

Comparing methods of irrigation scheduling for different crops at ZZ2

R J Myburgh – Pr. Eng



Contents

- Introduction
- Soil Water Balance
- Different tools
- Comparison
- Results
- Problems encountered



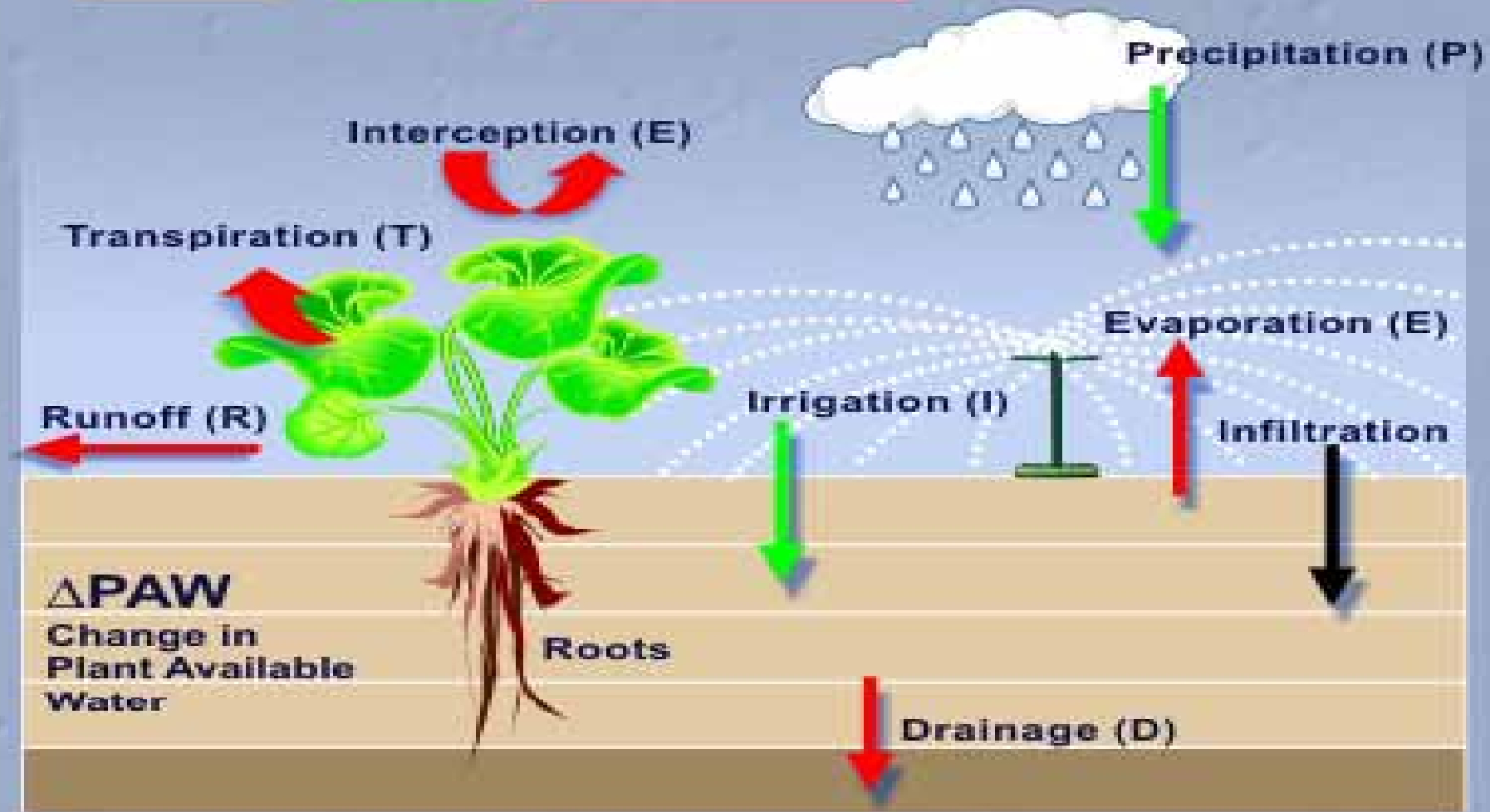
INTRODUCTION

Pressure is increasingly building up on the agricultural sector to use water more efficiently and also to prove it by measurements (applying the more recent methods of irrigation scheduling).

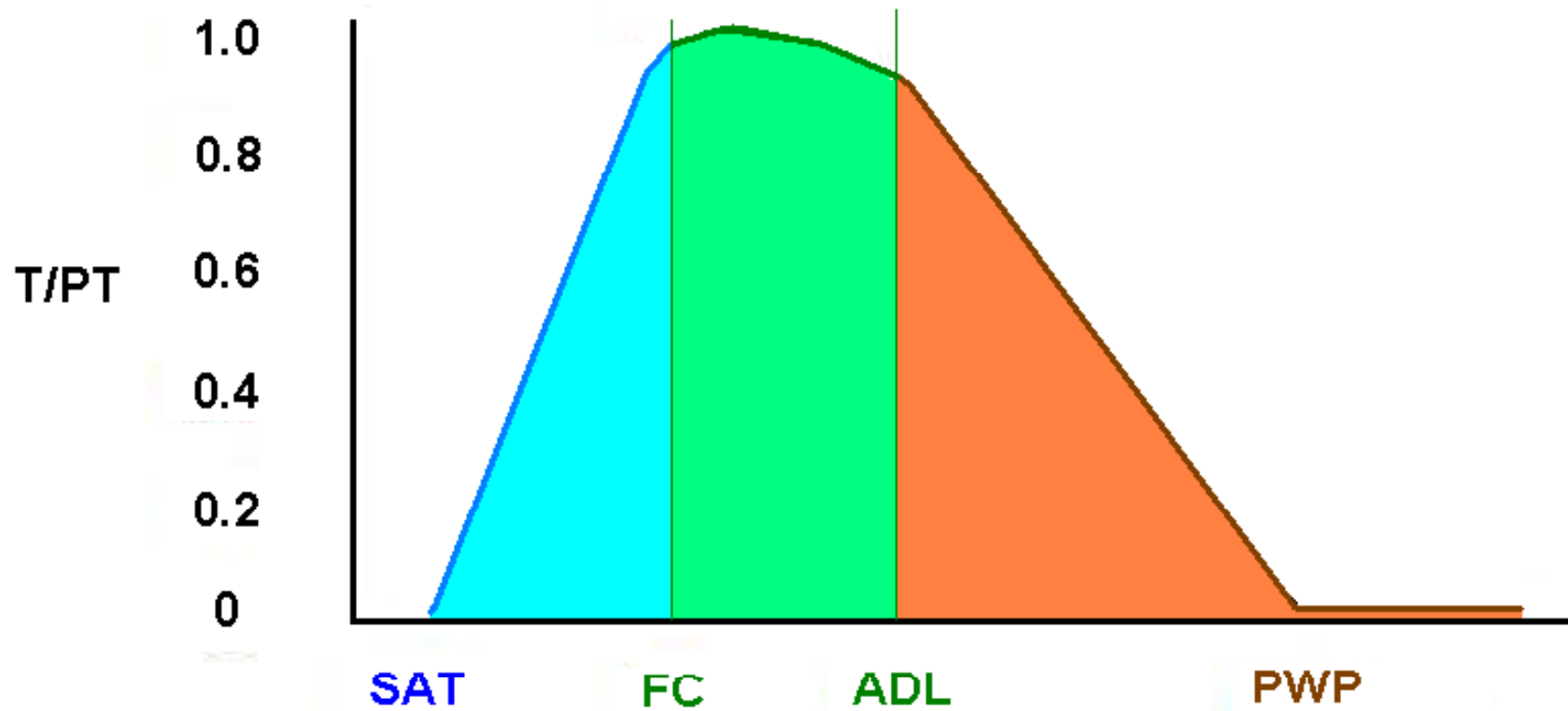
Irrigation scheduling is the decision, which needs to be made, about when and how much to irrigate. **It is all about the soil water balance.**

SOIL WATER BALANCE

$$\Delta PAW = P + I - R - D - E - T$$



Transpiration at different moisture levels





Soil Profile Evaluation

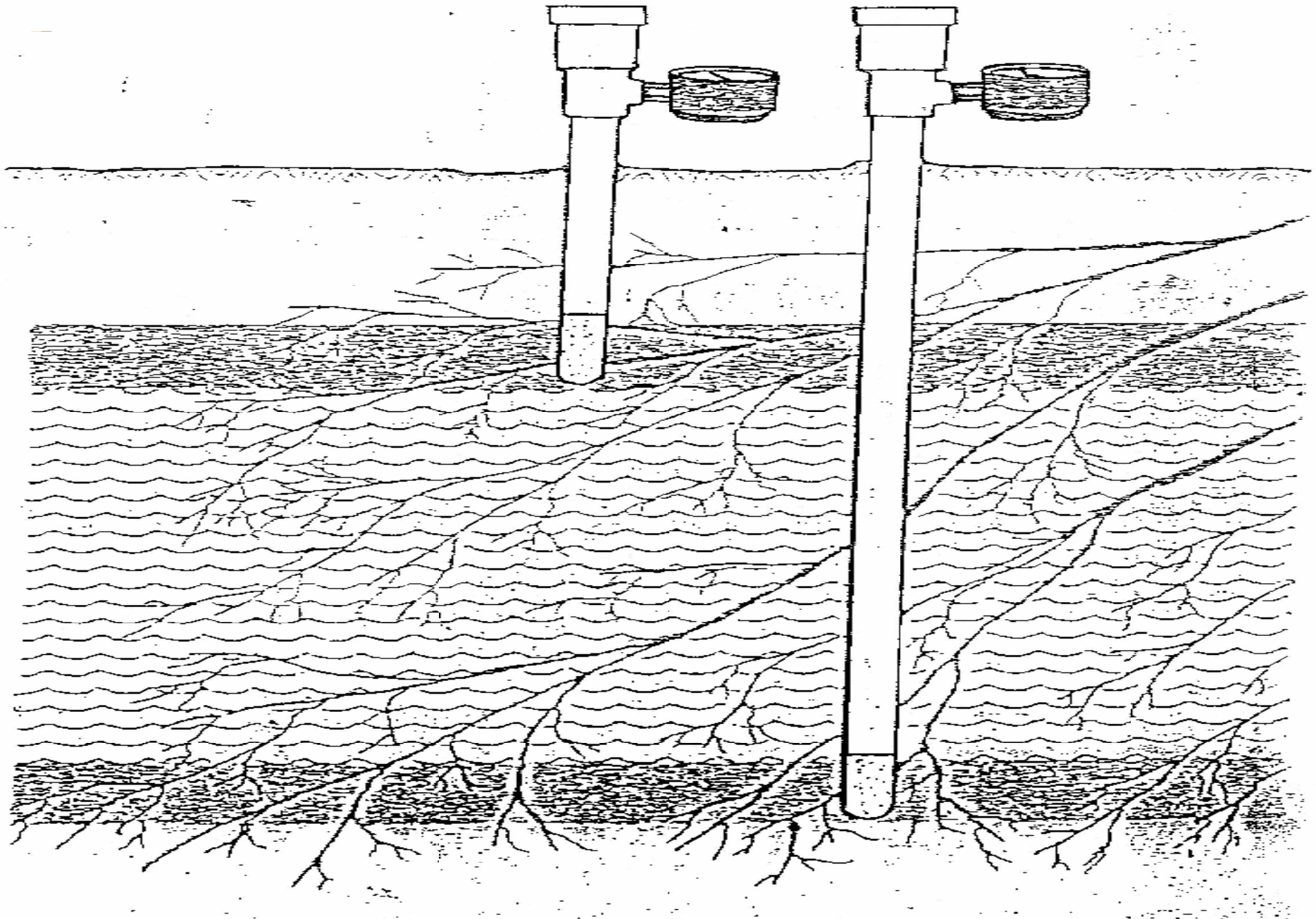
- **Advantages:**

- Become accustomed to soil characteristics- foot prints in field
- Look at condition of roots and plant- development, health
- Scout for diseases, pests

- **Disadvantages:**

- No measurement of soil moisture – hand feel method
- Deep percolation – not detected
- No continuous measurement - picture vs. video

TENSIOMETERS



FULL•STOP

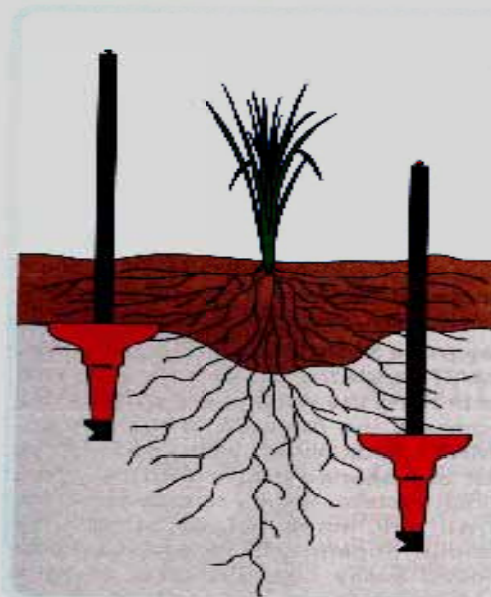
WETTING FRONT DETECTORS

FullStop™ wetting front detectors help you to judge how much water plants need as they grow through the seasons.

FullStop™ can be used to:

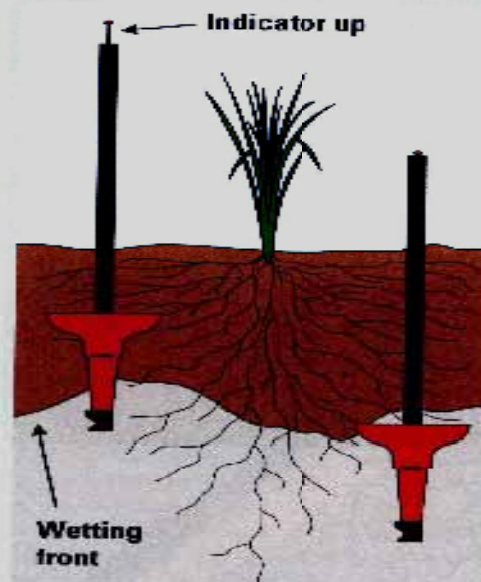
- find out if you are irrigating too little or too much
- assist in the management of fertiliser and salt
- detect water-logging.

A pair of wetting front detectors – one buried at about one third the depth of the root zone and the other two thirds the depth of the root zone – show the depth to which water (rain or irrigation) has infiltrated into the soil. When the water front reaches the detector an indicator pops up which is visible above the soil surface.



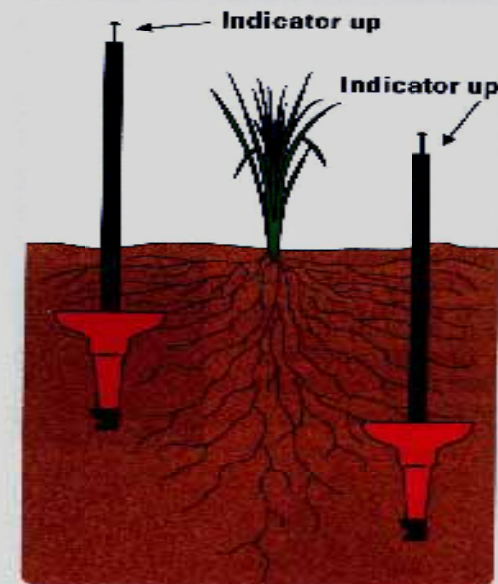
Too little water

If the indicator of the shallow detector rarely pops up, then water is not moving deep enough to fill most of the root zone. More water should be applied.



About right

The indicator of the shallow detector should pop up regularly after irrigation. The deeper detector should respond during periods of high demand for water.



Too much water

If the indicators of both the shallow and deep detectors regularly pop up then water could be wasted. Apply less water or lengthen the period between irrigations.

Neutron Water Meter(NWM)

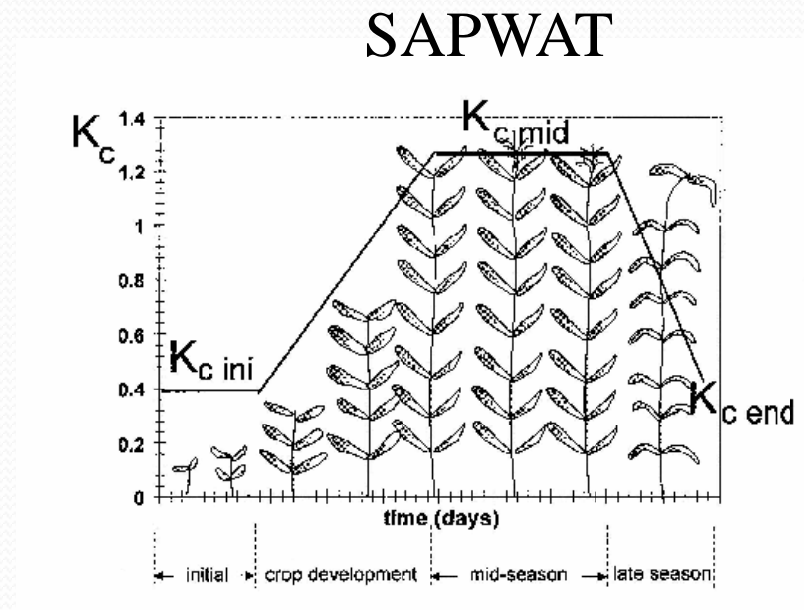


Continuous logging probe



Crop factors(Kc)

- Penman Monteith formula (ET_o)
- ET_c = K_c x ET_o
- K_c = ET_c / ET_o
- Where:
- ET_c = Crop water use
- ET_o = Grass reference evapotranspiration
- E_o = Pan evaporation



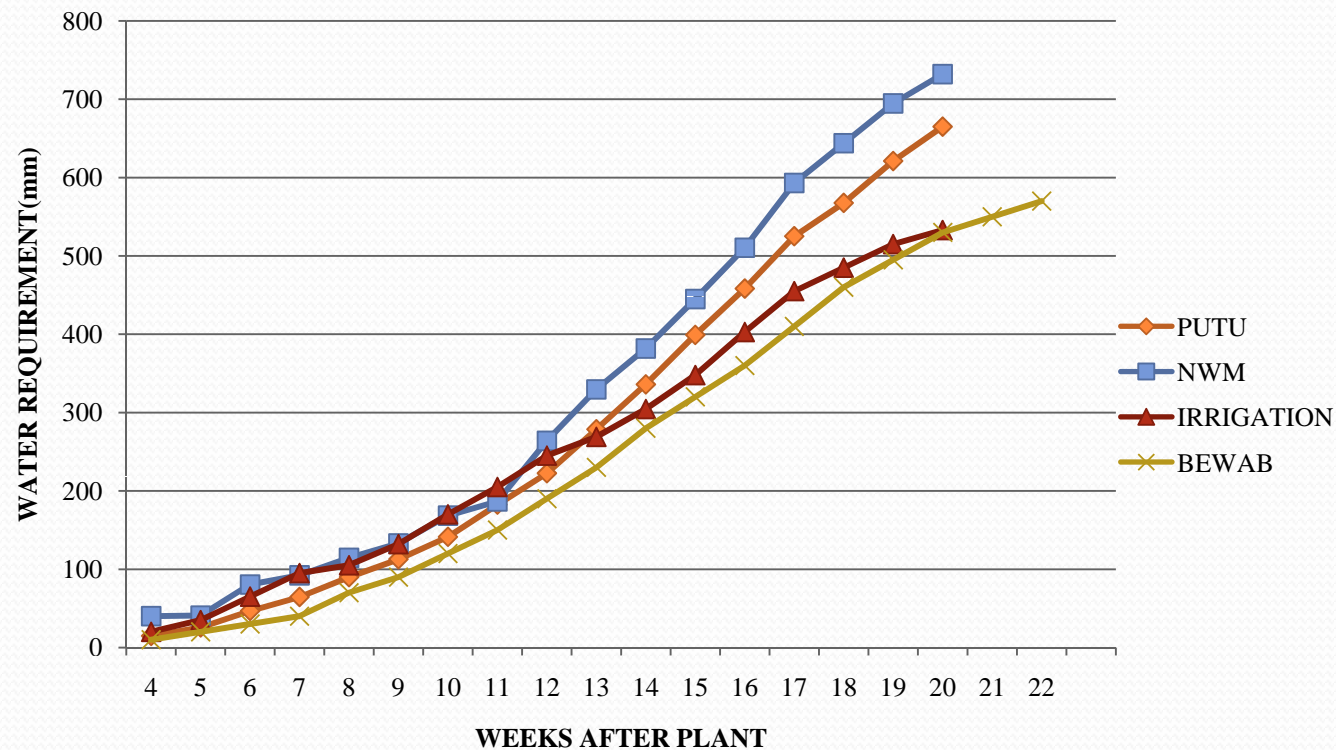
ELECTRONIC DENDROMETER

PHYTOMONITORING SERIES

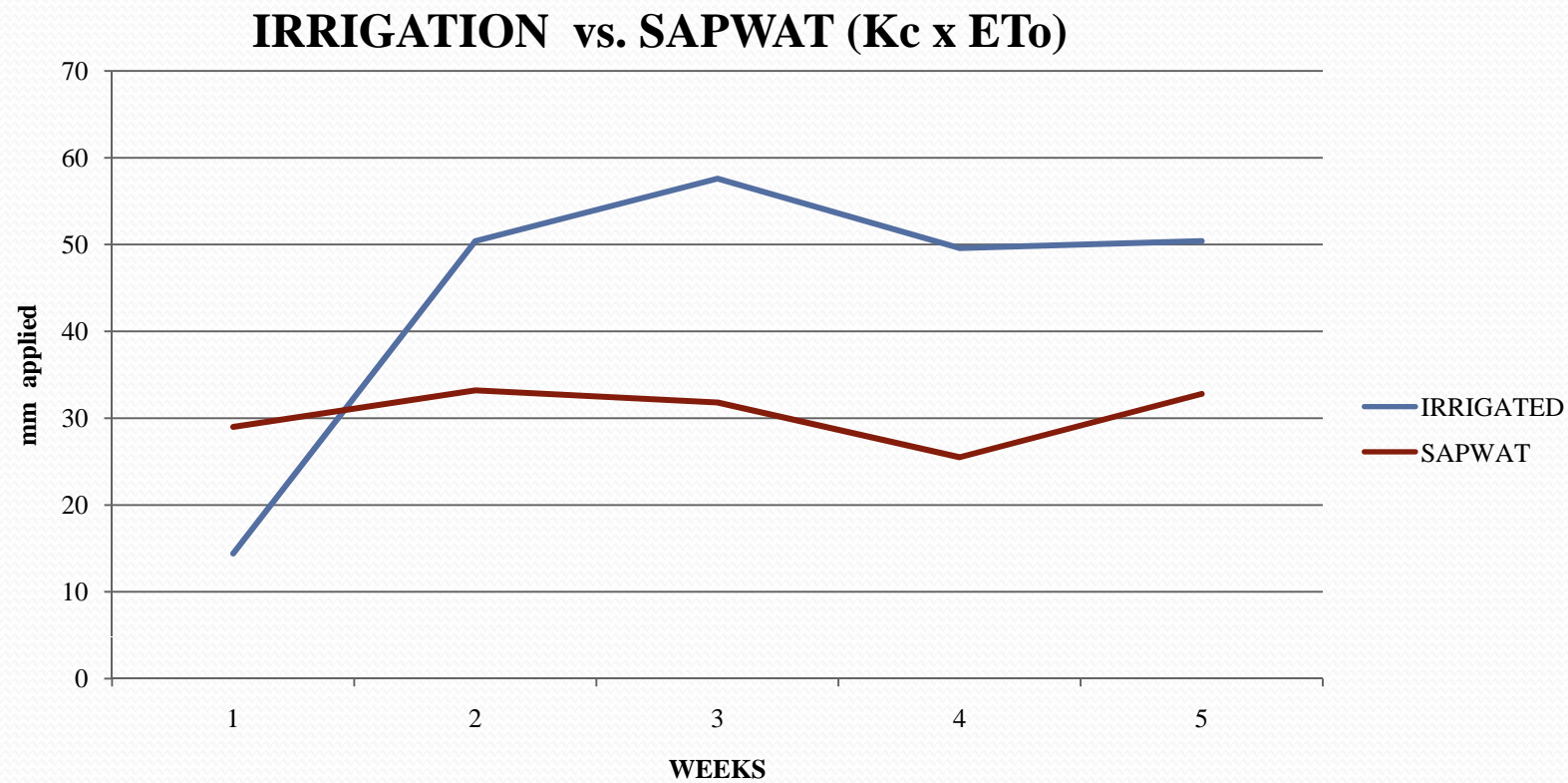


Irrigation scheduling methods compared

**Irrigation scheduling methods compared
Wheat planted 15/7/94**



Measured irrigation vs. SAPWAT at ZZ2



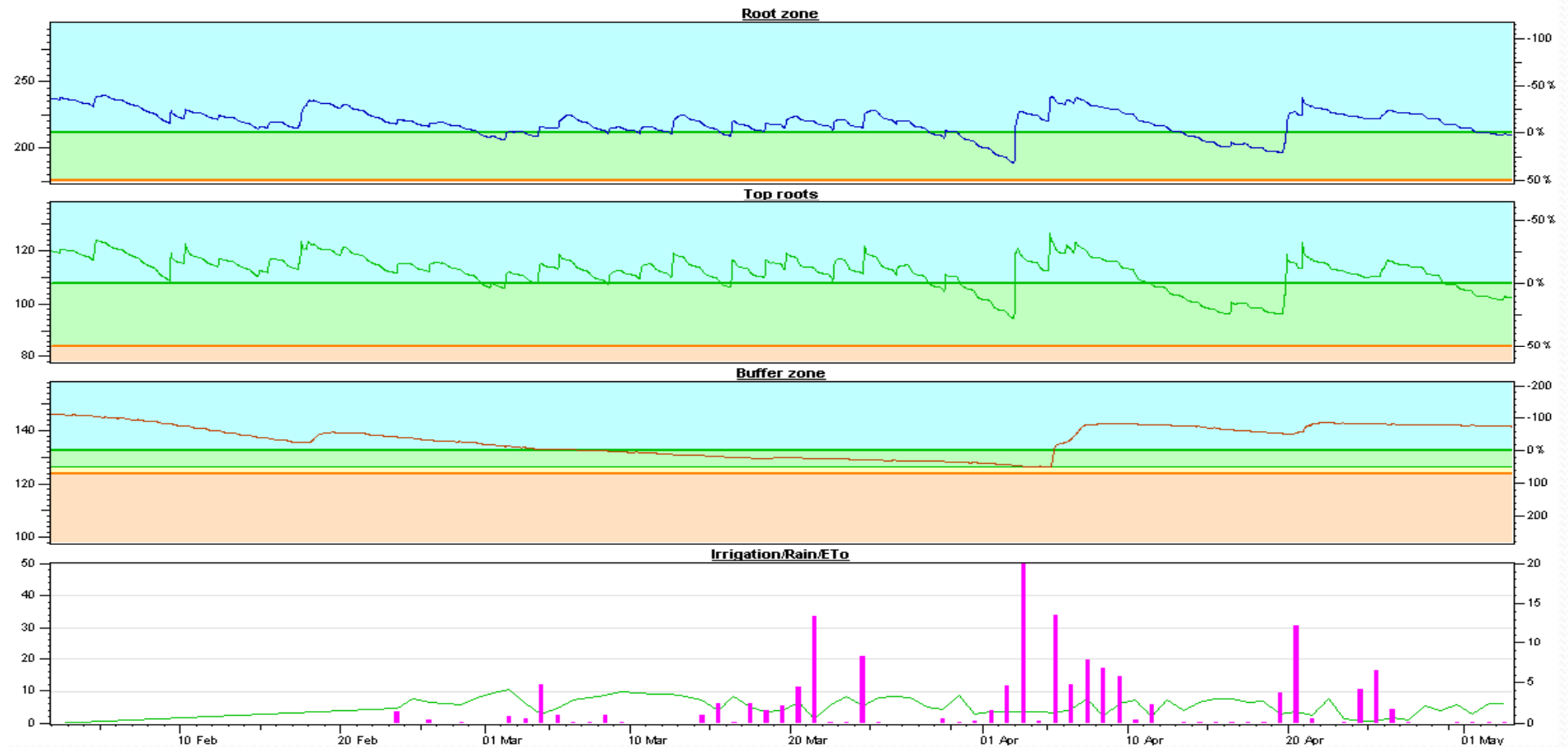


Which tool to apply at ZZ2?

- Soil profile already adopted as standard practice- backup by soil auger.
- Drip, micro and centre pivot systems used
- All short cycle systems – short cycle measurement needed.
- Continuous logging probes preferred tool (video vs. photo)
- NWM use to measure exact consumption (mm/day for design purpose).

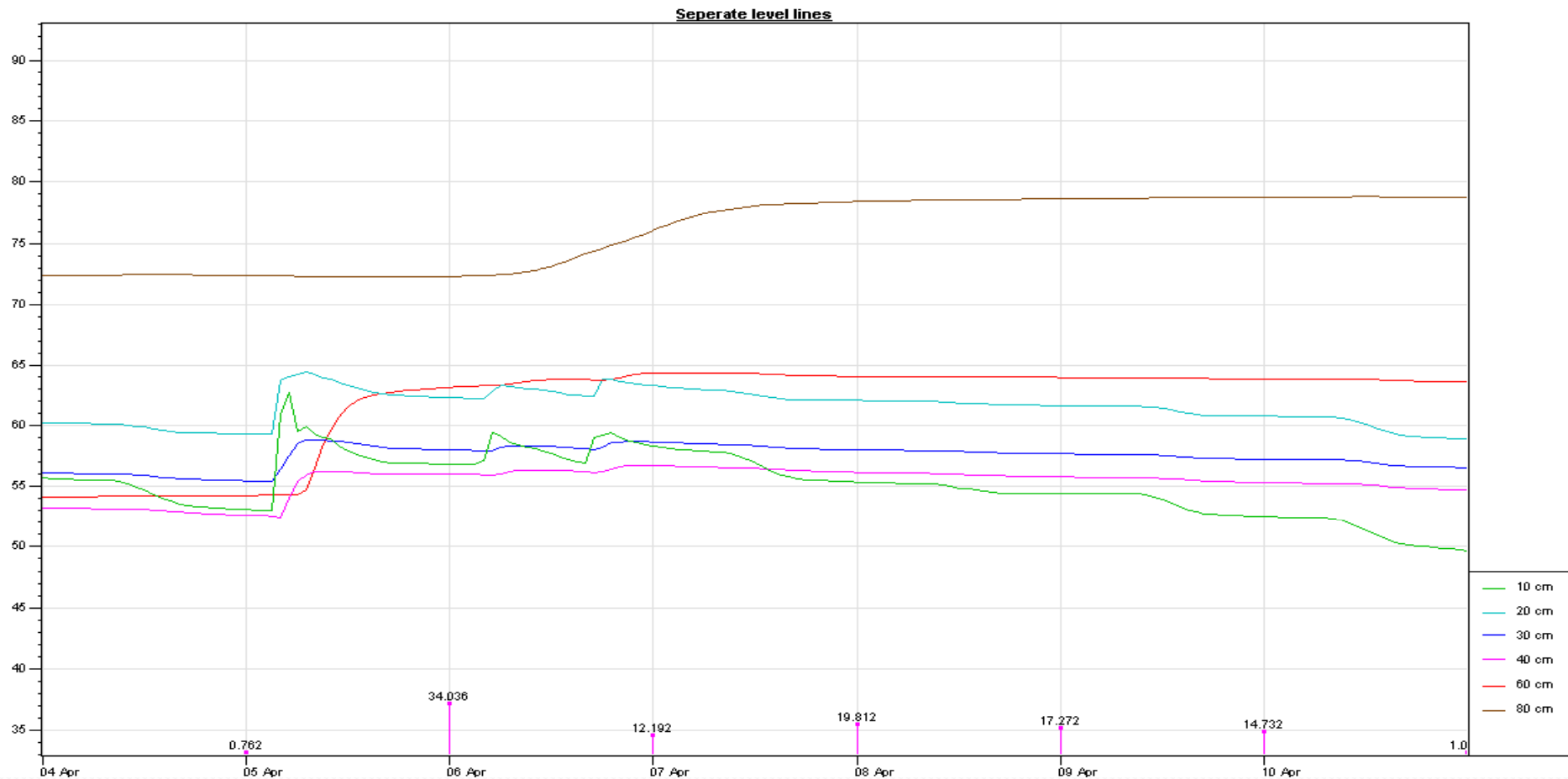
Scheduling with probes

Block SUM lines: (10770) WGD 7 /



Moisture penetration depth

Block separate level lines: (10770) WGD 7 /





Challenges encountered

- Different water retaining abilities of different soils
- Measuring mm irrigated/rainfall - orchards.
- Runoff - heavy rainfall/irrigation
- Crop factors - different planting dates, plant population(onions), climatical differences.
- Units of measurement - mm vs. %
- **Calibration/ interpretation !!!!**

SOIL WATER MANAGEMENT

Different soil water holding capacities at field capacity point (**ZZ2 fields**)

Block	Gravimetric % Moisture	Soil density (g/cm³)	Volumetric (mm/100mm) %Moisture	mm per 300mm at Field Capacity
WGD 3	11.37	1.5	17.05	51.15
Rooiland 5	13.38	1.5	20.07	60.20
Swartl 2	10.71	1.6	17.14	51.41
Nuweland 2 (wes)	15.05	1.5	22.58	67.75
Sandland 5	10.35	1.6	16.56	49.68
WGD 32	16.63	1.5	24.95	74.85
WGD 47	7.78	1.6	12.45	37.34
Nuweland 2 (oos)	19.44	1.5	29.16	87.48
WGD 57	14.25	1.5	21.38	64.13
Cisconi 7	17.90	1.5	26.86	80.57

Different mm needed (last column), for different ZZ2 soils, to wet the same 300 mm depth, because of different water holding capacity

Measuring irrigation time



Crop differences



Climate differences





Best method ?

- Choose one main method - irrigation cycle determines
- Combine with other tools for backup
- **Must leave foot prints in the field**- remote moisture monitoring must periodically be checked in field
- Technology must be adopted by farmer
- Tool must add value to irrigation process

Utilize resources fully, but.....



**Don't waste water, when the
reservoir is full, brake the wind mill**





THANK YOU