

Technologies for improving irrigation water productivity in Kuwait

A large center pivot irrigation system is shown, consisting of multiple long metal arms supported by a series of wheels. The arms are arranged in a radial pattern, extending over a field. The system is designed to rotate around a central point, allowing for efficient water distribution across a large area. The background shows a clear sky and some distant trees.

McCann, I.R., N. Bhat, and M. Albaho

Desert Agriculture and Ecosystems Program
Environment and Life Sciences Research
Center Kuwait Institute for Scientific Research

- **Irrigation is often the largest consumer of water in arid regions, including Kuwait and the Gulf.**
- **Achieving high irrigation water productivity requires good on-farm irrigation management, which requires balancing water demand (ET) with water supply (soil water).**
- **Good measurements and rapid dissemination of useful relevant information are important for good management.**

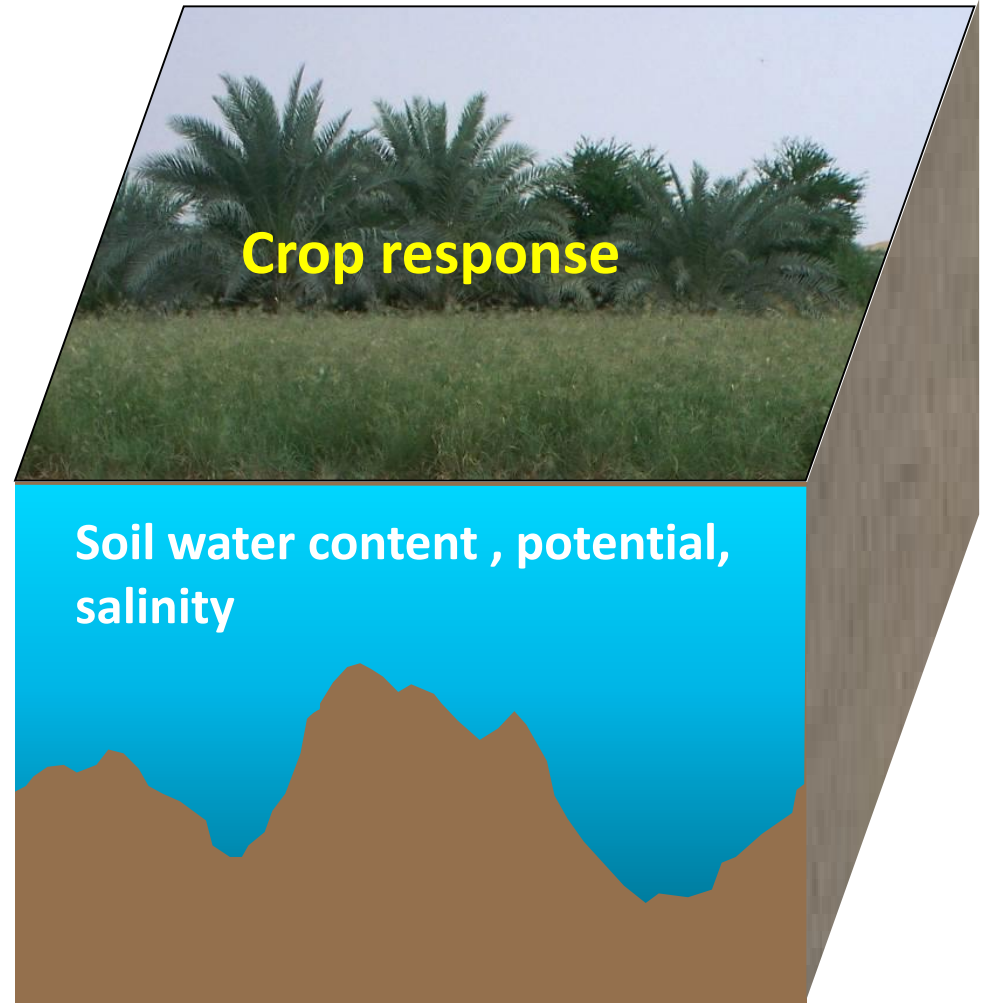
Irrigation management:

Balancing water supply and demand

Demand (weather)



Supply (from soil)



Irrigation Water Productivity

What water?

Renewable, Groundwater, Surface Water, Rain
Quality (Fresh, Saline, Desalinated, Waste Water)

What production?

Agriculture (open field, protected), landscape

What measure?

Agricultural (crop per drop), Nutritional
Socioeconomic (\$ per drop, jobs/drop)
Environmental (sustainability)

From which perspective (farmer, regional)

Crop per drop

Which crop?

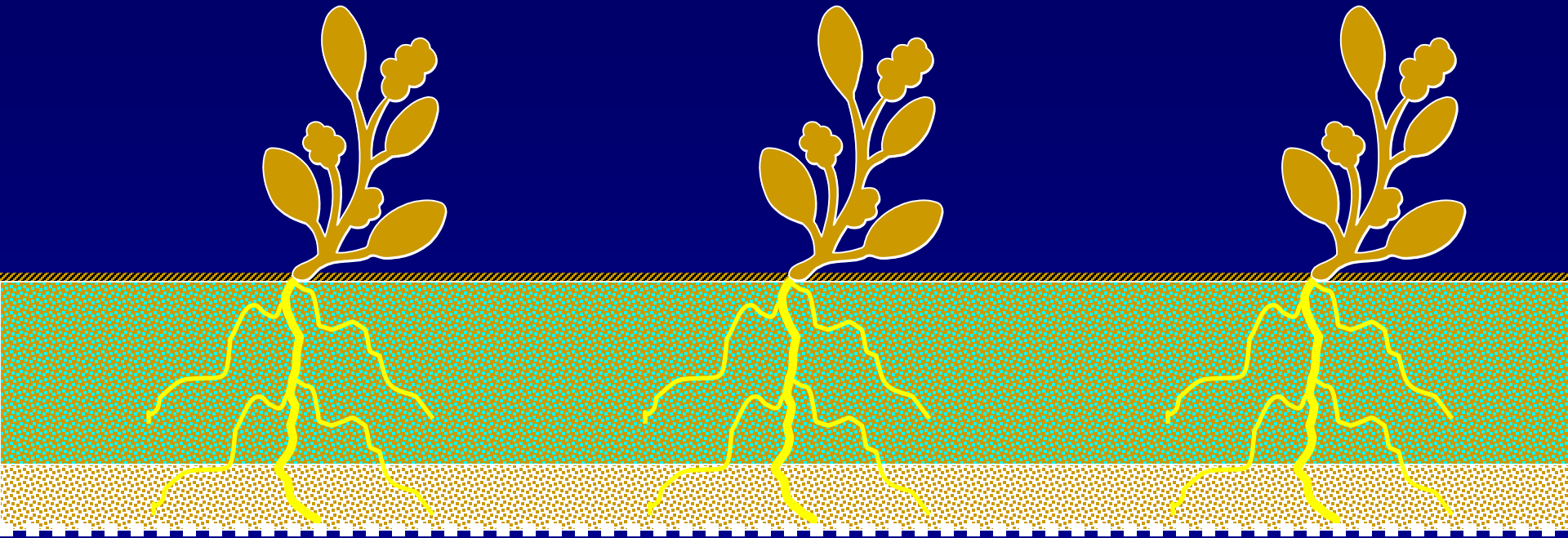
Which drop?

Issues affecting water productivity:

- Water quality
- Maintenance
- Crop
- Management

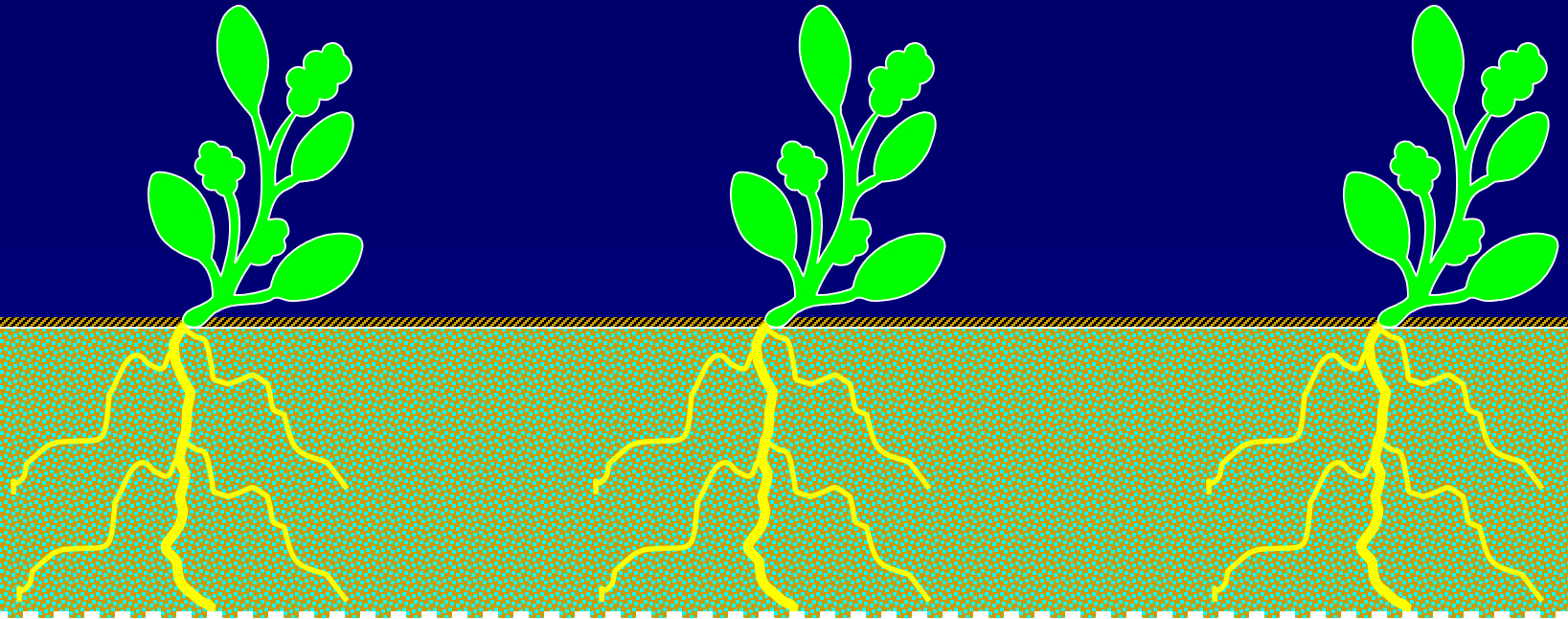


SCHEDULING



**Too little water causes crop stress and damage, and probably
loses money**

SCHEDULING



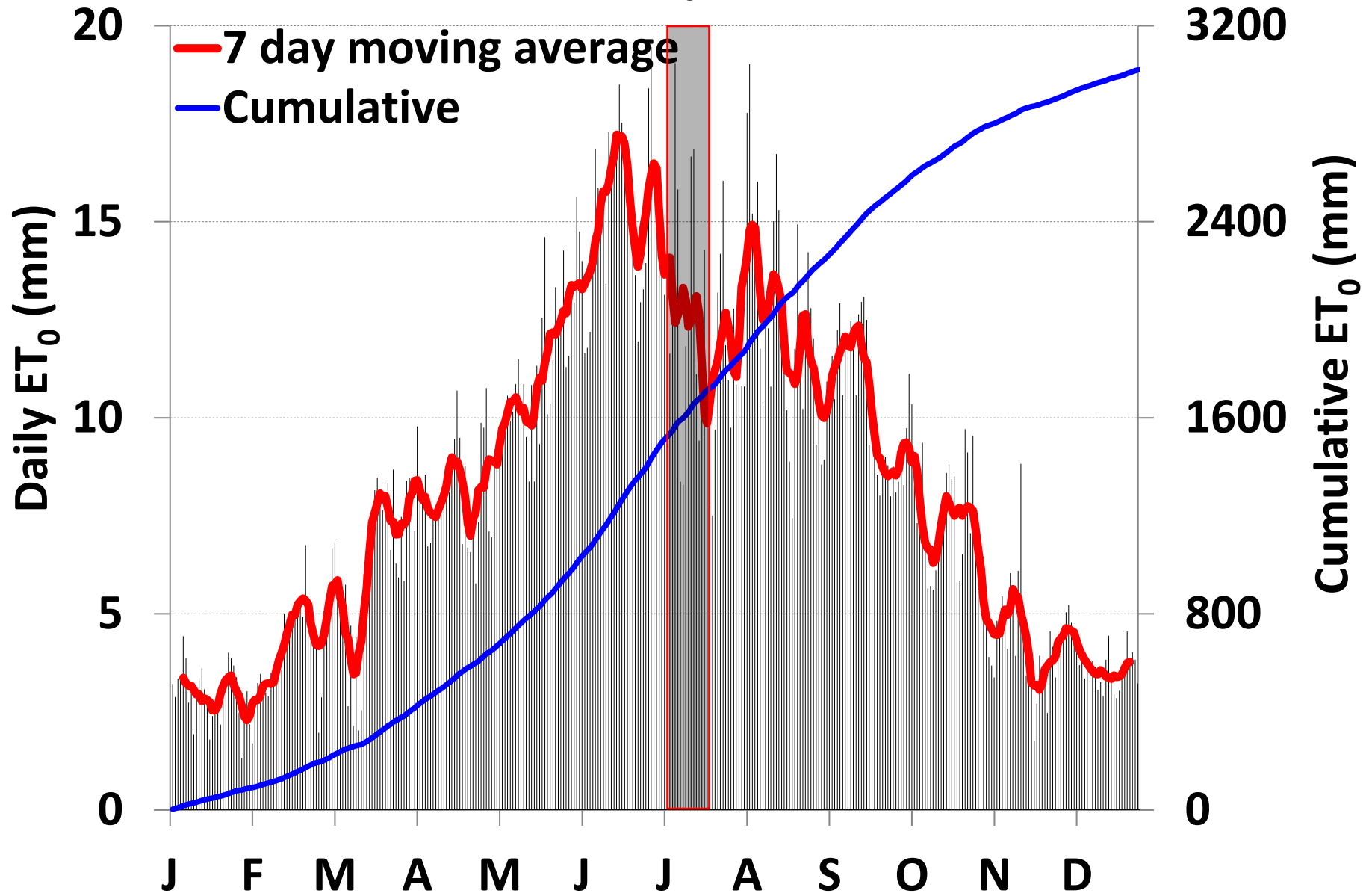
Environmental impact

Too much costs money (water, energy, chemicals)

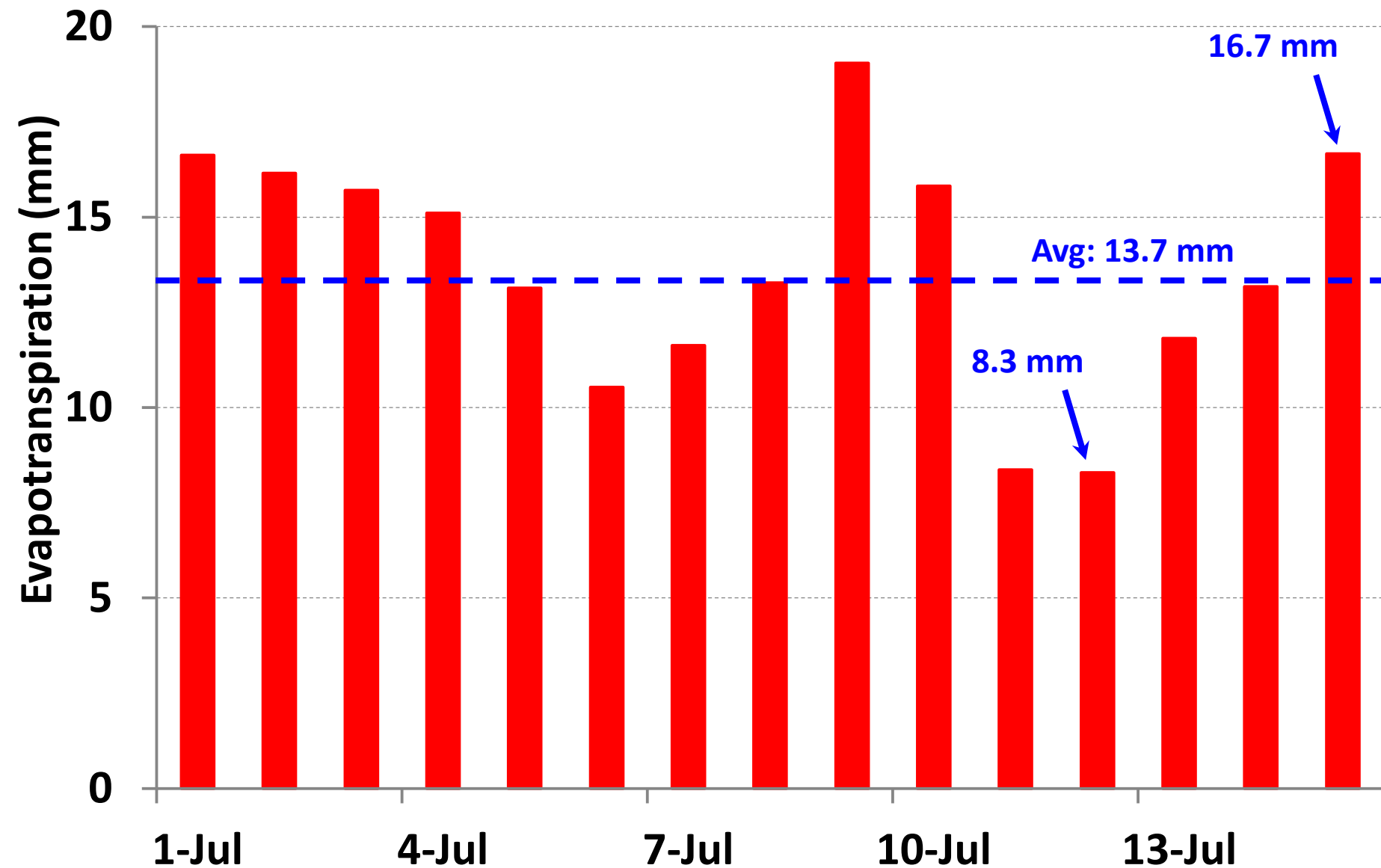
Water demand (ET)

Weather based estimates

Daily Estimated ET_0 at Taweel in 2011



Daily estimated evapotranspiration



Water supply

Soil water content

Soil water content

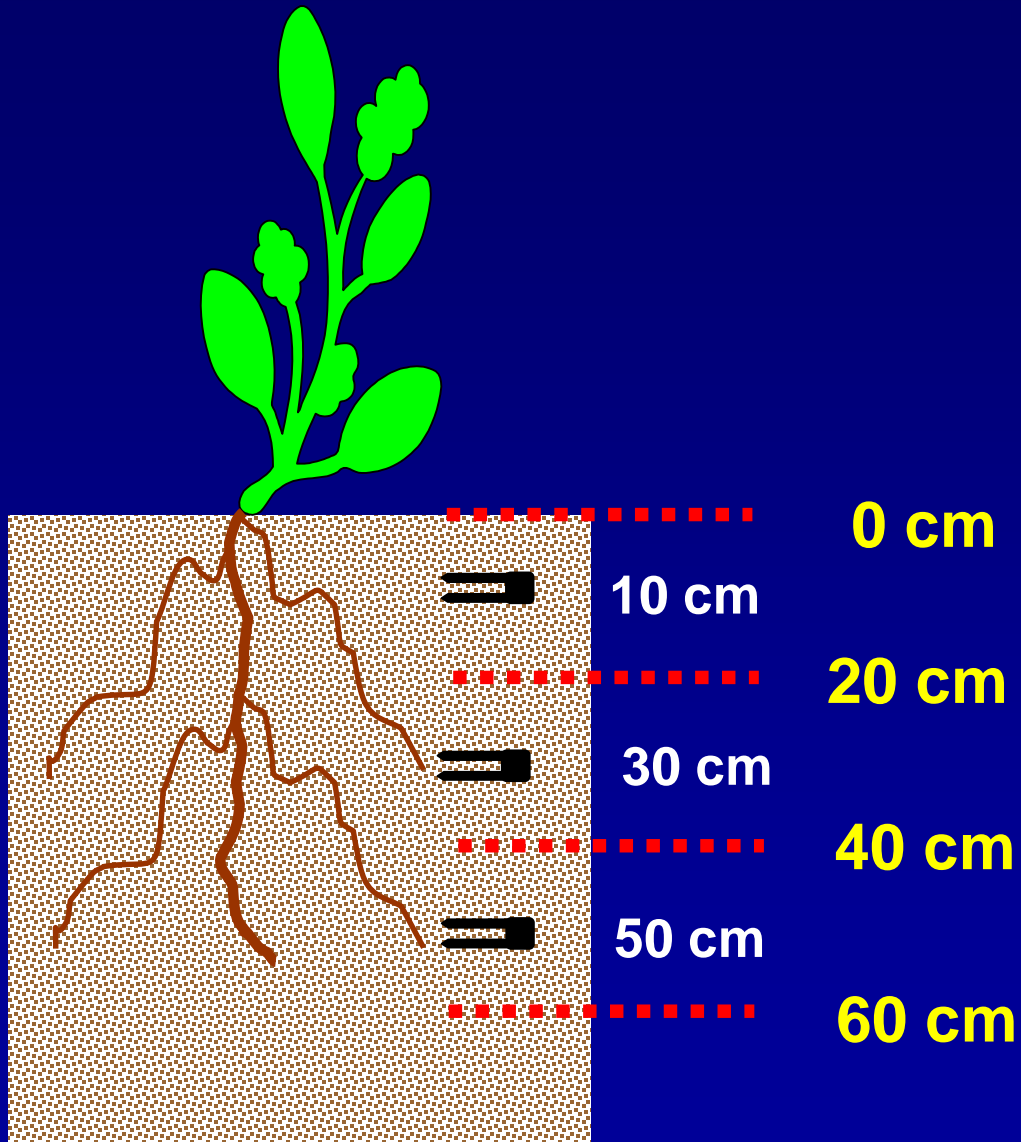
Has been measured for a long time using various techniques

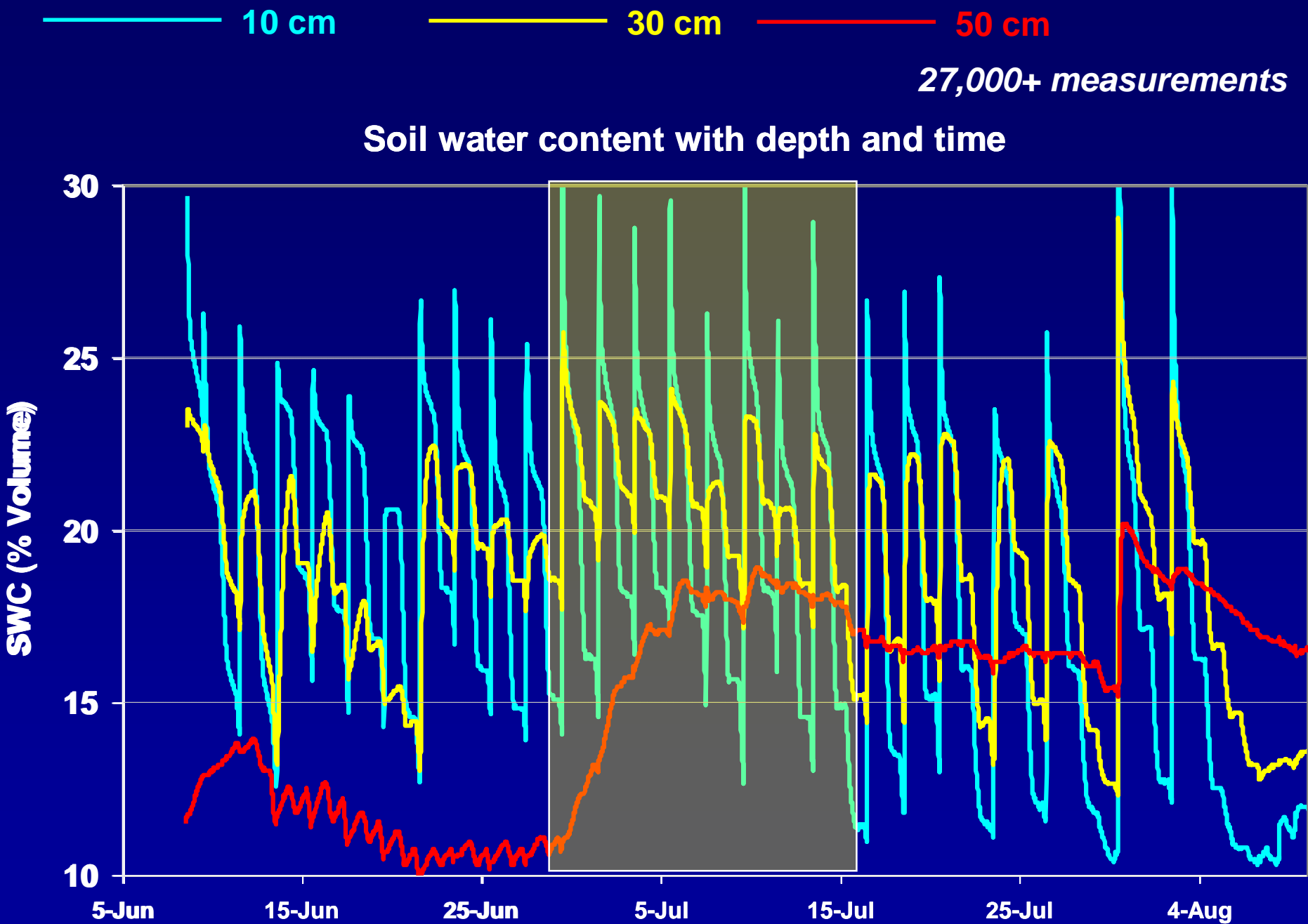
Electronic, computer, and communication technology is opening the door to new ways to measure and use soil water data

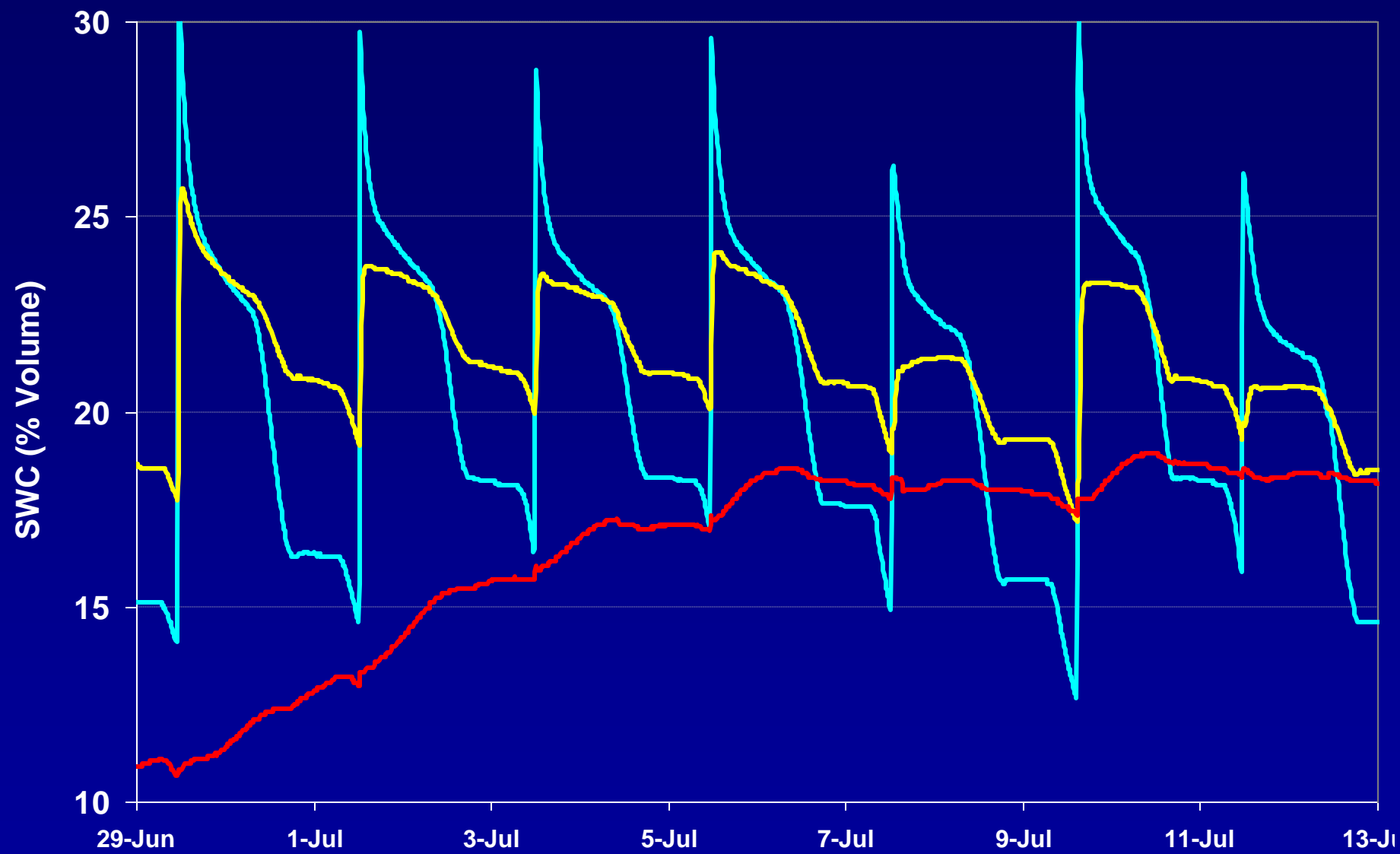
However, its important to understand what is being measured, what the data means, and what are its limitations.

Accuracy vs ease of use and continuous monitoring

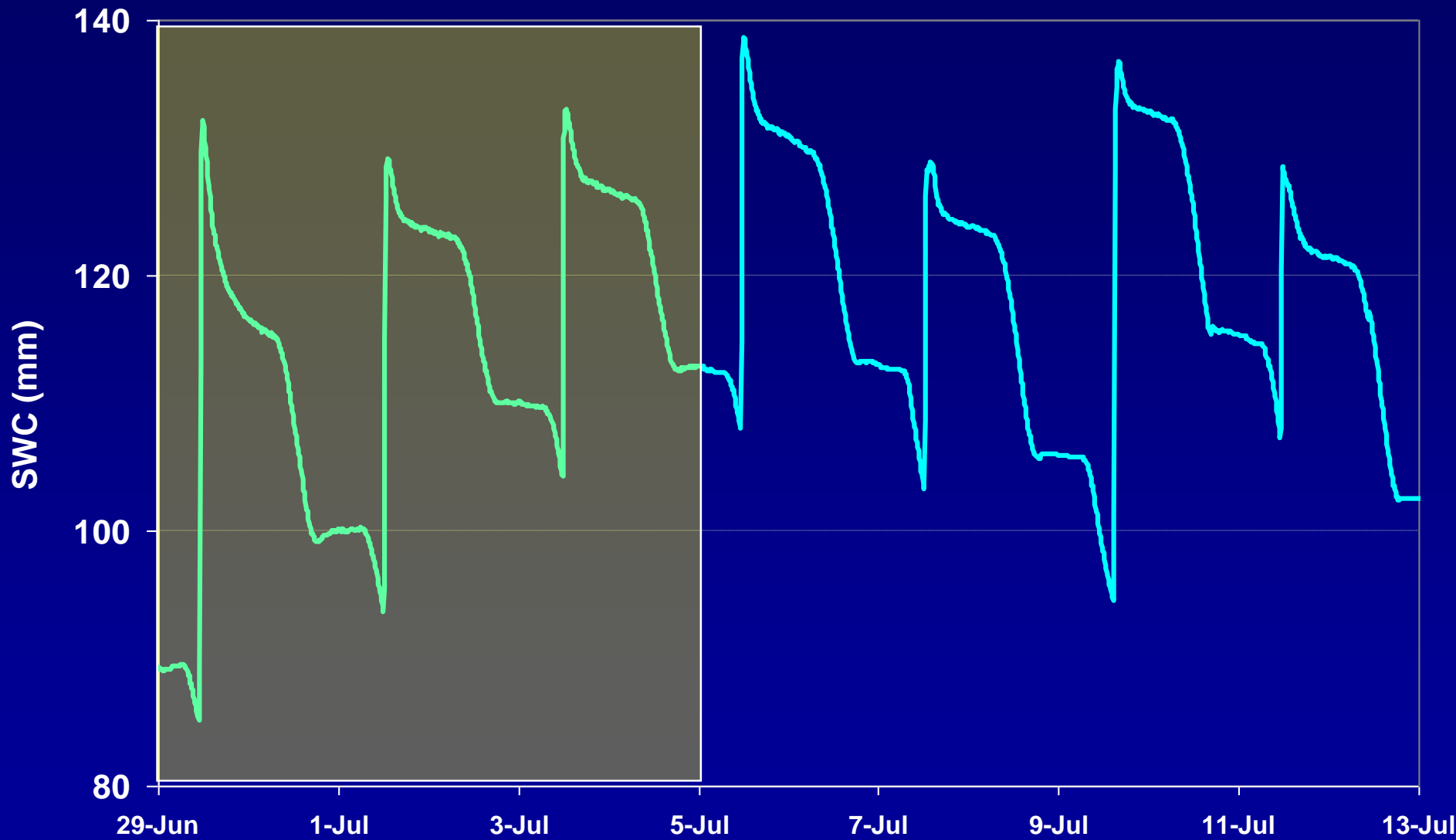
Soil water content



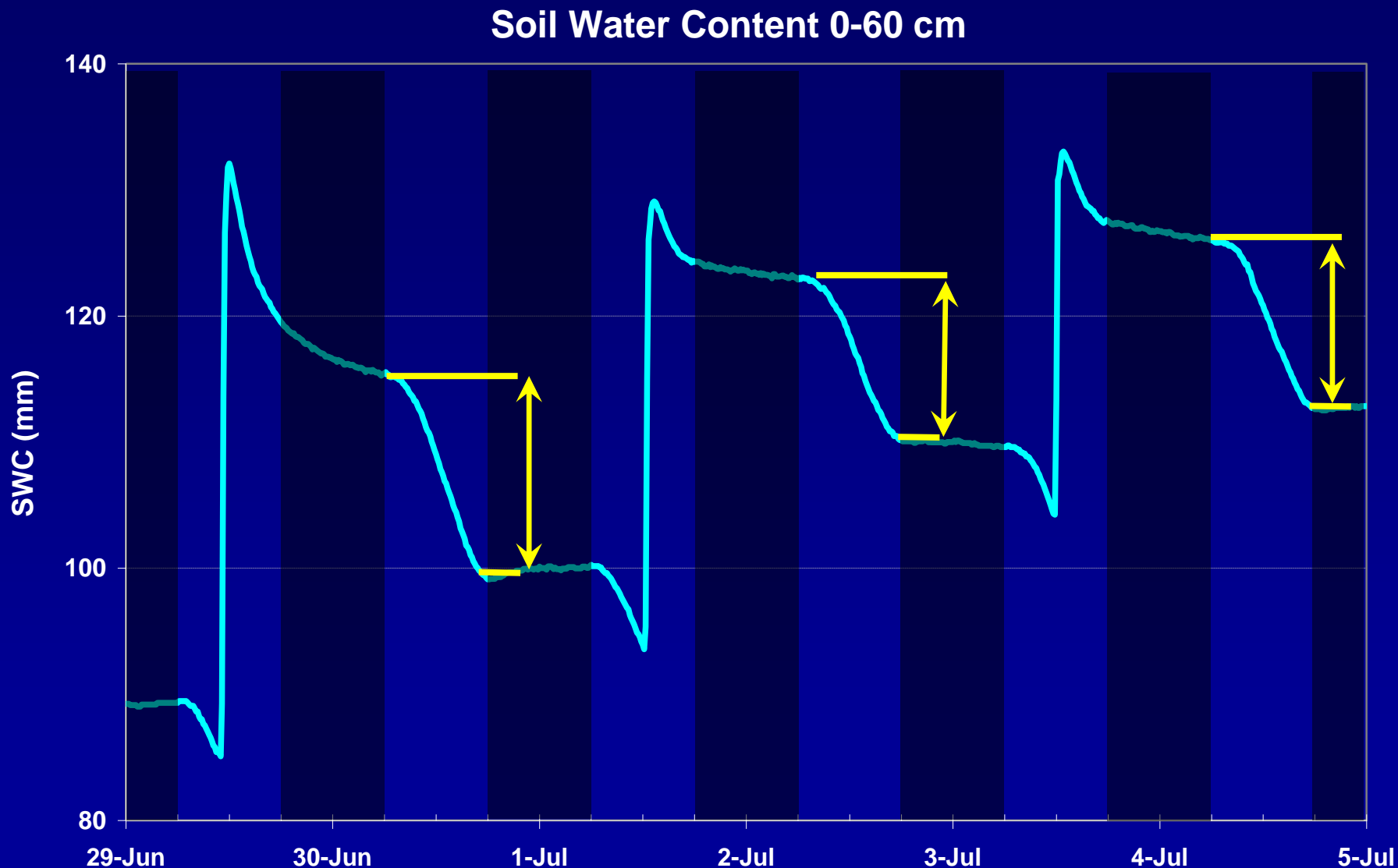


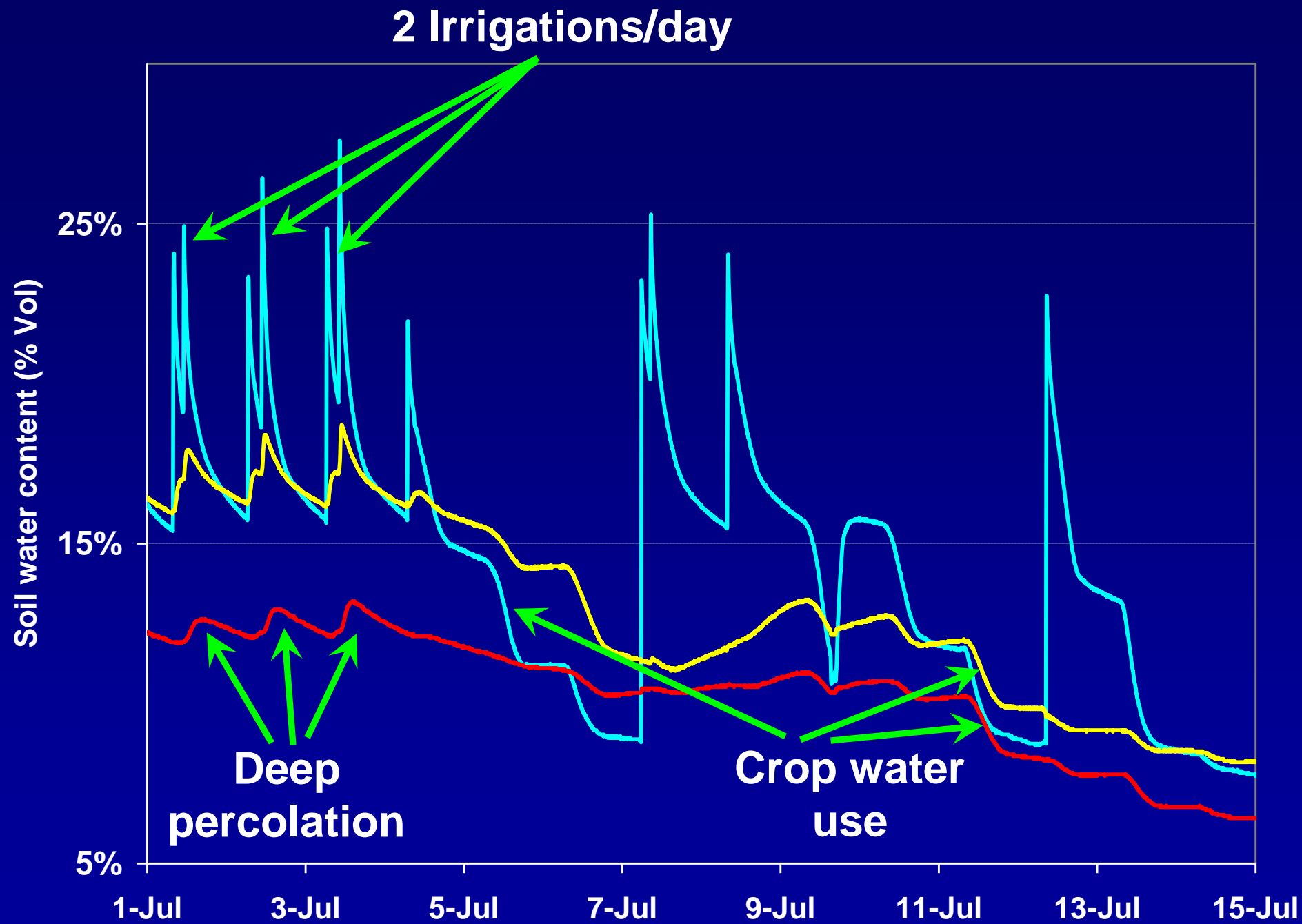


Soil Water Content 0-60 cm



Change in soil water content during daytime (Approximates ET)





Measuring the crop itself

Reflected spectrum in various
wavelengths



**Temperature of the
crop can indicate
its stress.**





Thank you