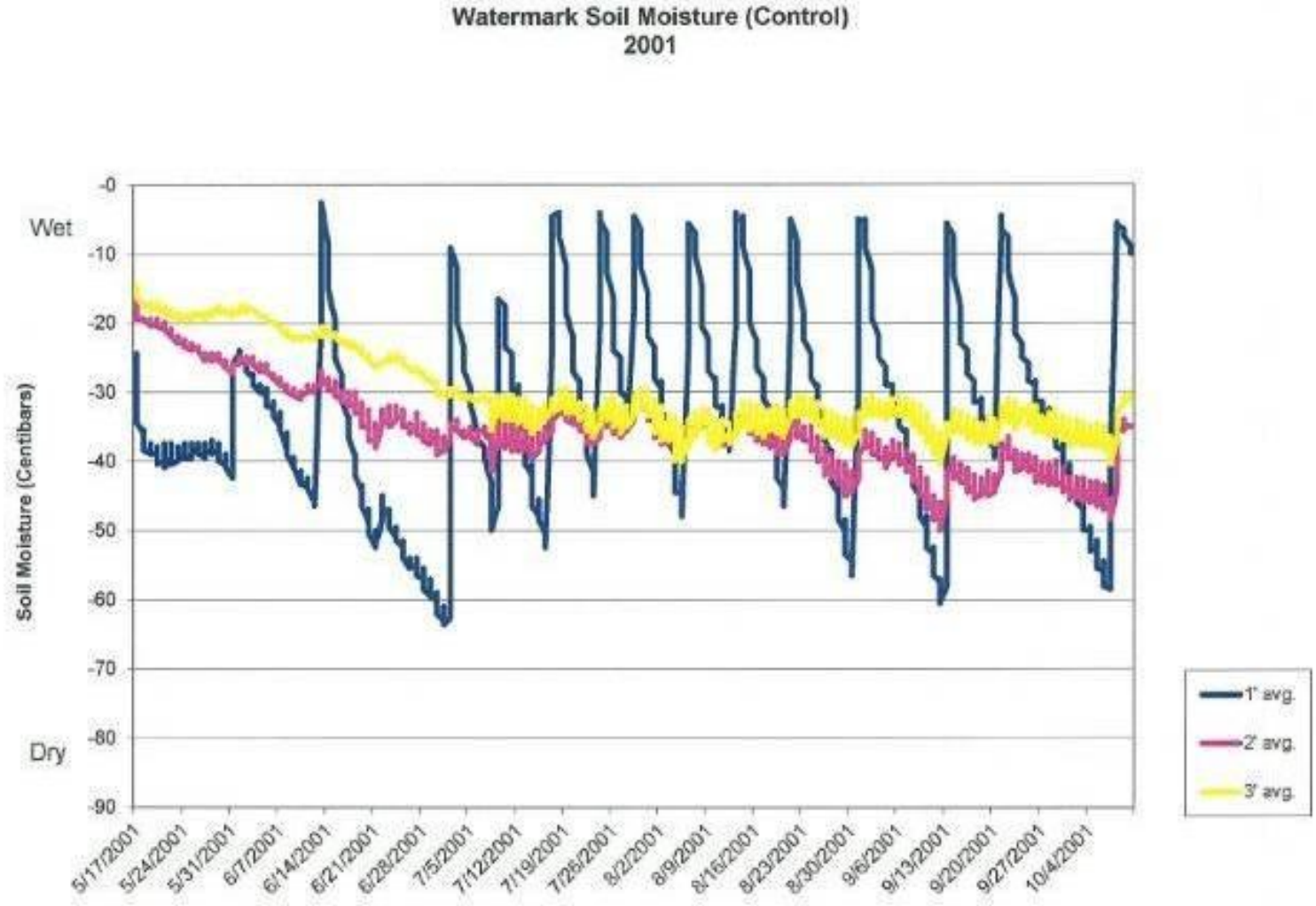
Description of Project

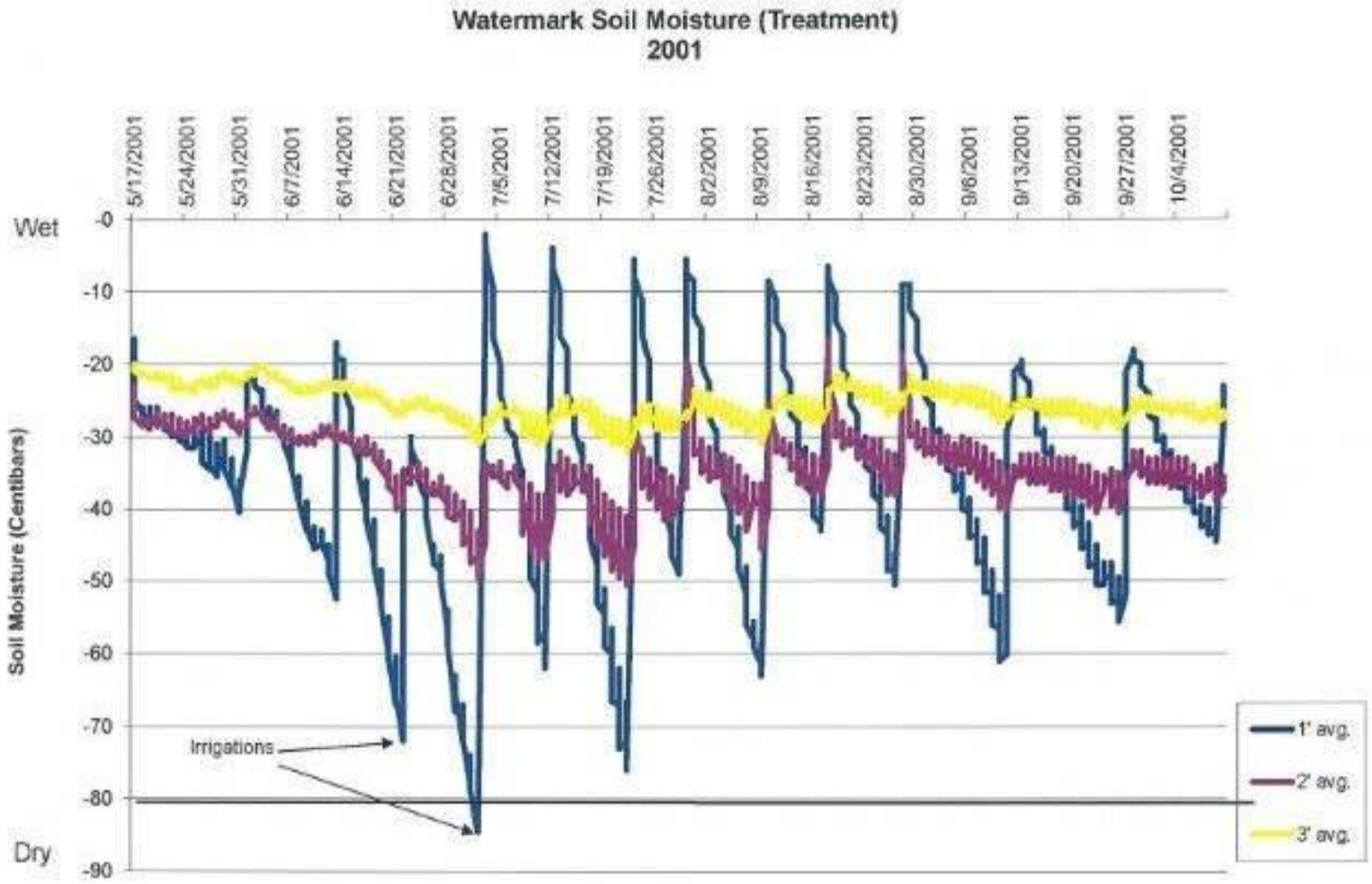
- Sugarbeet fields (Canyon and Washington Counties)
- Treatment and control plot in each field
- Control – irrigation and fertility managed according to growers normal practices
- Treatment – irrigation and fertility management based on soil moisture data, visual observation and soil sampling

Description of Project

- Watermark soil moisture sensors and AM400 dataloggers (3X per day)
- Neutron probe (1X per week)
- Soil samples




Watermark Soil Moisture (Control)
2001
Soil Moisture (Centibars)
Wet
Dry
-0
-10
-20
-30
-40
-50
-60
-70
-80
-90
6/17/2001
5/24/2001
5/31/2001
6/7/2001
6/14/2001
6/21/2001
6/28/2001
7/5/2001
7/12/2001
7/19/2001
7/26/2001
8/2/2001
8/9/2001
8/16/2001
8/23/2001
8/30/2001
9/6/2001
9/13/2001
9/20/2001
9/27/2001
10/4/2001
1' avg.
2' avg.
3' avg.


Watermark Soil Moisture (Treatment)
2001
Soil Moisture (Centibars)
Wet
Dry
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
5/17/2001
5/24/2001
5/31/2001
6/7/2001
6/14/2001
6/21/2001
6/28/2001
7/5/2001
7/12/2001
7/19/2001
7/26/2001
8/2/2001
8/9/2001
8/16/2001
8/23/2001
8/30/2001
9/6/2001
9/13/2001
9/20/2001
9/27/2001
10/4/2001
Irrigations
1' avg.
2' avg.
3' avg.

Summary

2000

- T used 14.5% less water
- T yield 1.7 t/ac greater
- Sugars the same
- T used 50 lbs/ac less N

2001

- T used 19.4% less water
- T yield 1.7 t/ac greater
- Sugars the same
- T used 50 lbs/ac less N

2002

- T used 18.0% less water
- T yield 0.9 t/ac less
- Sugars the same
- T used 50 lbs/ac less N

END