

20 Years of Drip Irrigation Research on Onions

Clint Shock

**Treasure Valley Irrigation Conference, Nampa, ID
December 18, 2014**

Semi-arid, winter precip.

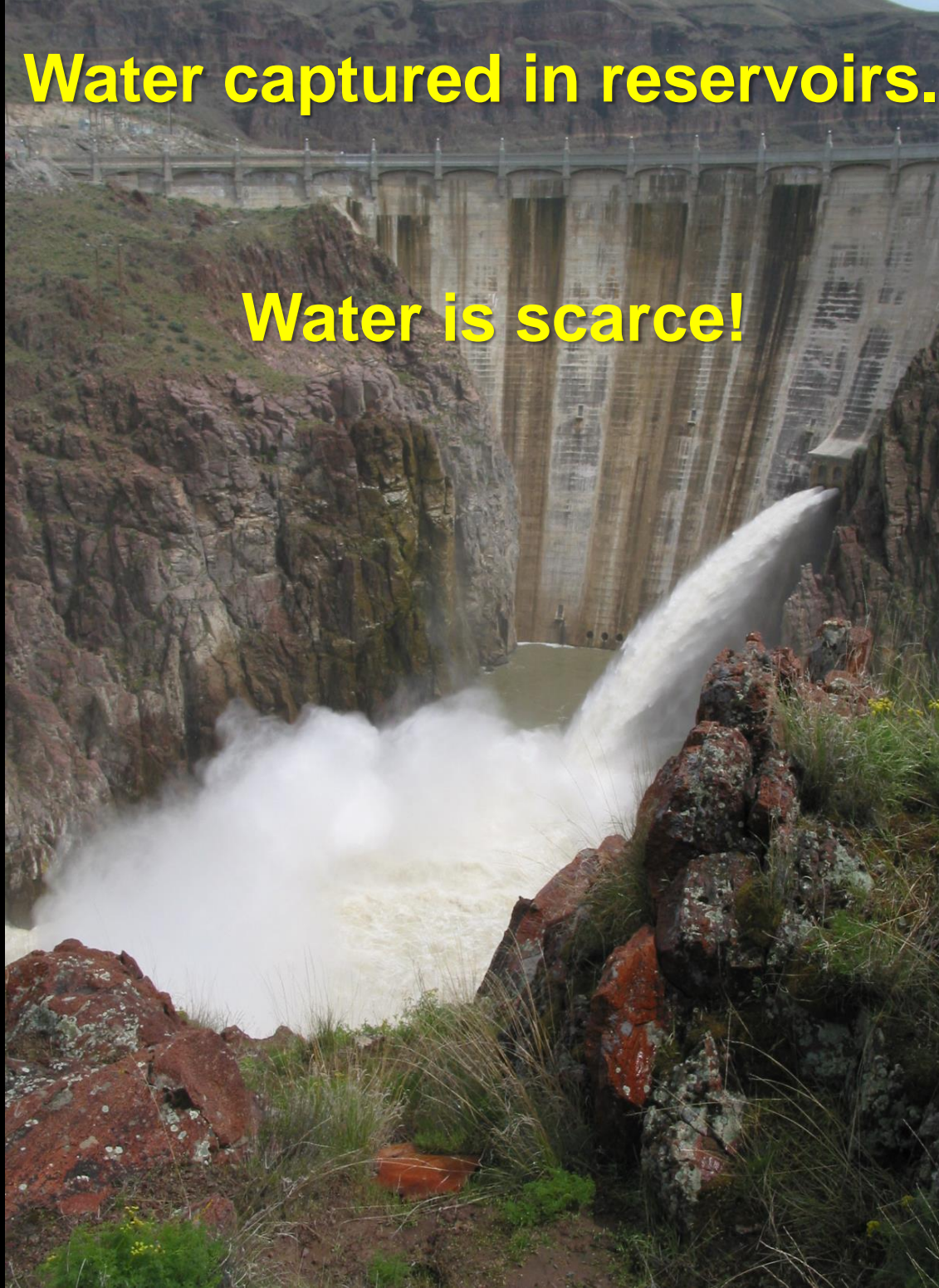


**Fundamentally gravity systems.
Water collects in uplands.**



Water captured in reservoirs.

Water is scarce!



Gravity irrigation is delivered over the valley.



Furrow Irrigation:

Negative environmental effects of furrow irrigation :

- nitrate leaching**
- erosion, loss of sediment and phosphorus**
- inefficient water use.**



20 years of drip irrigation research on onion

- 1. Irrigation system options**
- 2. How to schedule onion drip irrigation**
- 3. Using drip to overcome onion response to irrigation deficits**
- 4. Management factors**

Location

Pacific
Ocean

Oregon

Malheur
Basin

Vale

Ontario

Boise

Jordan Valley

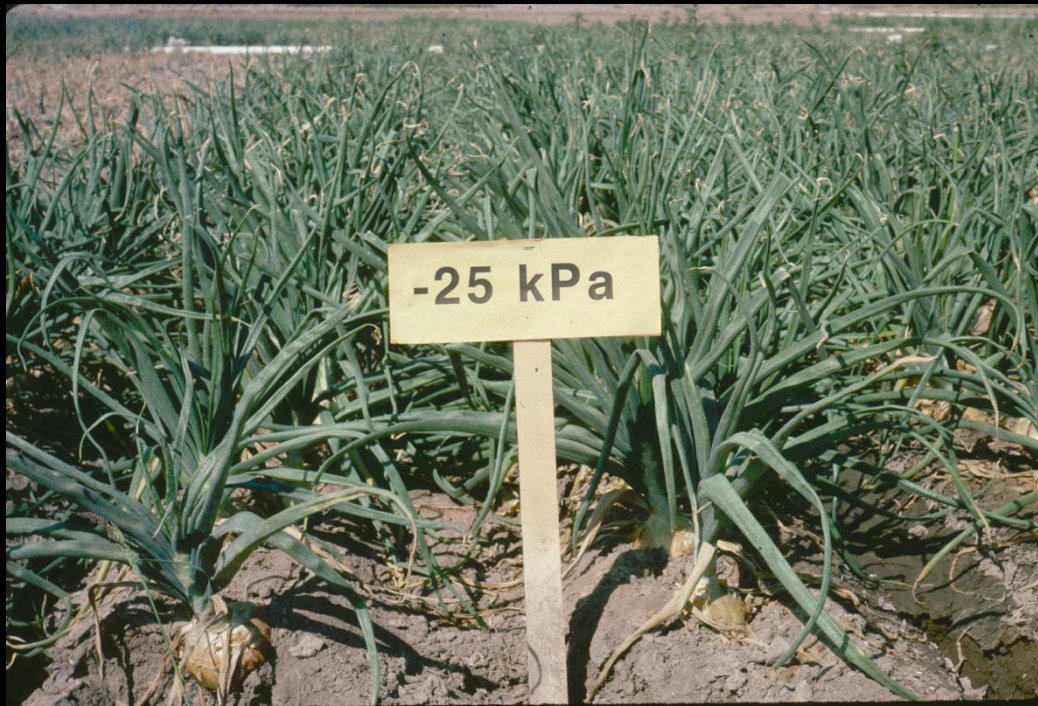
Owyhee
Basin



1st Point

What are the effects of irrigation system on onion production?

Furrow, **Sprinkler**, or **Drip**?



3 series of multi-year trials

There is a small advantages of **Drip** over **Sprinkler**, greater advantages over **Furrow**.

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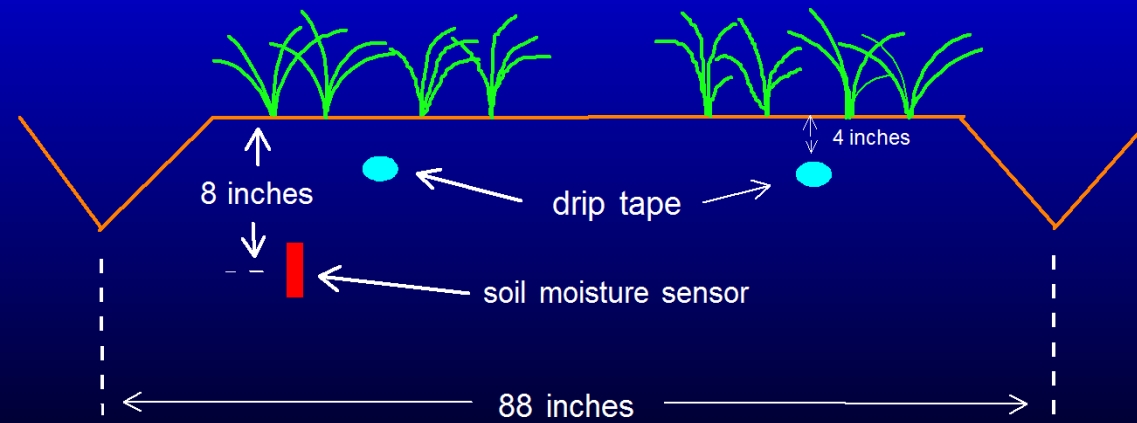


2nd Point

What are the effects of the onion distance from drip tape?



Conventional Drip Irrigation

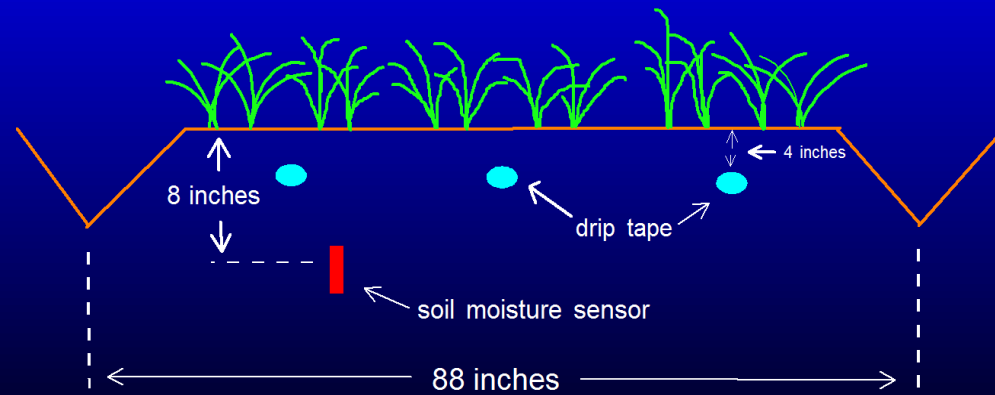


**Conventional drip and “intense bed”
drip plots:**

**Each plot automatically irrigated
based on a soil water tension set
point of 20 cb.**

**Soil water tension measured by 4
Watermark soil moisture sensors in
each plot.**

Intense Bed Drip Irrigation



3rd Point

How wet should we keep the soil?

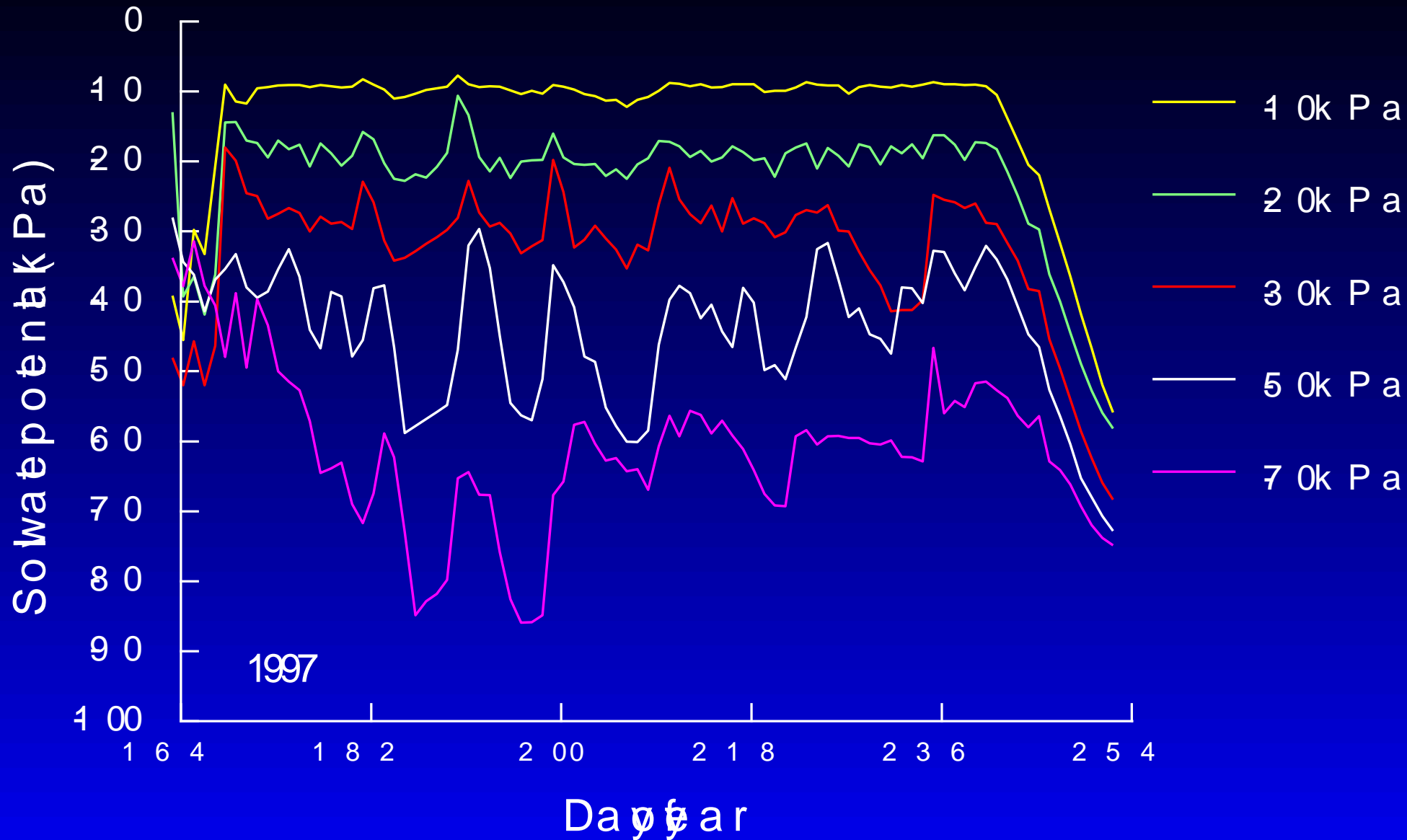
20 cb for drip-irrigated onion.

About 80% of the soil's available water holding capacity.

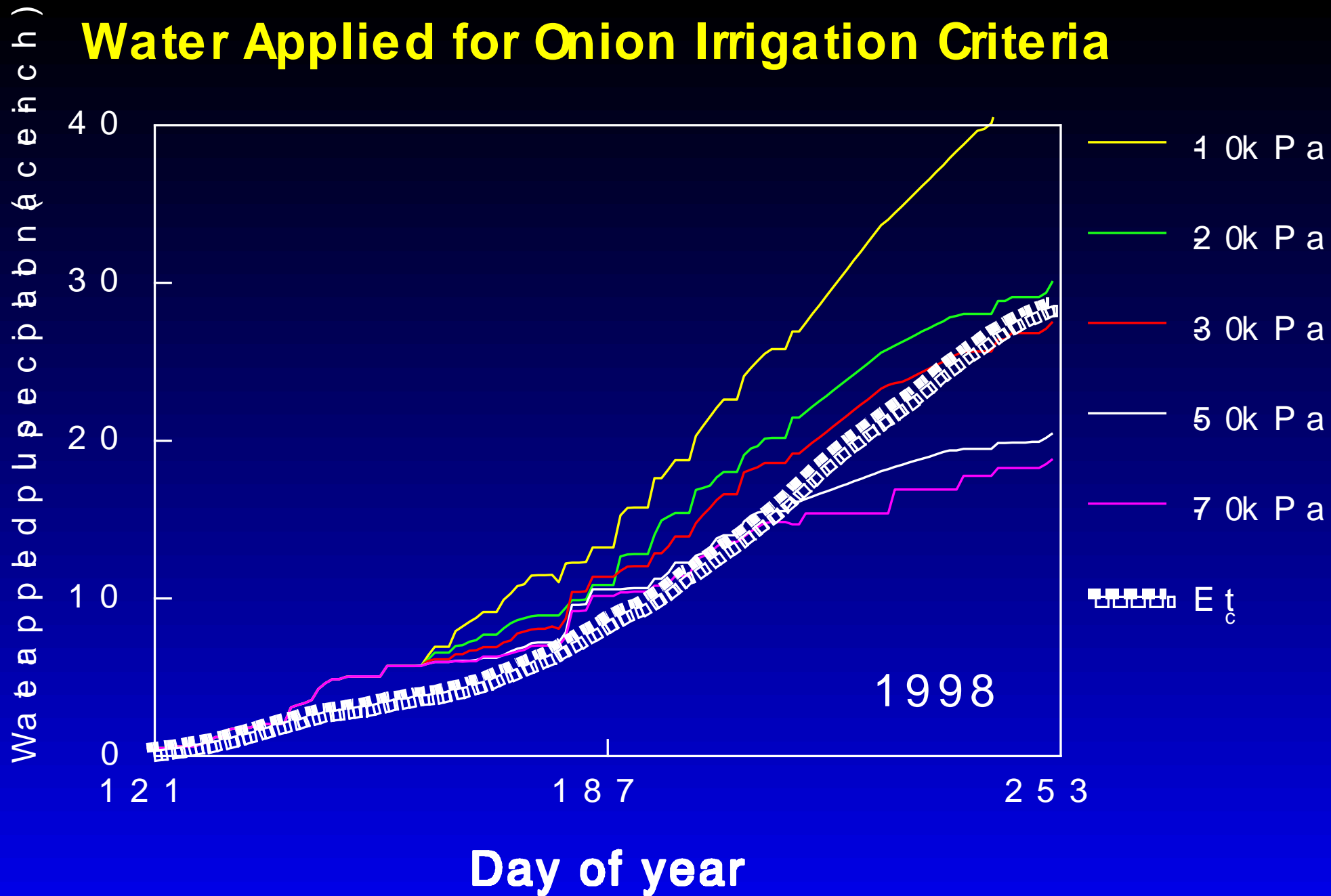
**Bulb yield and quality
are closely linked to
irrigation scheduling
criteria!**

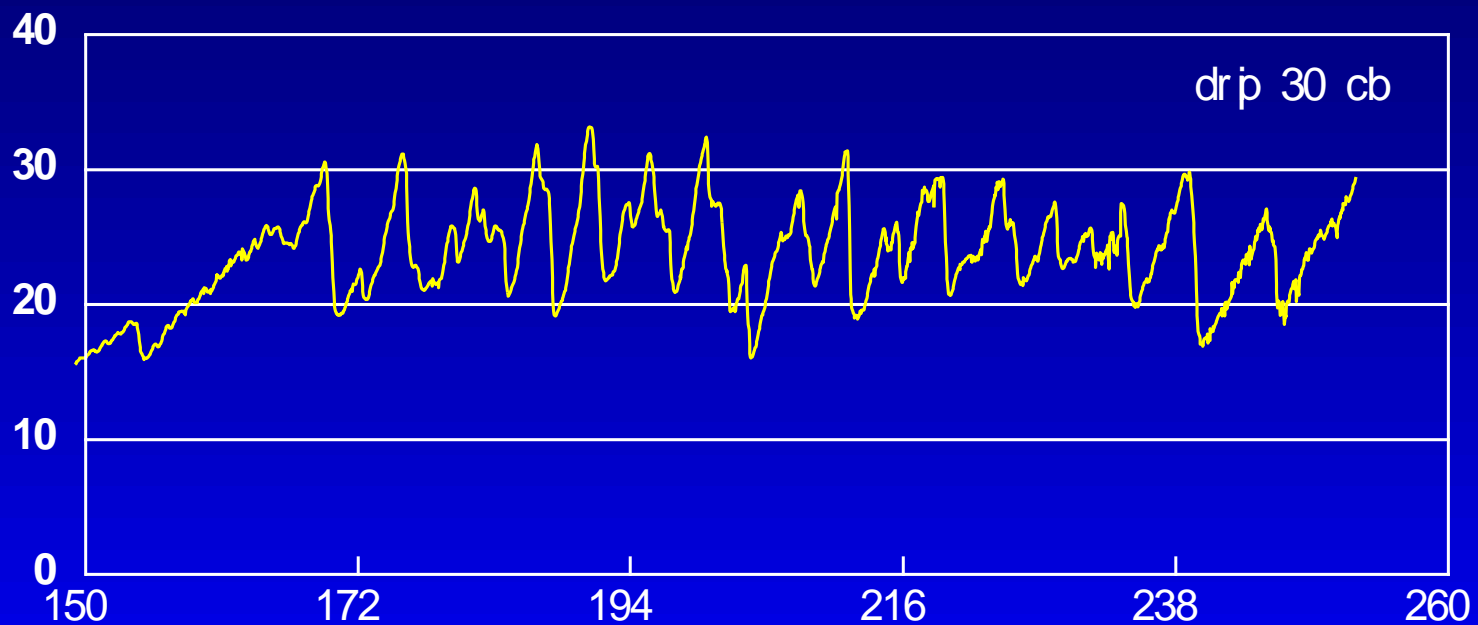
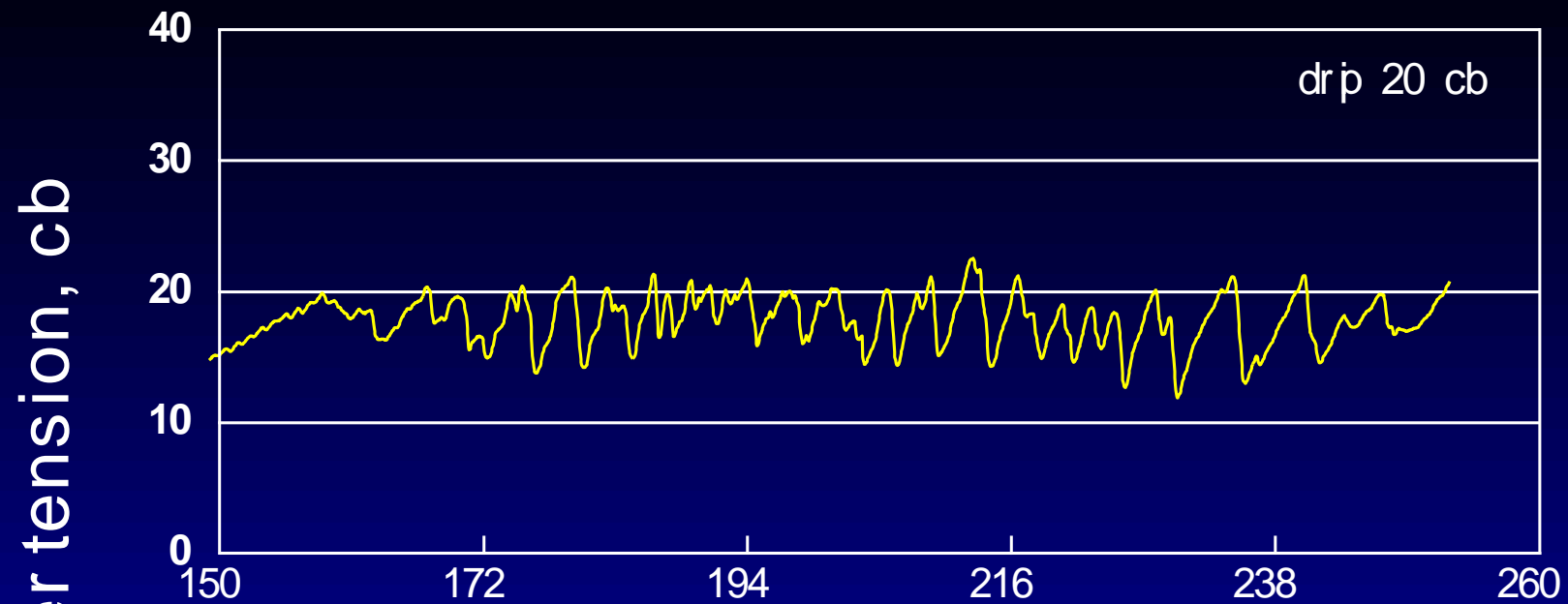


Irrigation Criteria for Drip-Irrigated Onion

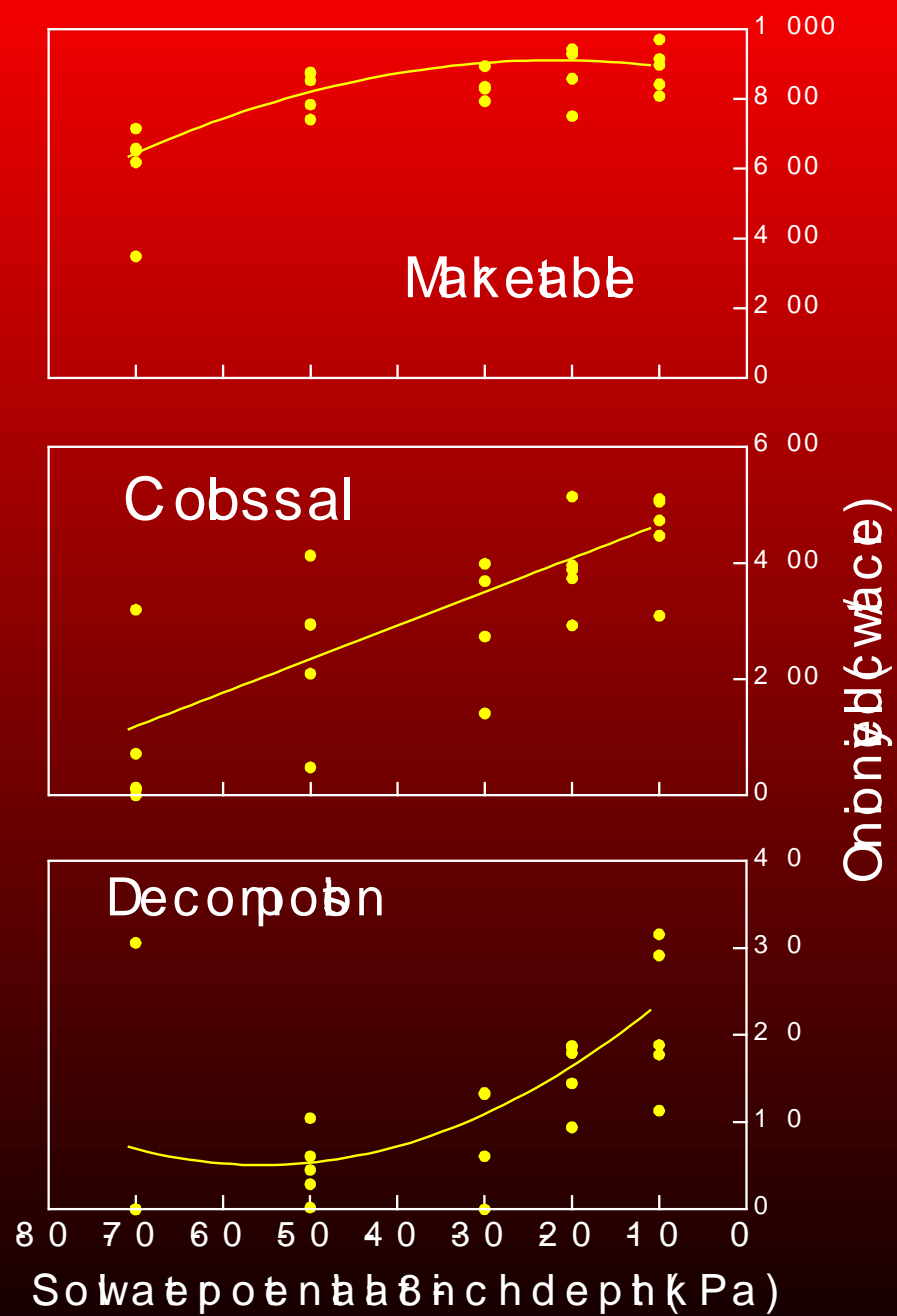


Water Applied for Onion Irrigation Criteria



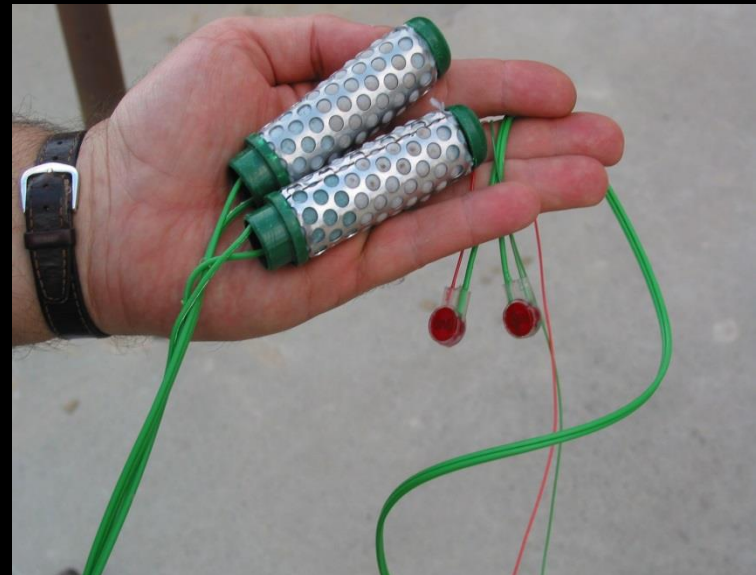


Day of 2008



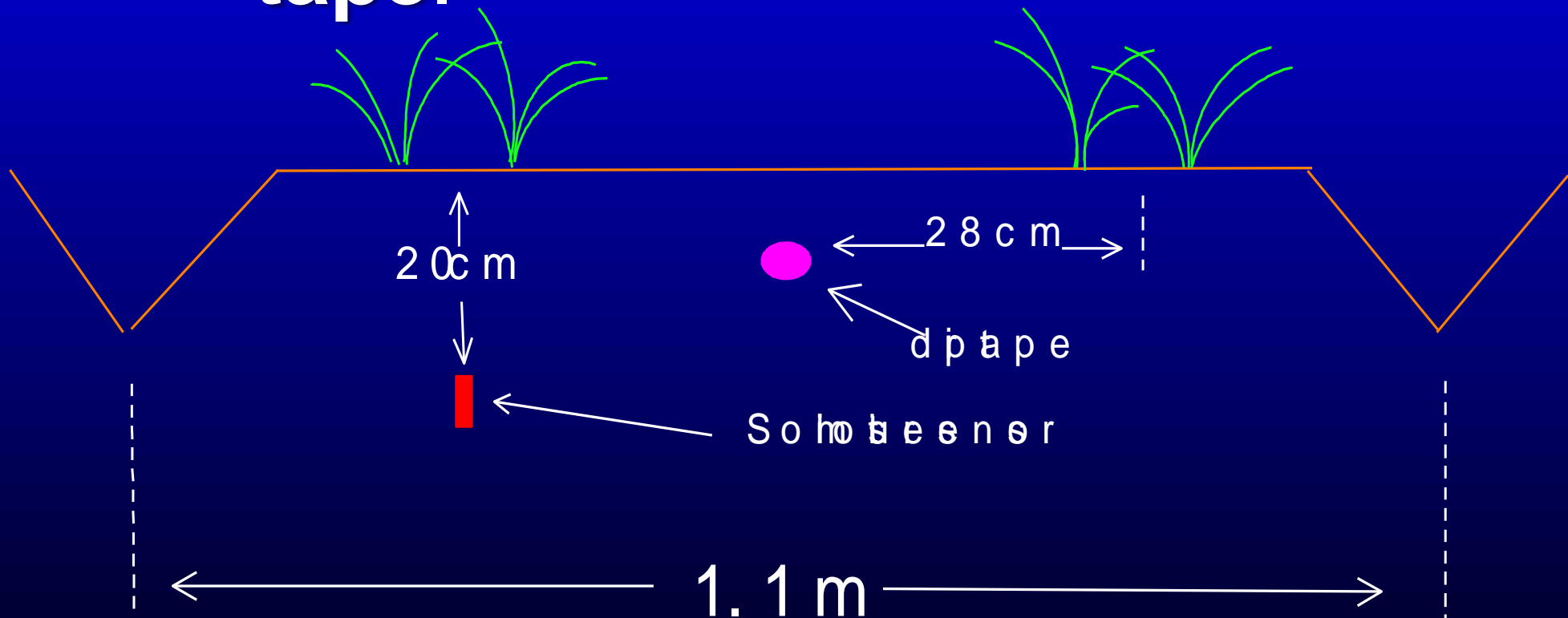
4th Point

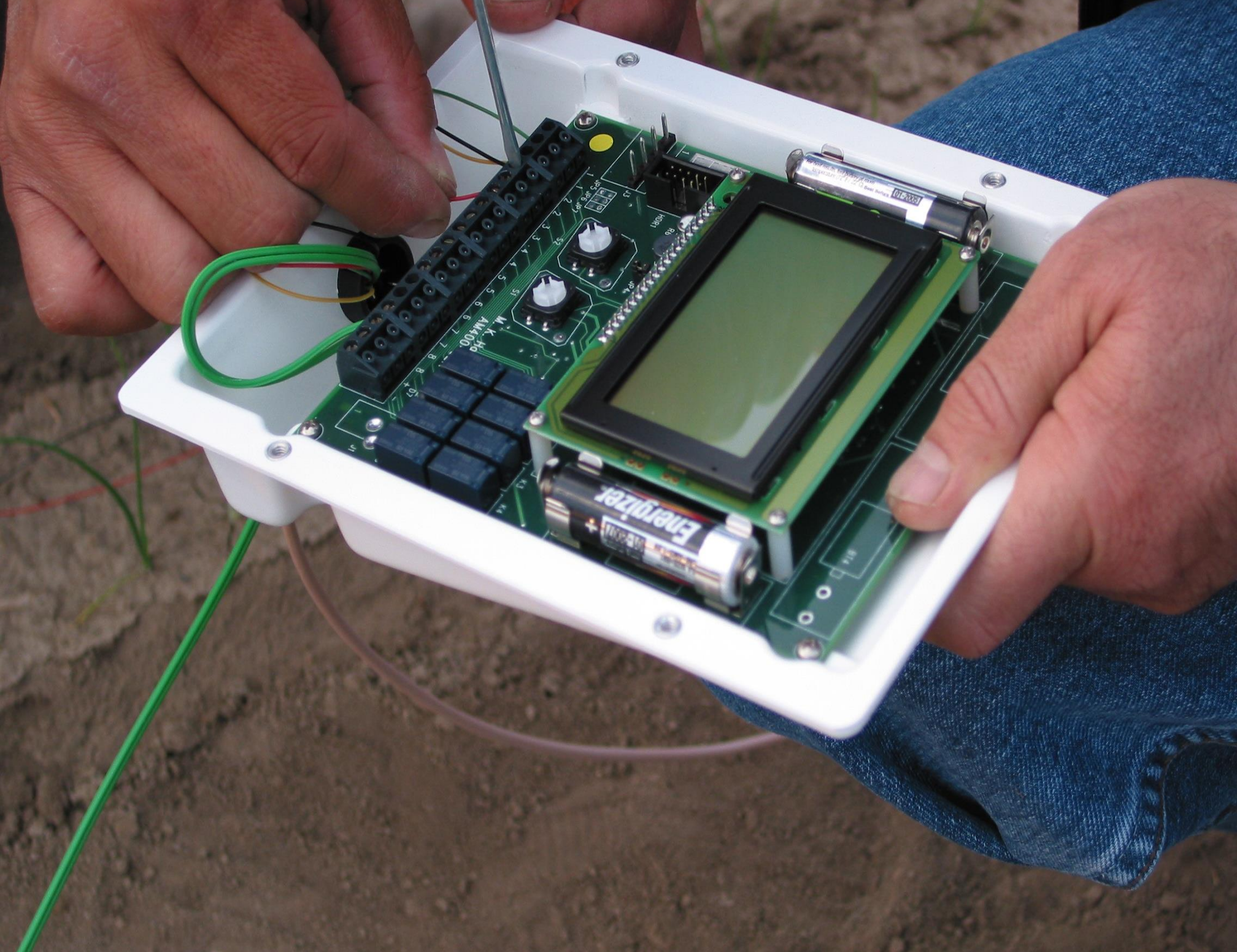
**“Soil Water Tension” (SWT)
proved to be a convenient way to
manage water stress of onion.**





Placement of **sensors** compared to the onions served by the drip tape.





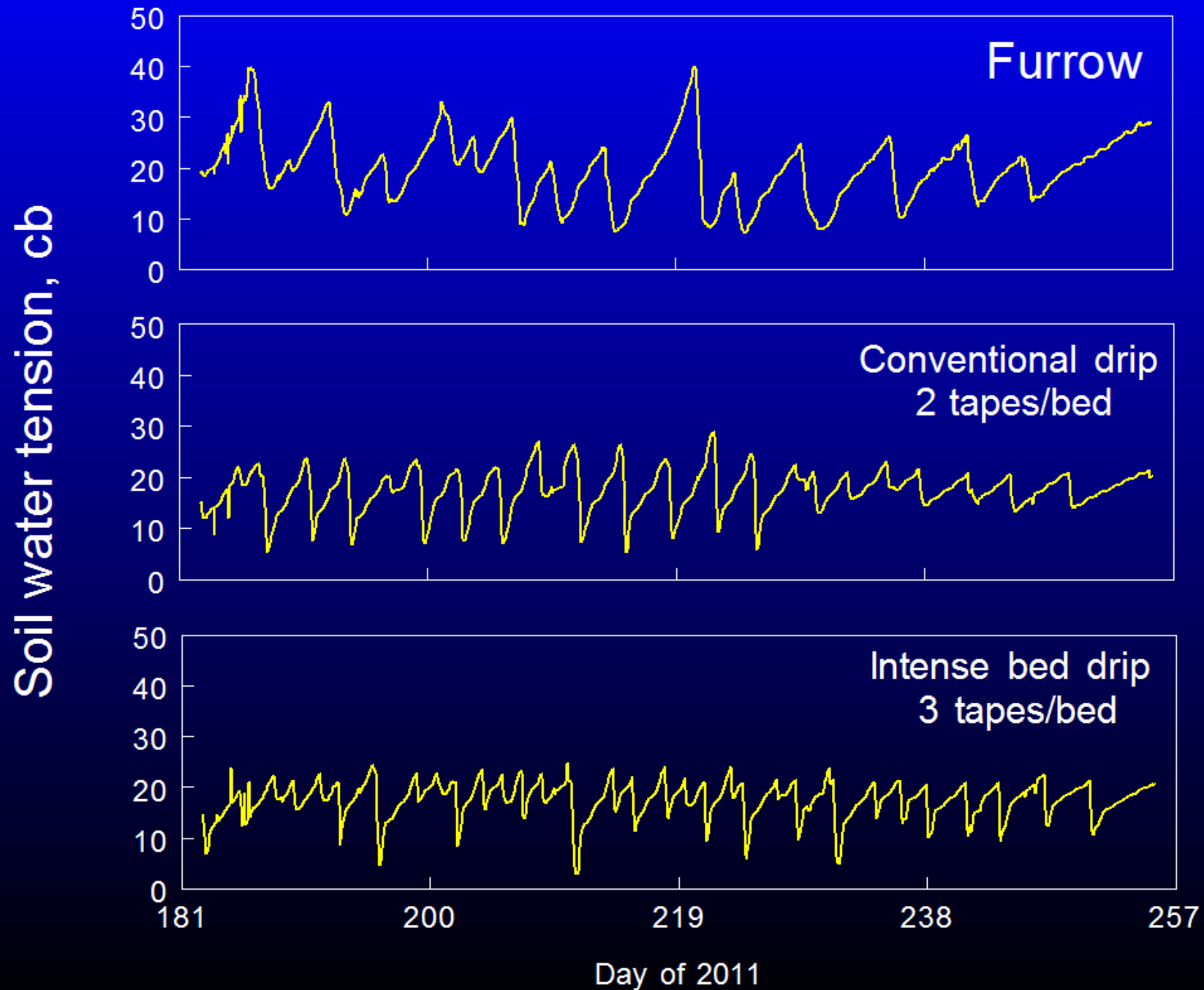




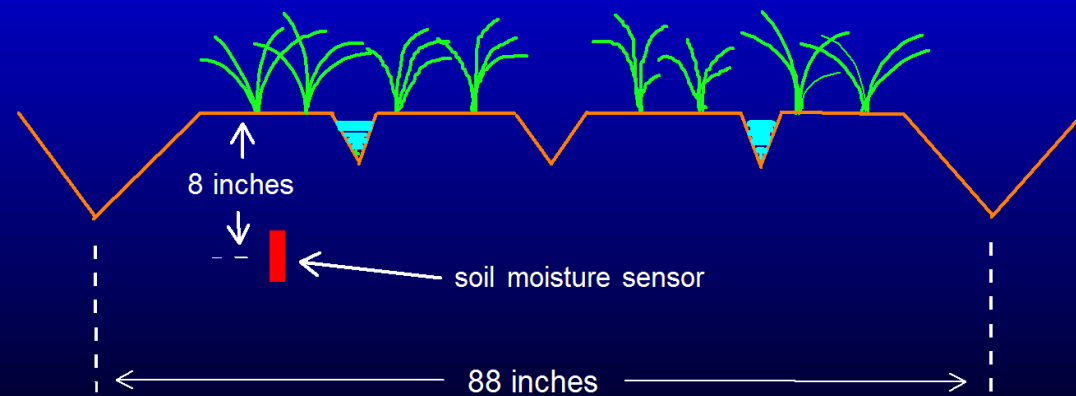
**WATERMARK
MONITOR**

ARMAMETER COMPANY, INC.
RIVERSIDE, CA

Soil water tension at 8-inch depth for 3 irrigation systems



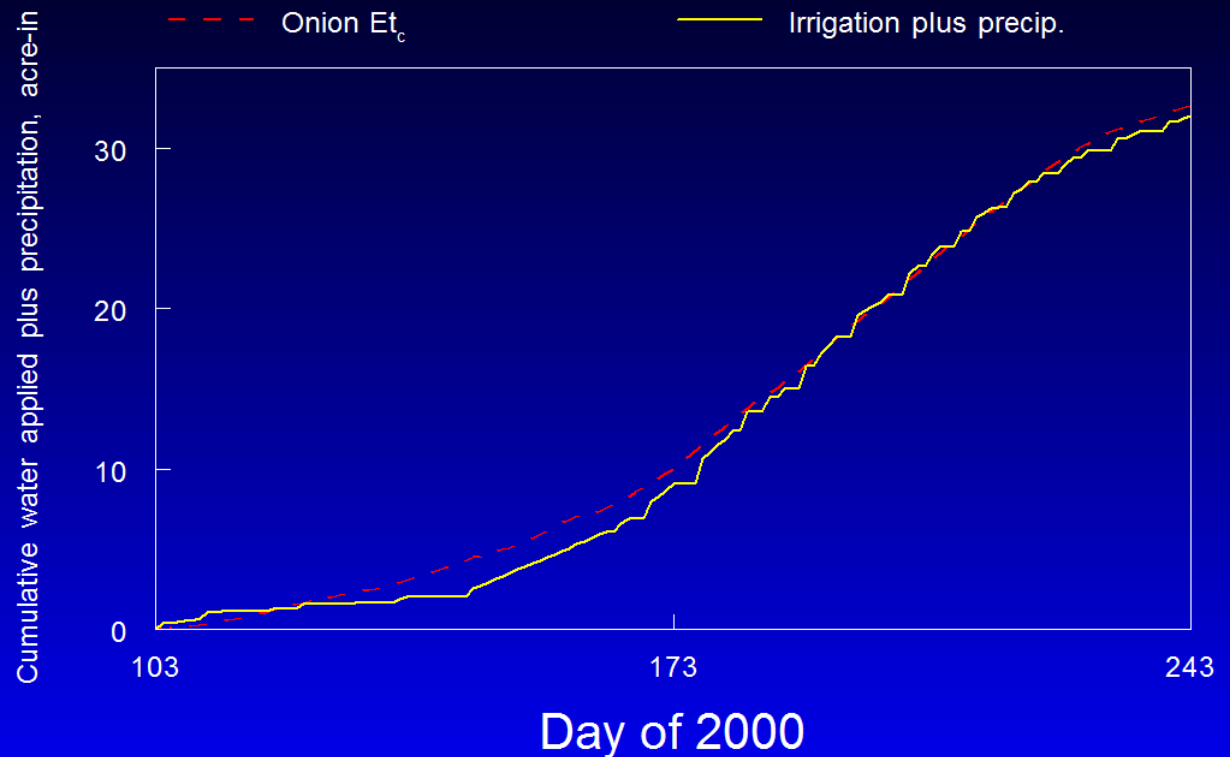
Furrow Irrigation

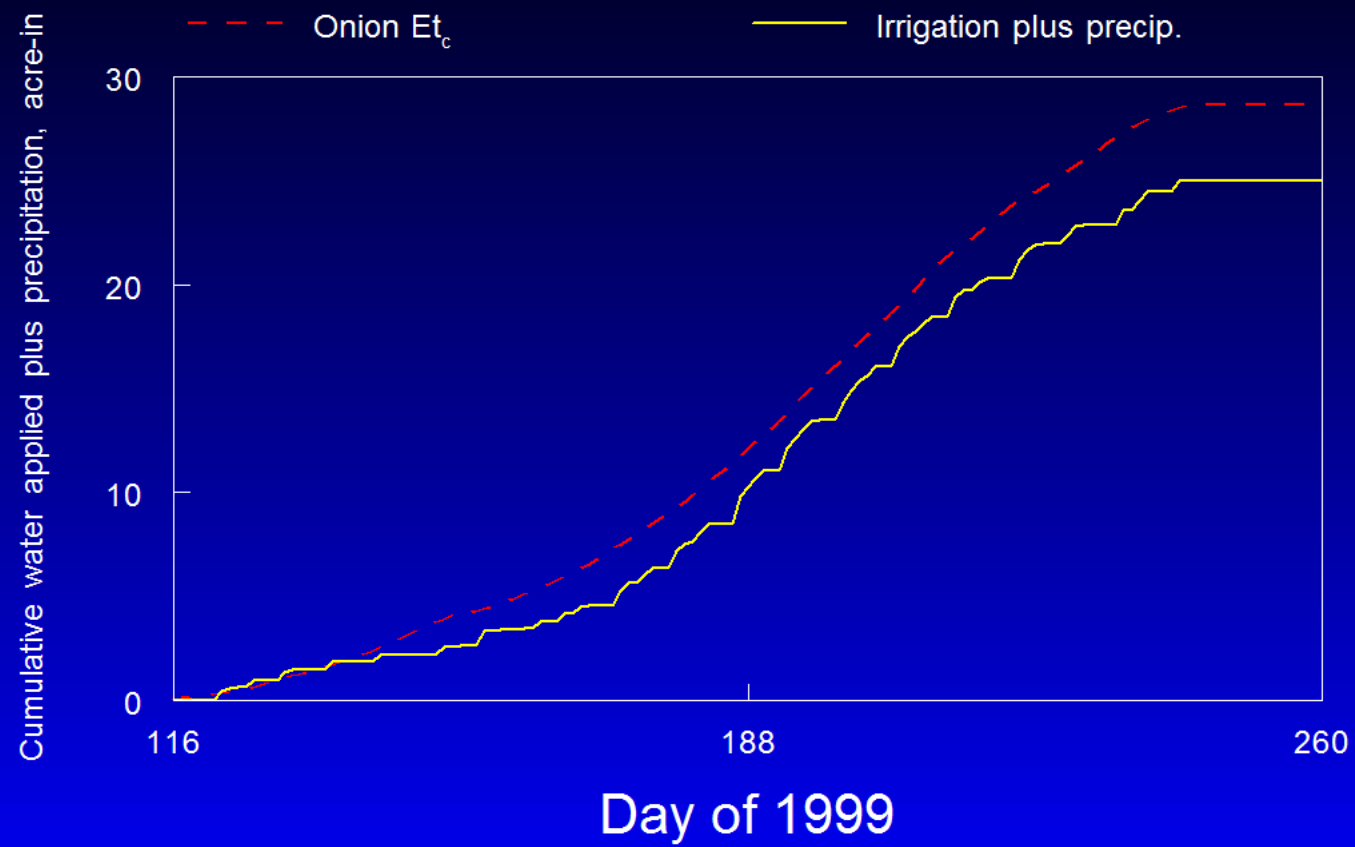


5th Point

✓ How much water does onion require?

About 30''

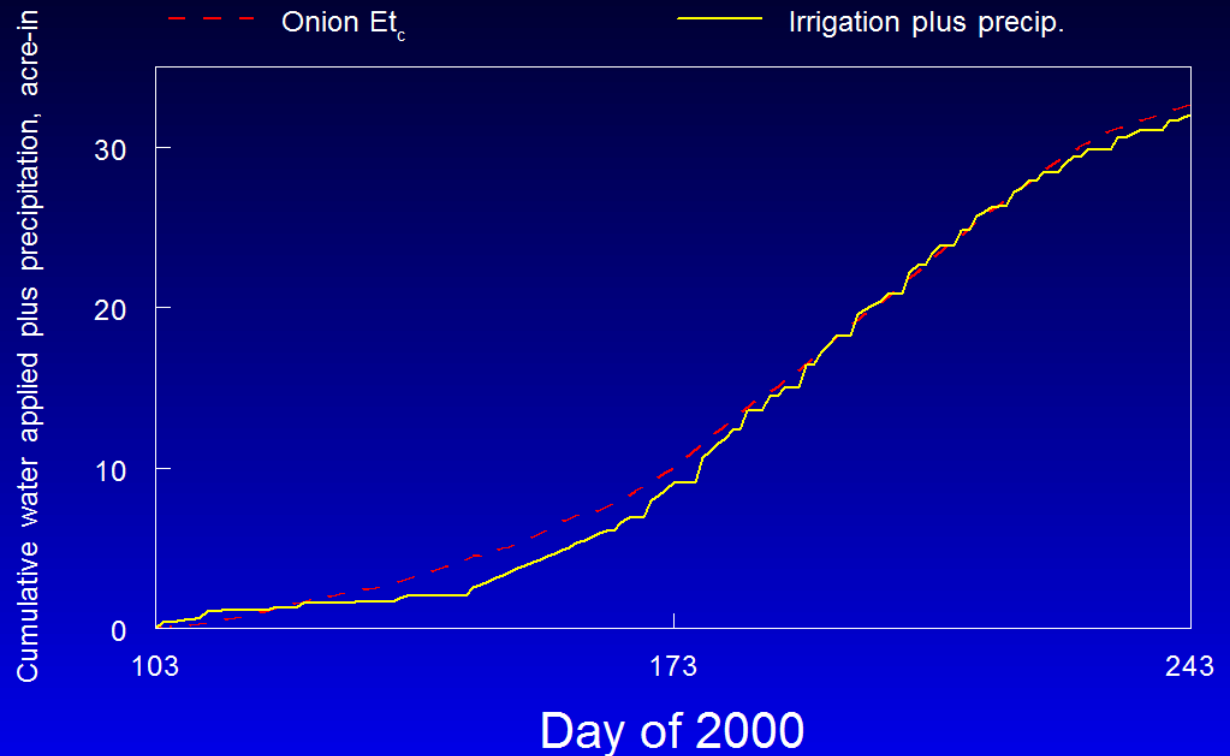




6th Point

✓ What is the maximum daily water use rate?

0.3-0.4"/d



7th Point

Effects of precise irrigation:

Increased onion yield, grade

Increased onion single centers

Decreased onion decomposition

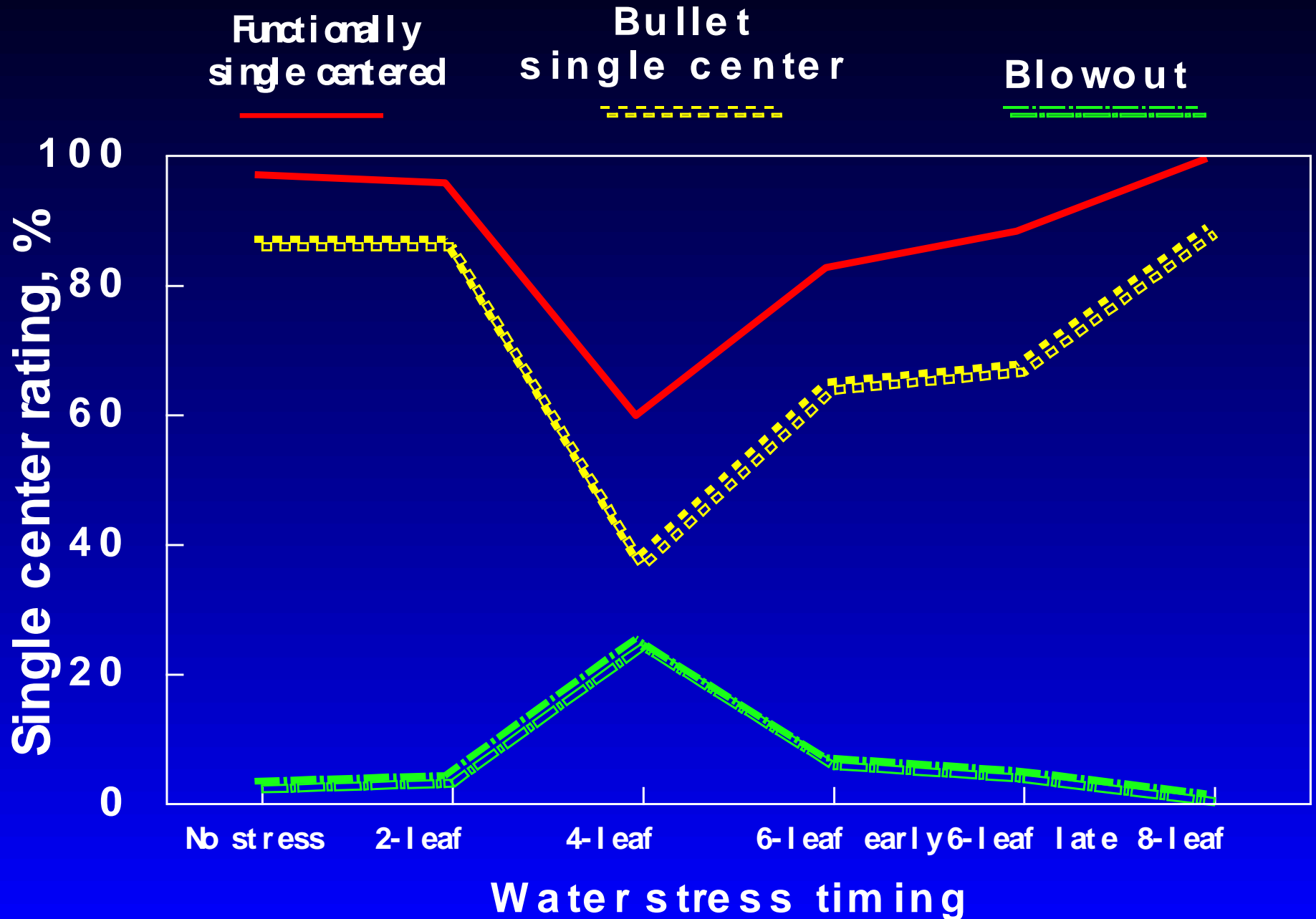
Single centered onions are related to minimized water stress.





Single centered onions are needed for onion rings.

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



8th Point

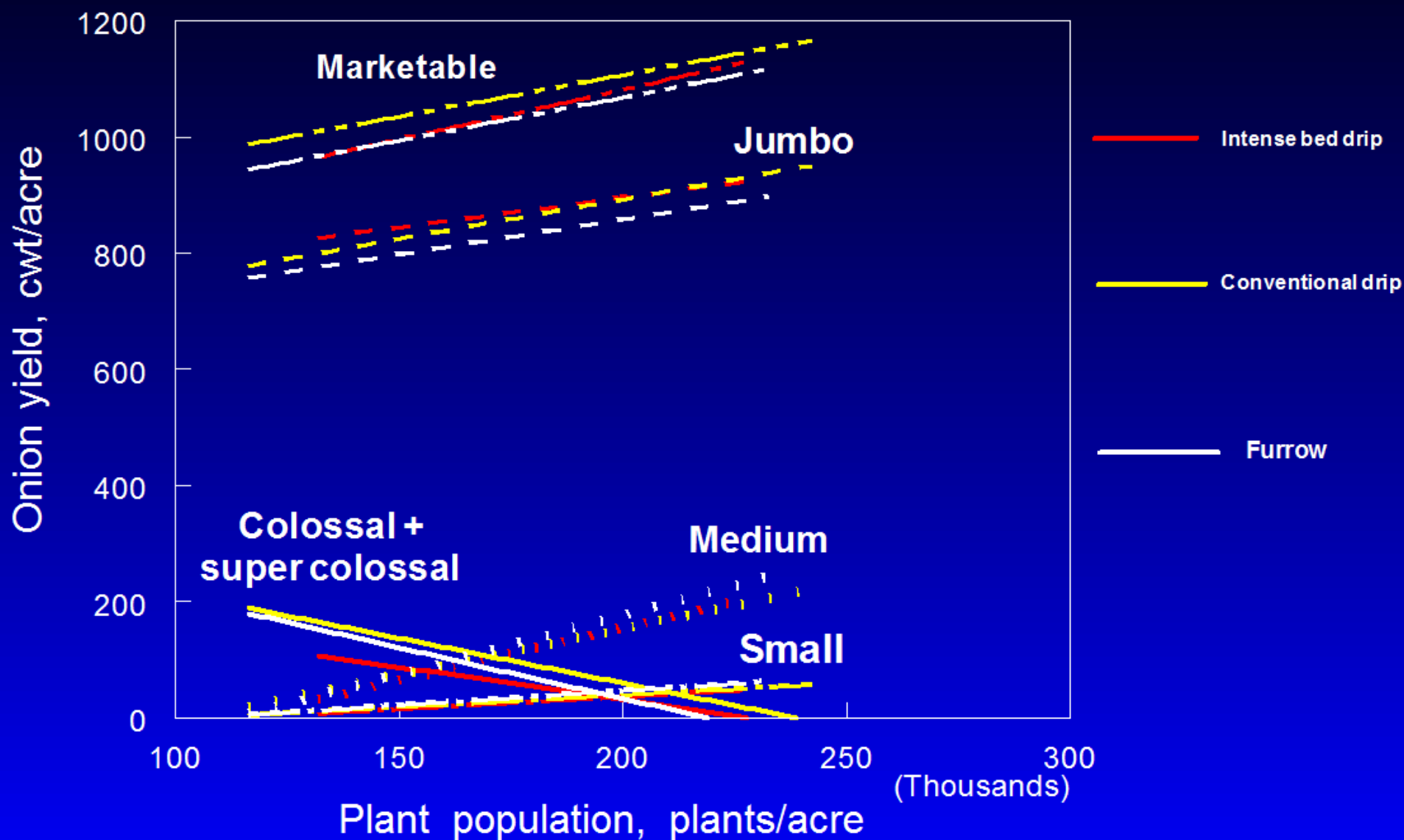
Ideal plant populations for drip-irrigated onions:

100,000 plants per acre to

150,000 plants per acre for the

US market.

Onion bulb size response to plant population for **Barbaro** under 3 irrigation systems in 2011



9th Point

Nitrogen fertilization for drip-irrigated onion?

Only 0 to 150 lb N/ac depending on other N sources!!

Decreased groundwater contamination.

N use efficiency of furrow- and drip-irrigated onion production for Malheur County, Oregon, and Idaho, February 2008, compared to a 1989 survey and 1980 estimates.

| | Malheur Co. 1980 | Malheur Co. 1989 | Malheur Co. 2008 | Idaho 2008 |
|----------------------------|---------------------|---------------------|------------------------|------------------|
| | Furrow-irrigated | | | |
| Yield (cwt/ac) | 480 ^a | 540 ^a | 789 ^b | 783 ^b |
| Total applied N (lb/ac) | 400 ^c | 284 ^b | 257 ^b | 260 ^b |
| lb onions/lb applied N | 120 | 190 | 307 | 301 |
| | Drip-irrigated | | | |
| Yield (cwt/ac) | - | - | 814 ^b | 787 ^b |
| Total applied N (lb/ac) | - | - | 175 ^b | 162 ^b |
| lb onions/lb applied N | - | - | 465 | 486 |

10th Point

Special considerations for drip-irrigation systems?

Design, Management.

Design, sand media filters, and automatic controls allow drip irrigation to work just right.





Drip irrigation adapts well to irregularly shaped fields.

11th Point

What does not work or at least does not help?

- 1. Ultra low flow tape.**
- 2. Repeated very small impulses of water.**
- 3. High N, water, plant populations.**

Final Point - Whew

Outreach and information exchange.

Many great ideas come from growers and industry.

**It is about people: their thoughts, plans, ideas,
and actions.**



Proven new practices are introduced to growers and fieldmen at field days ...





farm show booths ...

and workshops



Acknowledgements:

- **Idaho- Eastern Oregon Onion Committee**
- **Onion Seed Companies**
- **OSU & USDA hatch funds**
- **ODEQ/EPA**
- **Western SARE**
- **Irrrometer Co. Inc. & Clearwater Supply.**

Oregon State
UNIVERSITY

OSU

A wide-angle photograph of a sunset over a flat, snow-covered landscape. The sky is filled with horizontal bands of clouds, some of which are illuminated from below by the setting sun, creating a warm orange and yellow glow. The sun itself is a bright, glowing orb positioned just above the horizon line. In the distance, a range of low mountains or hills is visible against the horizon. The foreground is a vast, flat expanse of snow, reflecting the light from the sky.

**Research results from the last 20
years www.CropInfo.net**

Thank you!