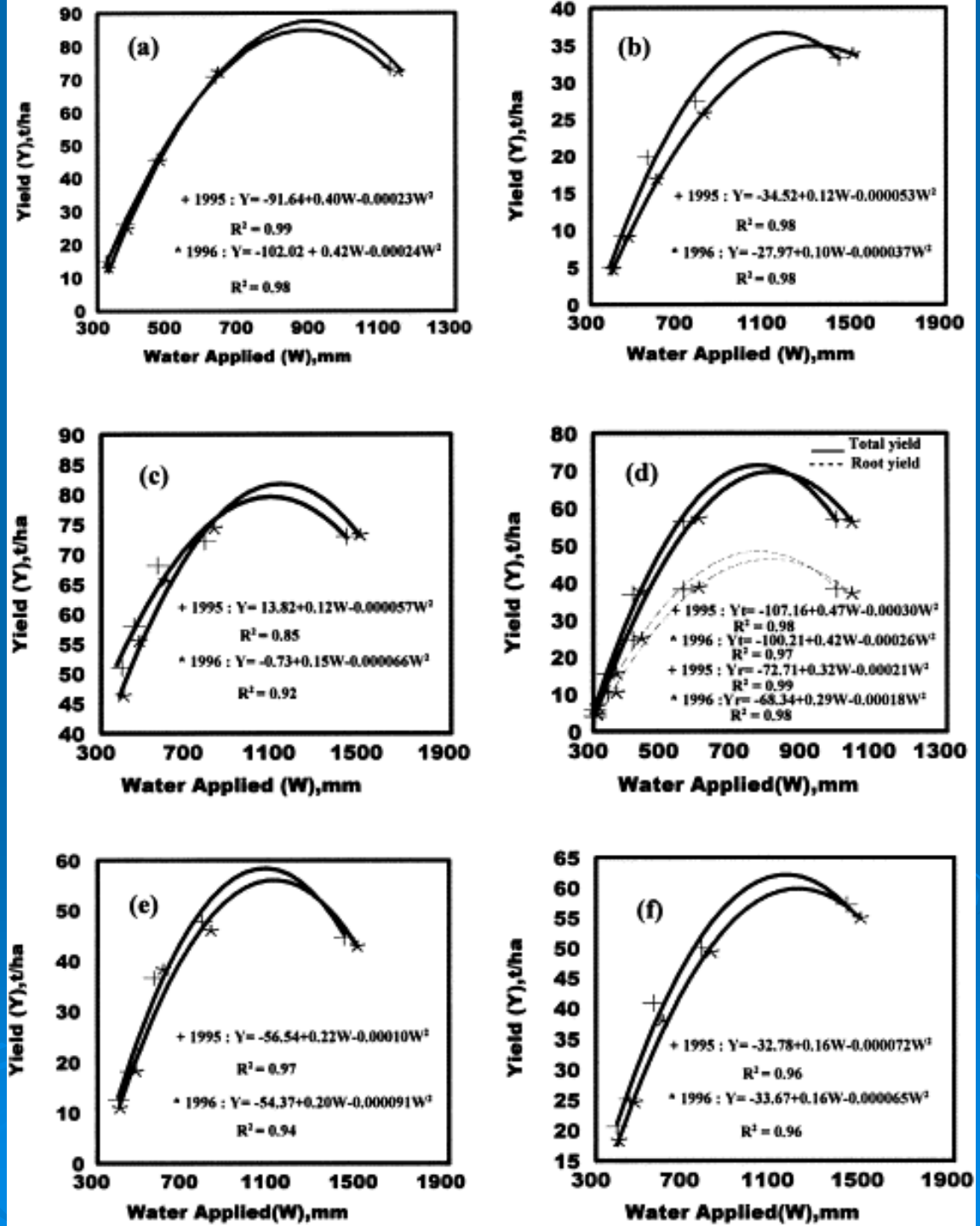
Managing Irrigation to Avoid Abiotic/Biotic Crop Problems

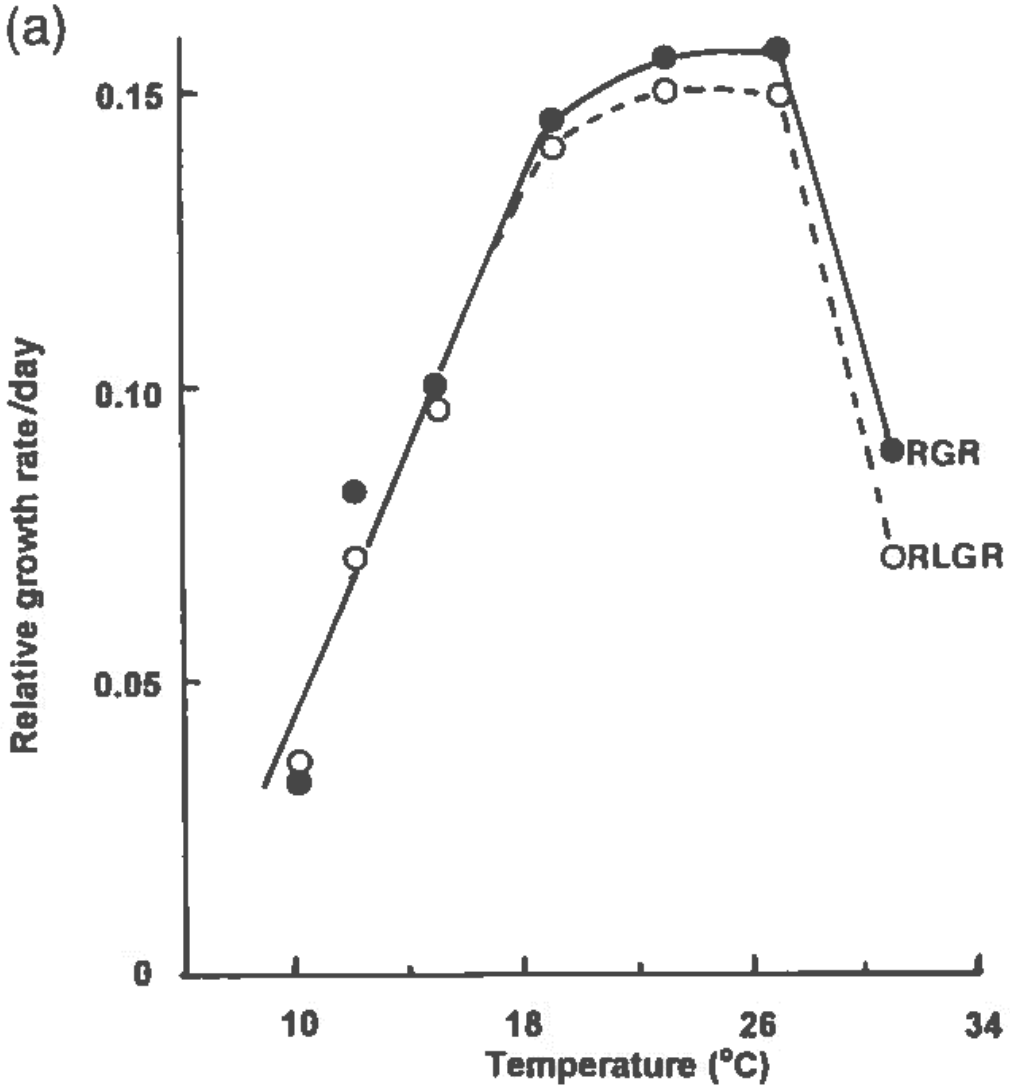
R. Troy Peters, Ph.D.
WSU Extension Irrigation Engineer

Marketable Yields for Various Vegetable Crops



Imtiyaz, M., N.P. Mgadla, B. Chepete, and S.K. Manase. 2000. Response of six vegetable crops to irrigation schedules. Agricultural Water Management. 45(3):331-342

Onion Growth Rates with Temperature



Brewster (2008)

Evaporative Cooling?

- Works! But only when the canopy is wet.
- On hot days, a wet canopy dries quickly.
- Requires fast pivots, small amounts/pass
  - Might get behind in irrigation.
- Solid set – low flow, sprinklers must stay on during the hot part of day.
- Requires lots of water
  - Saturated soils,
  - Root rot problems,
  - Leached nitrates, etc

- Drip irrigating under plastic is *very* efficient, i.e. very little water lost to evaporation
- Use less water when dripping under plastic
- “Out of site, out of mind”
- Check soil water status frequently
- Use information based irrigation scheduling
- Saturated soil conditions promote *root rot*.

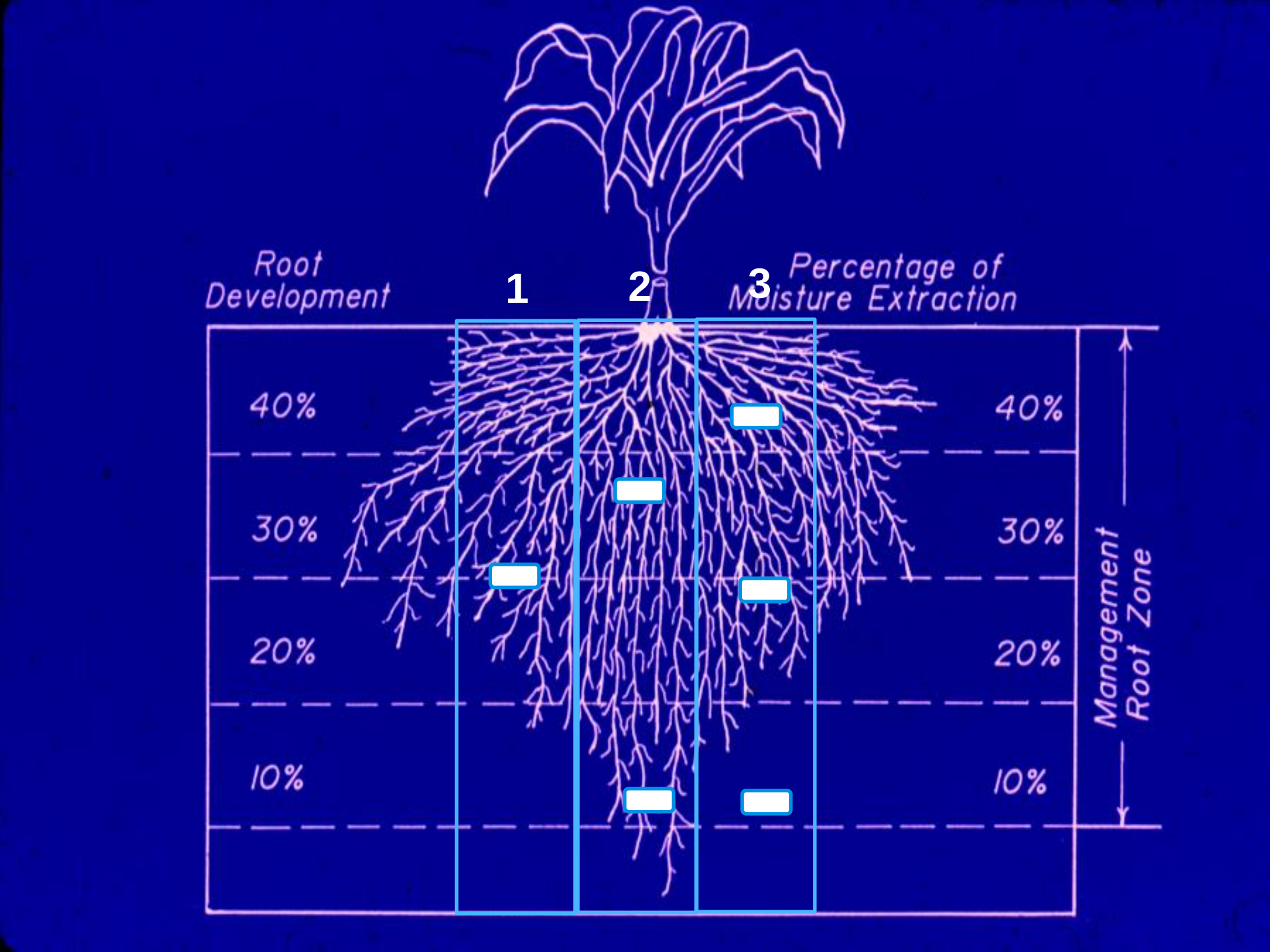
Over-Irrigating

- Increased incidence of plant diseases
  - Blights, molds, rots, wilts
- Less oxygen in root zone = yield loss
  - Root rot
- Reduced storability for many vegetables
- Additional labor, pumping, wear and tear on irrigation equipment.
- Leached fertilizers
- Difficulty with harvesting and cultural operations

Soil Moisture Sensors

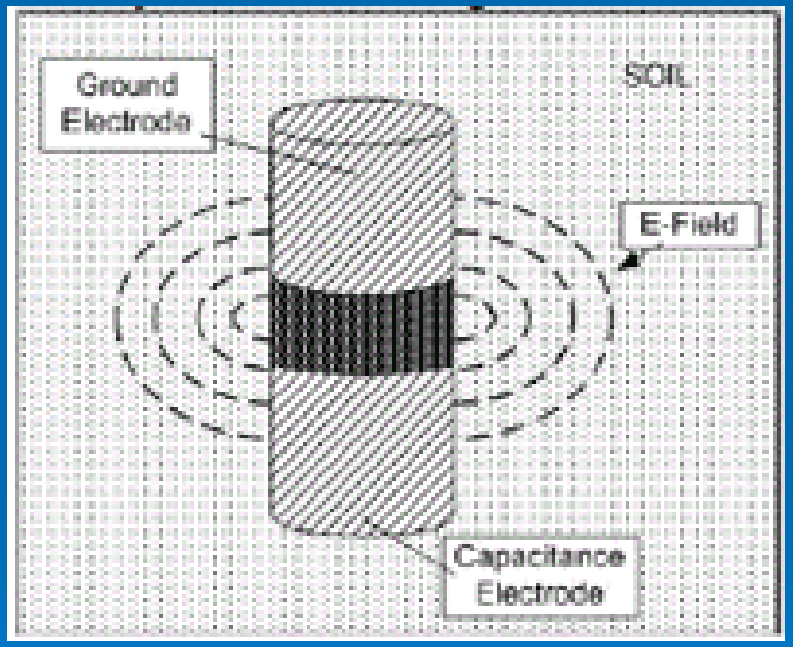
Where to put them?

- Field location
  - *Not* right on the edge of the field.
  - Average soil condition?
  - Lowest water holding capacity (sandy).
- Depths
  - (1) Middle of root zone.
  - (2) 1/3 – middle, and bottom of root zone.
  - (3) Top, middle, and bottom of root zone.
  - Top sensors tell you *when* to water, bottom shows more severe stress, and shows water holding capacity of soil… *how much.*


Root Development
1
2
3
Percentage of Moisture Extraction
40%
30%
20%
10%
40%
30%
20%
10%
Management Root Zone

Capacitance Probes

Capacitance Sensors



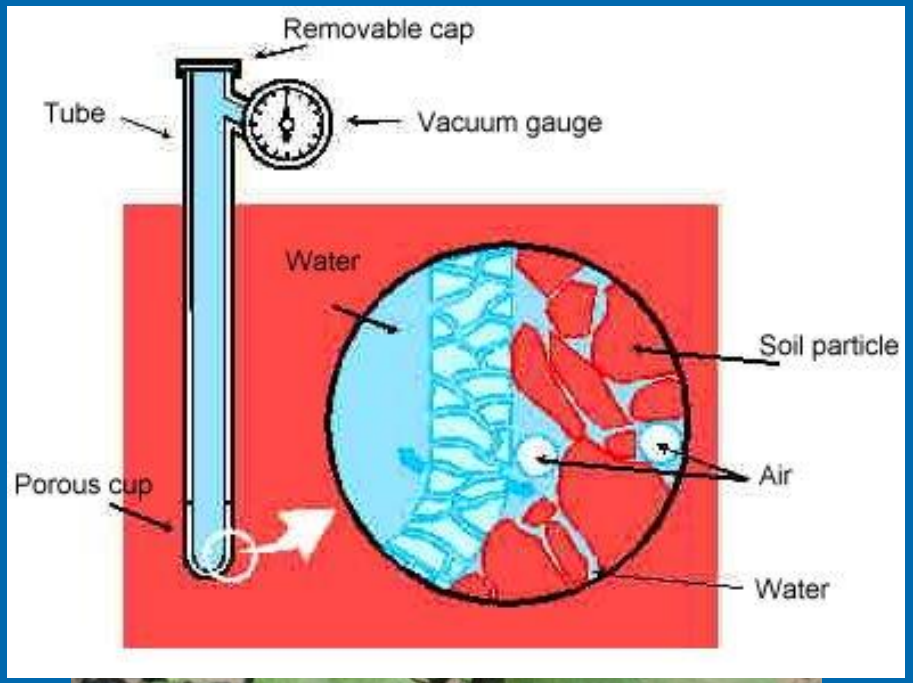
Capacitance Sensors

- Strengths
  - Gives soil water content
  - Easy to log data (real-time)
- Weaknesses
  - Small sample area
  - Highly dependant on very local soil structure
  - Inconsistent (high variability)
  - Can be expensive
  - Proper installation is critical, and not always easy
  - Affected by salinity and temperature

Practical use of Soil Content Sensors (capacitance, neutron probe)

- Measure as soon as soil thaws = field capacity, or 24 hrs after heavy irrigation
- Then use AWC by soil texture and start with 30-50% of this for maximum depletion for vegetables.
- Refine these using feedback from plants and experience.

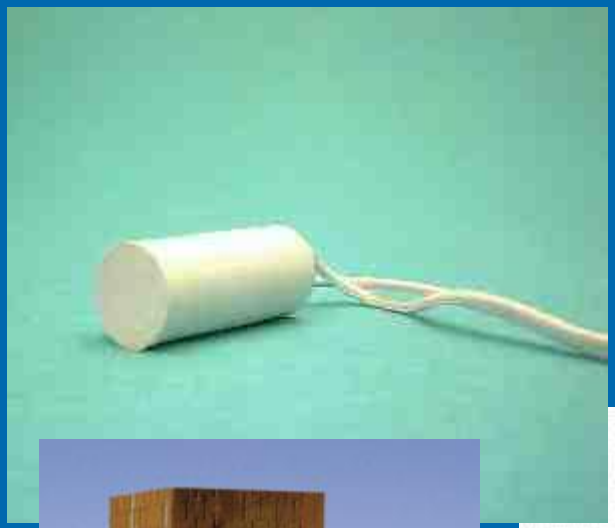
Tensiometers



Tensiometers

- Strengths
  - Soil water tension (same as plant sees)
  - Less expensive
  - Widely used, studied and accepted
  - Not affected by salinity
- Weaknesses
  - Small sample area
  - Indicates “when” to irrigate, not “how much”

Resistance



Resistance type

- Strengths
  - Inexpensive
  - Usable trends
  - Give soil water potential (same as plant sees)
  - Easy to log data
- Weaknesses
  - Affected by salinity
  - Imperfect accuracy
  - Samples small area

Practical use of Tension-Based Soil Moisture Sensors

- Start with 20-40 centibars as irrigation point for no stress.
- Correlate numbers to crop condition, then use numbers in future to indicate degree of soil dryness.
- Watch deep sensor after an irrigation to indicate depth of penetration.

Soil Moisture Sensors
The “Look and Feel Method”

- Advantages
  - Cheap
  - Easy
- Weaknesses
  - Subjective - especially w/ dry soil.

Look and Feel

- May take time and experience to train yourself to do this correctly.
- Start with the NRCS pamphlet recommendations
- Refine your techniques for your particular soil by condition of soil at particular crop stress points, or correlated with a soil sensor.
- Go deep!

Soil Moisture Sensors

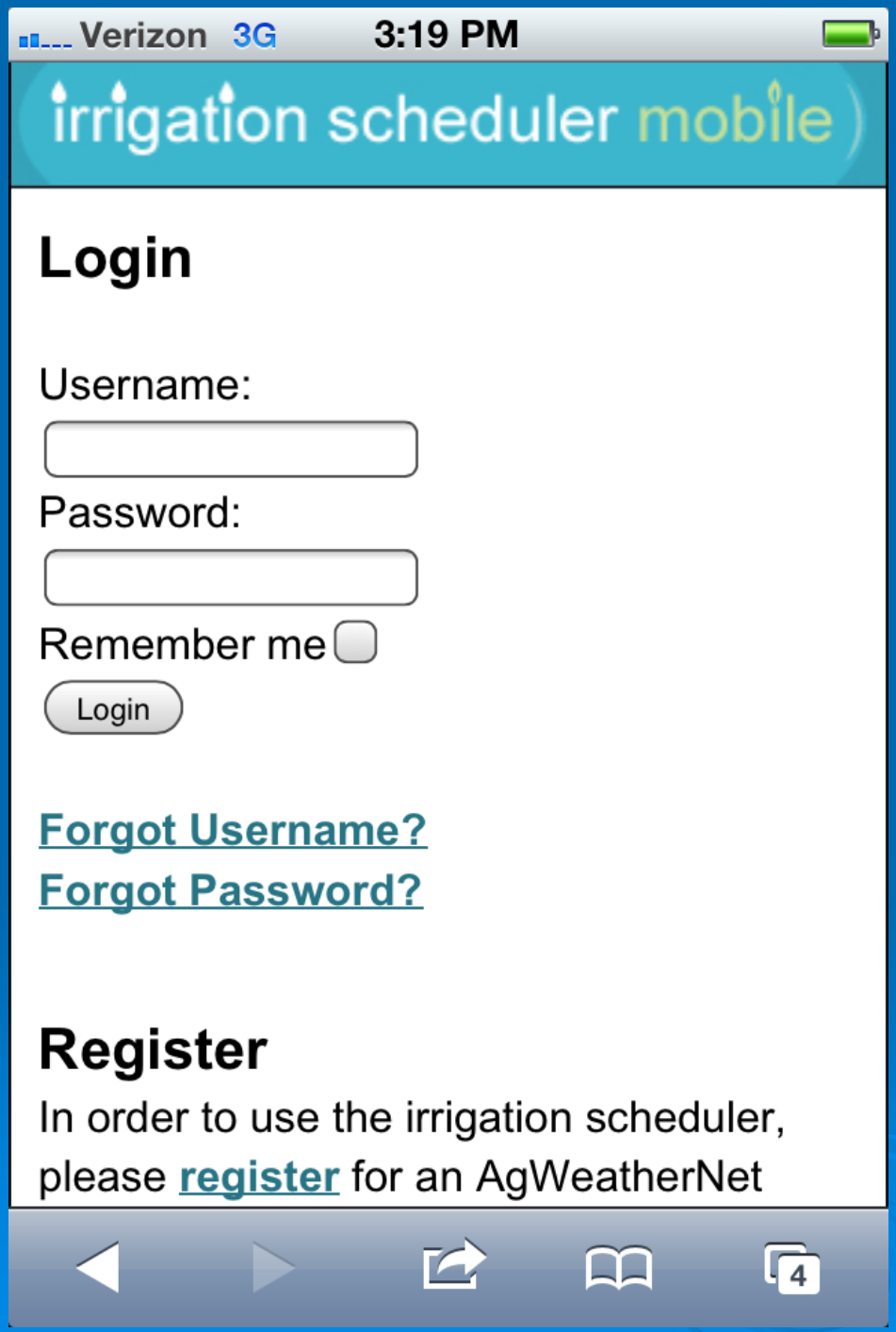
- Neutron Probe is most accurate (consultants).
- Most sensors will give a trend that is usable for irrigation scheduling.
- Proper installation of sensors is critical and must be done right for good data
- Actually using the sensor data is most important!
- Keep records… calibrate yourself using numbers, crop response and experience
- Hire a consultant and watch them.

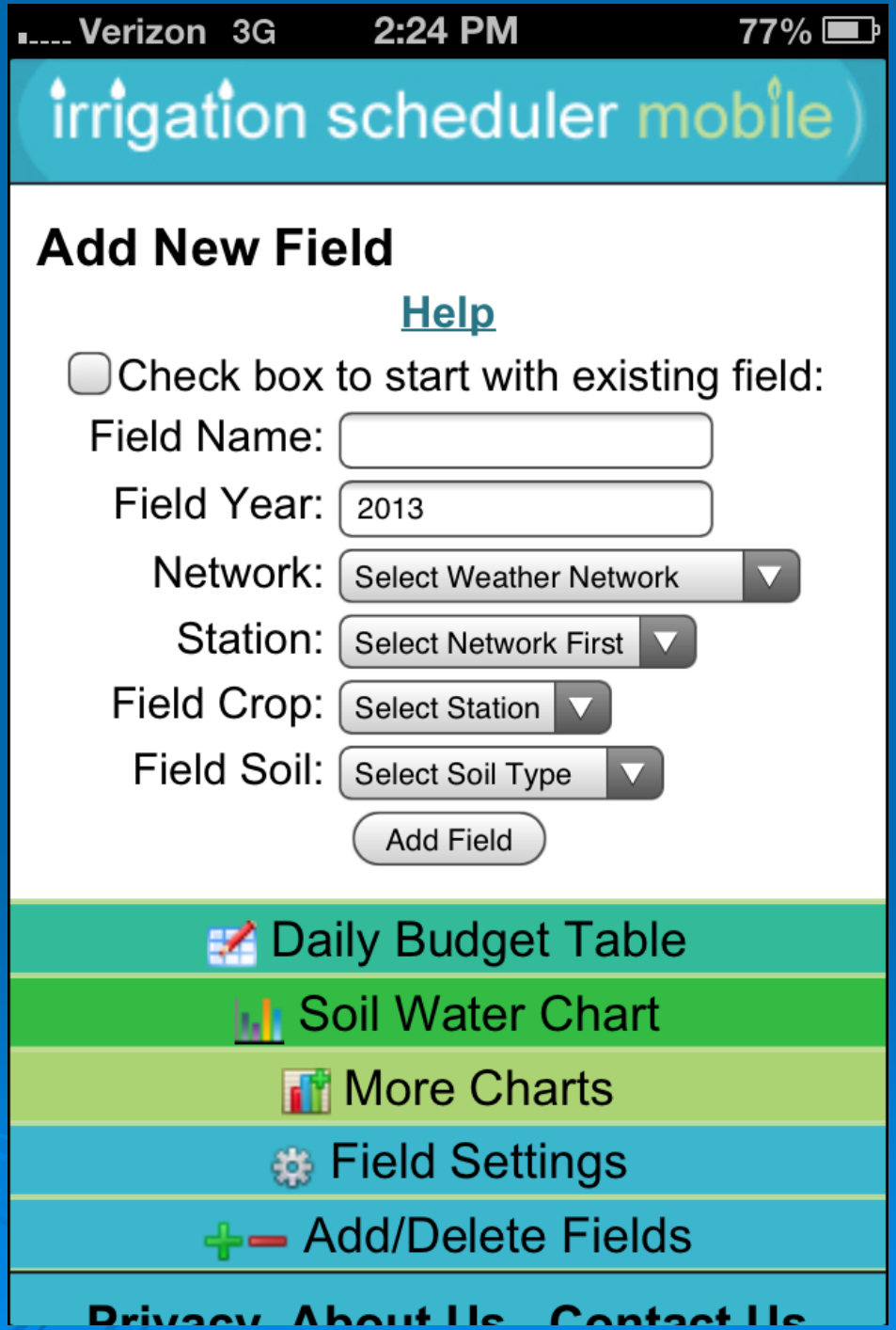
Soil Water Balance

Water In = Water Out +- Storage

irrigation scheduler mobile

- Simple soil water balance based on ET.
- Designed for use on a smart phone, but usable on any desktop web browser.
- Designed for usability #1.
- Quick & easy to set up.
- Automatically pulls ET data from selected weather stations.


Verizon 3G 3:19 PM
irrigation scheduler mobile
Login
Username:
Password:
Remember me
Login
Forgot Username?
Forgot Password?
Register
In order to use the irrigation scheduler, please register for an AgWeatherNet


Verizon 3G 2:24 PM 77%
irrigation scheduler mobile
Add New Field
Help
Check box to start with existing field:
Field Name:
Field Year: 2013
Network: Select Weather Network
Station: Select Network First
Field Crop: Select Station
Field Soil: Select Soil Type
Add Field
Daily Budget Table
Soil Water Chart
More Charts
Field Settings
Add/Delete Fields

Verizon 3G 11:13 AM 100%

irrigation scheduler mobile

7-Day Daily Budget Table

Field: Potatoes, 2011; Potatoes

Help

Date	Water Use (in)	Rain& Irrig. (in)	Available Water (%)	Water Deficit (in)	Edit Data
07/12	0.22	0	80.9	0.88	Edit
07/13	0.25	0	75.5	1.13	Edit
07/14	0.22	0	70.7	1.35	Edit
07/15	0.24	0	65.4	1.59	Edit
07/16	0.23	0	60.4	1.82	Edit
07/17	0.22	1	77.5	1.04	Edit
07/18	0.2	0	73.1	1.24	Edit

|<< <<< Jul 12, 2011 >>> >>|

Verizon 3G 4:30 PM 88%

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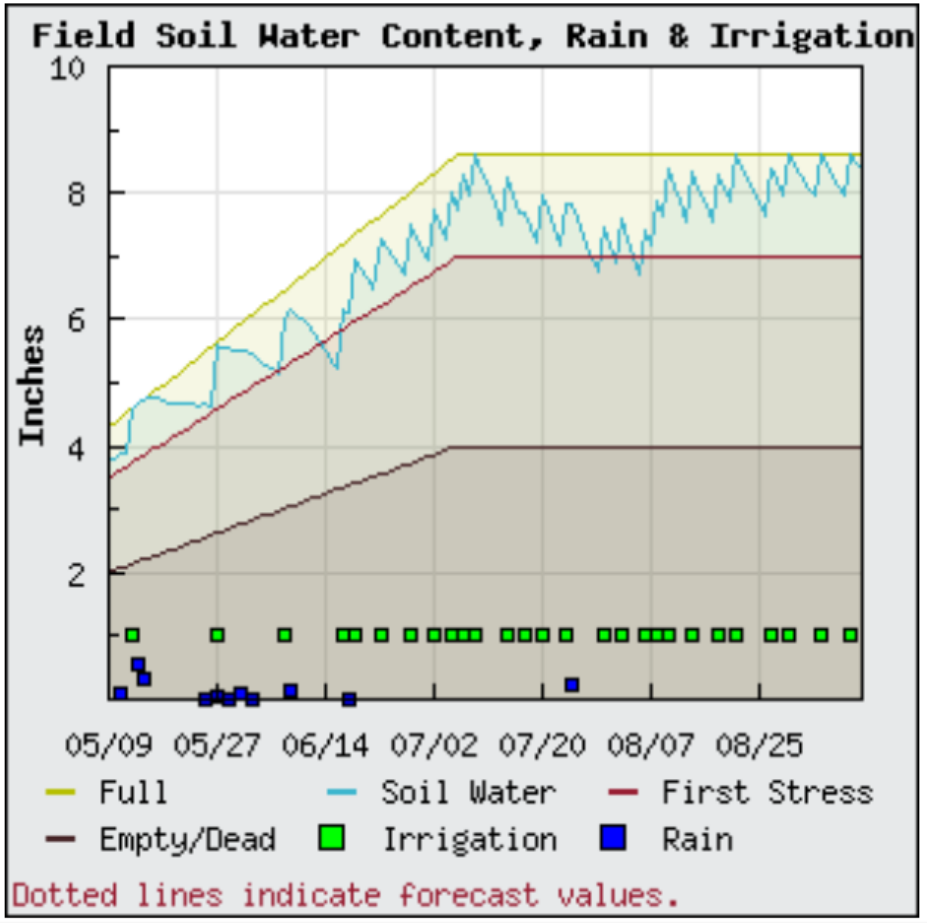
Field: Potatoes, 2011; Potatoes

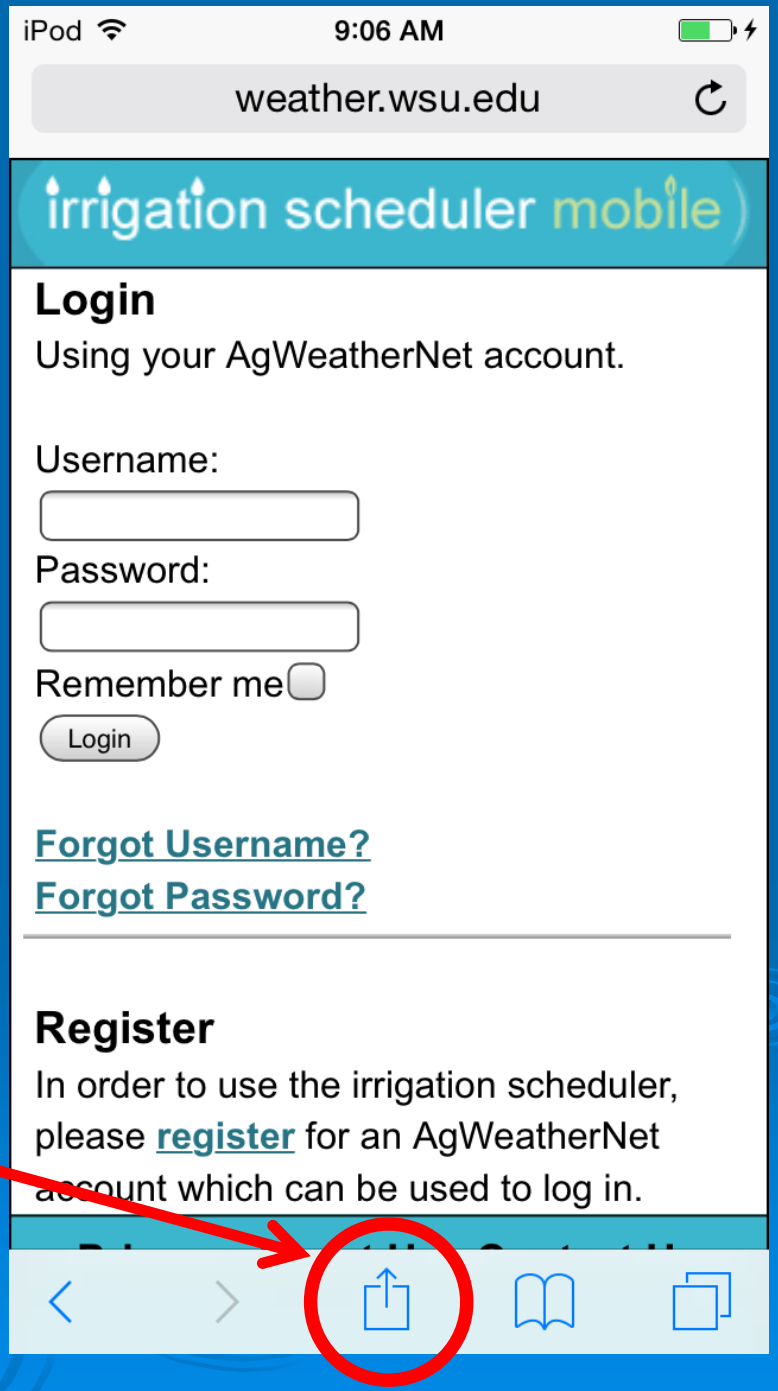
Help

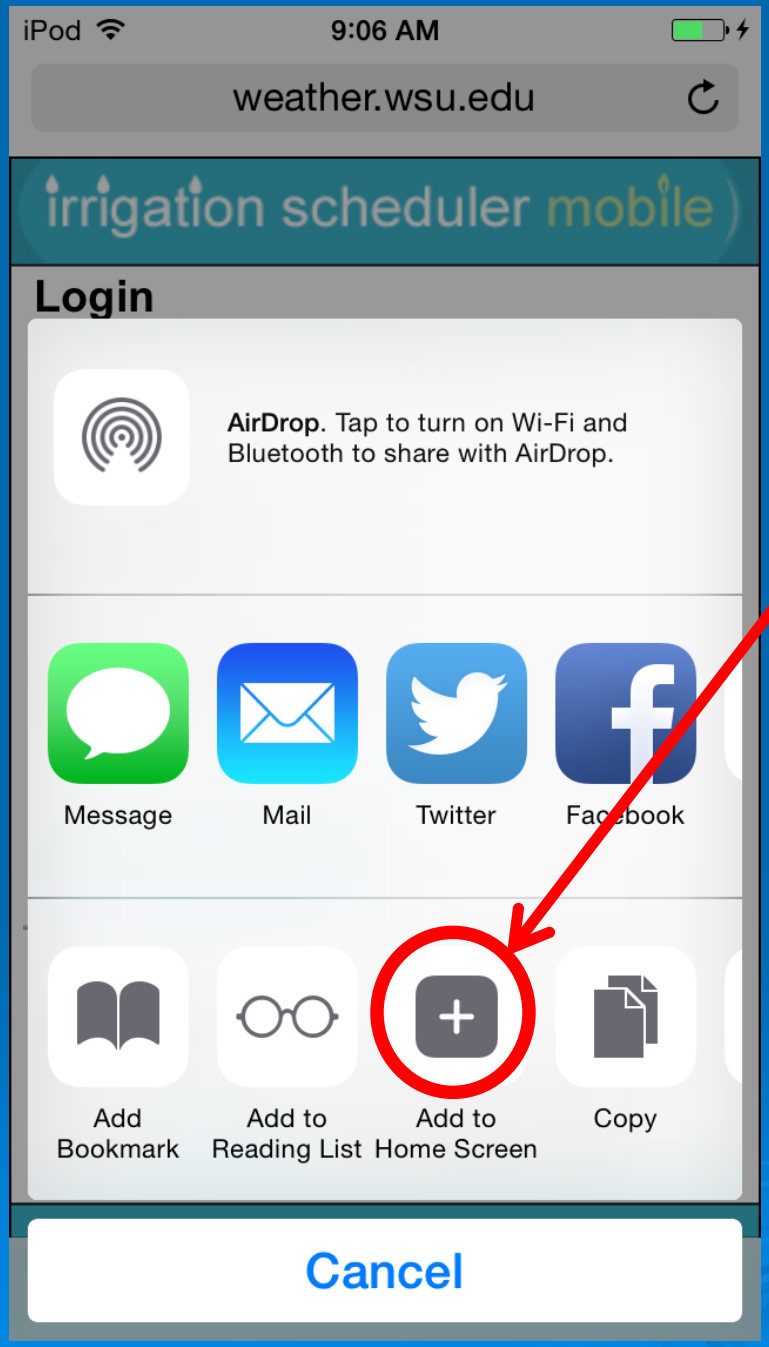


iPhone
iPad
iPod

weather.wsu.edu/ism
in Safari

Then…




iPod
9:06 AM
weather.wsu.edu
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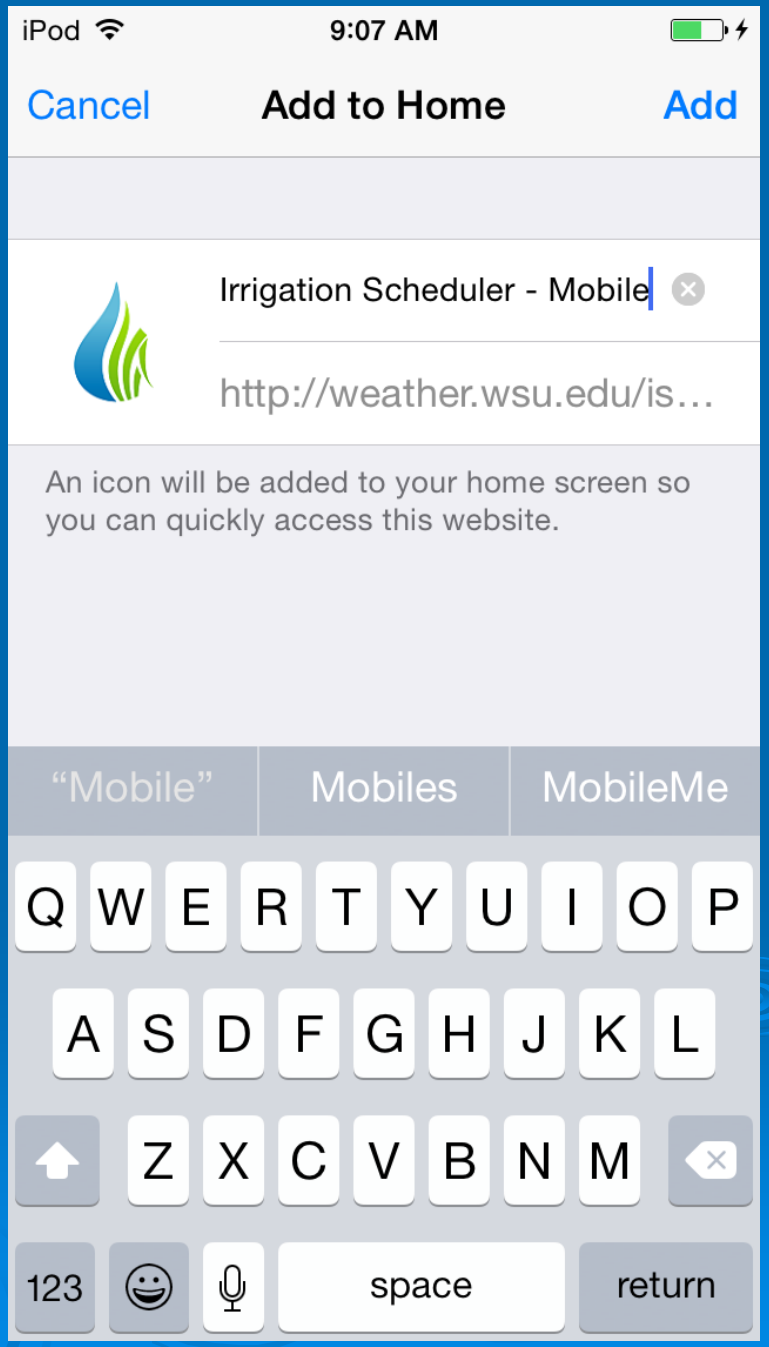
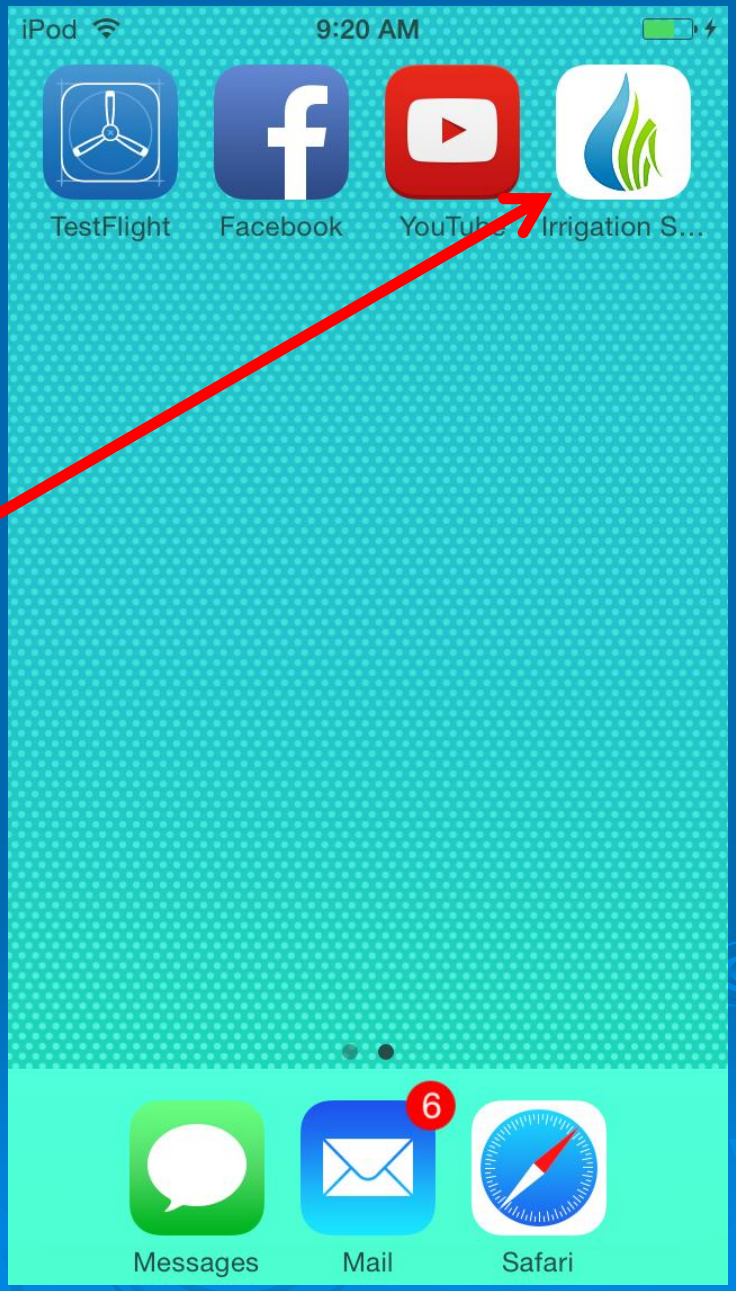
Login
AirDrop. Tap to turn on Wi-Fi and Bluetooth to share with AirDrop.
Message
Mail
Twitter
Facebook
Add Bookmark
Add to Reading List
Add to Home Screen
Copy
Cancel

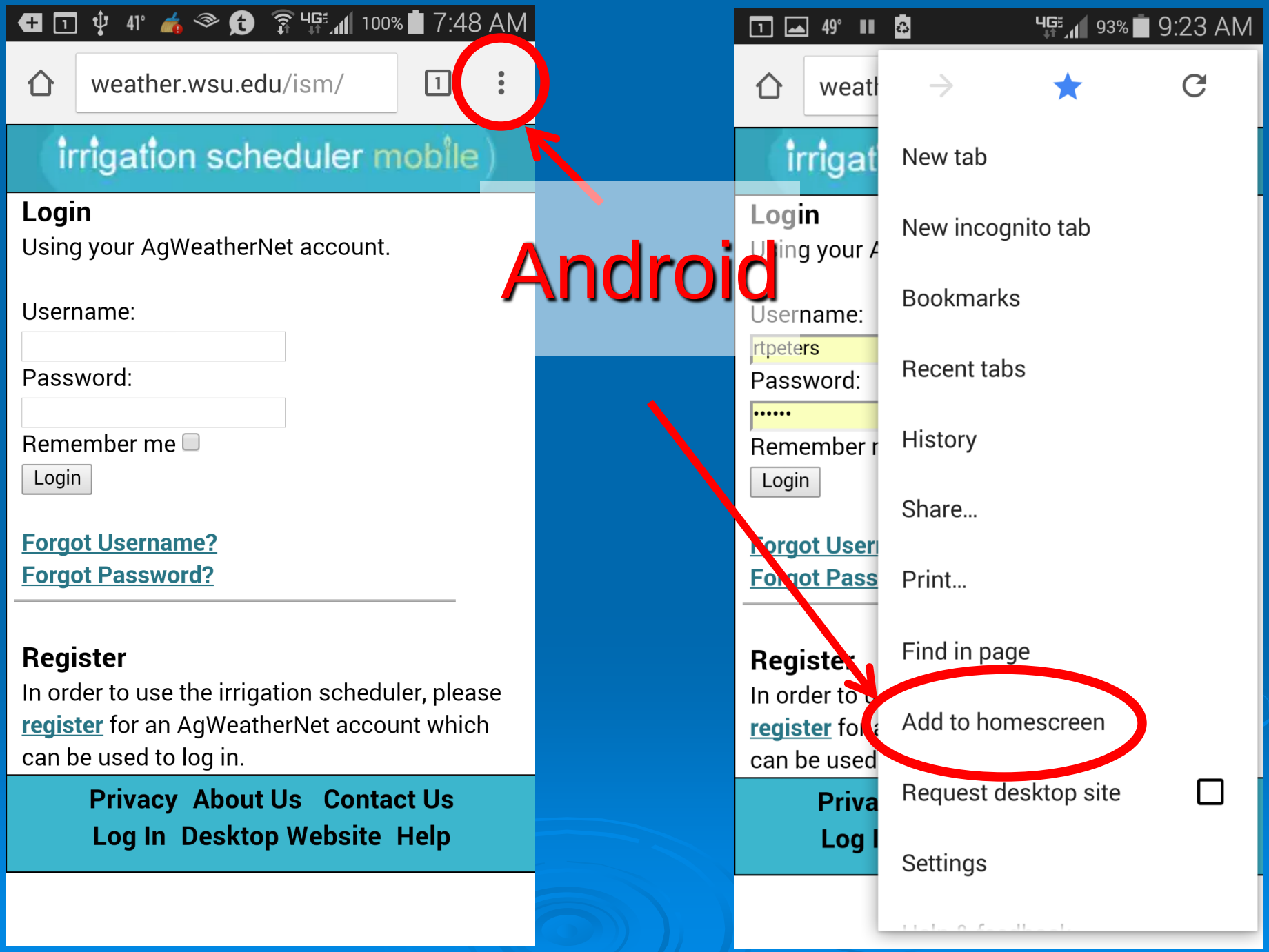
Then


iPod
9:07 AM
Cancel
Add to Home
Add
Irrigation Scheduler - Mobile
http://weather.wsu.edu/is…
An icon will be added to your home screen so you can quickly access this website.
"Mobile"
Mobiles
MobileMe
Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
123
space
return

Looks and behaves like an app!

runs in Safari




7:48 AM
weather.wsu.edu/ism/
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Login
Using your AgWeatherNet account.
Username:
Password:
Remember me
Login
Forgot Username?
Forgot Password?
Register
In order to use the irrigation scheduler, please register for an AgWeatherNet account which can be used to log in.
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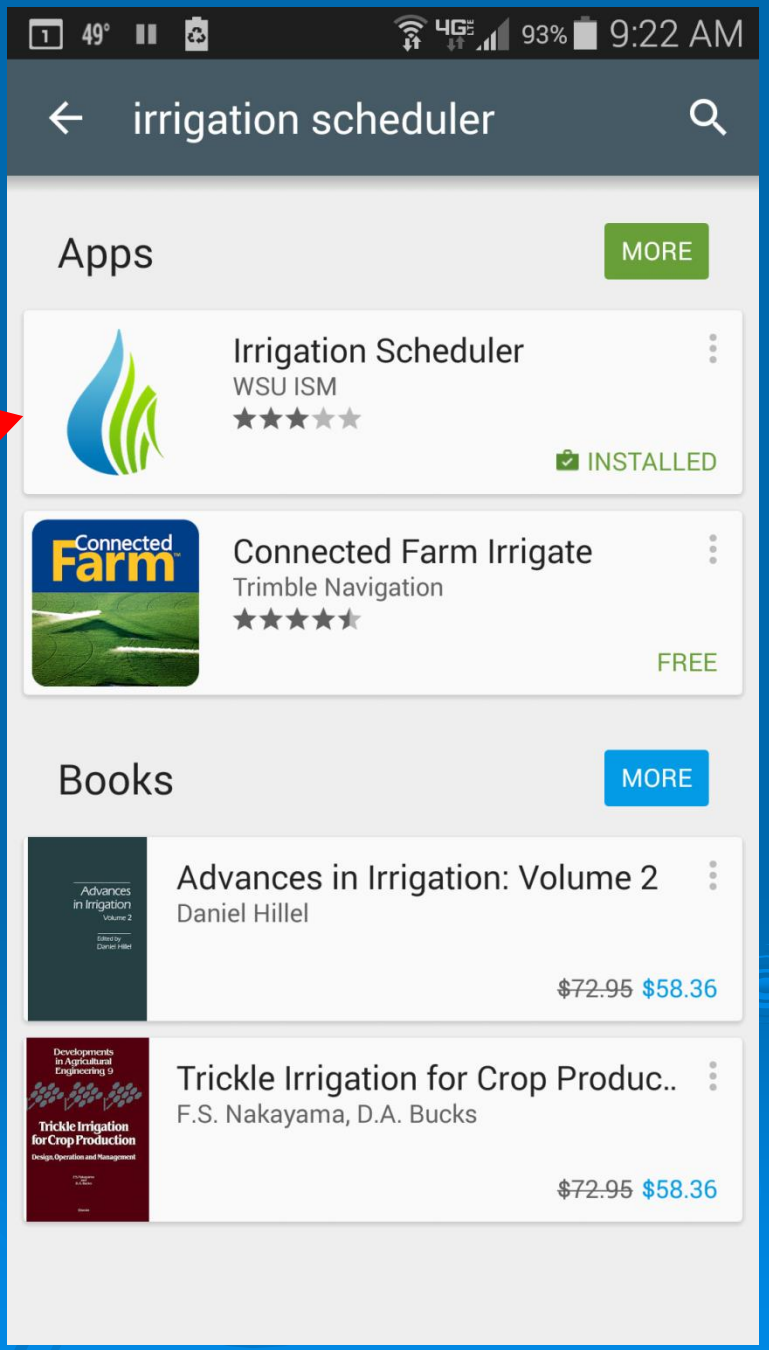
Log In Desktop Website Help
Android
9:23 AM
New tab
New incognito tab
Bookmarks
Recent tabs
History
Share...
Print...
Find in page
Add to homescreen
Request desktop site
Settings

Android

Google Play Store



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http://weather.wsu.edu/ism

Google “Irrigation Scheduler Mobile”

Most important thing is:

- Do Something.
- Collect some data.

  You can't manage what you don't measure.

Water Management. Its worth the effort!

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