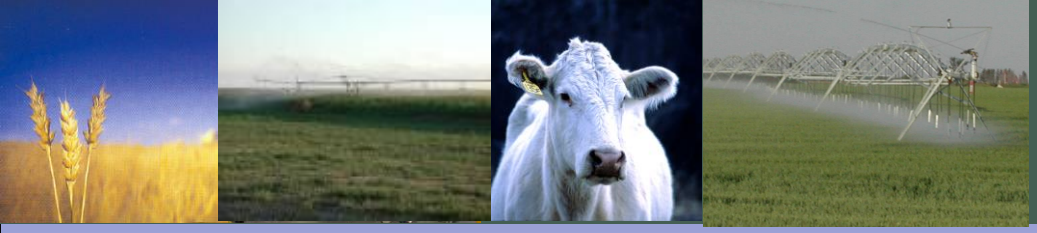

Irrigation Water Management

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Soil & Water Workshop
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Irrigation Scheduling

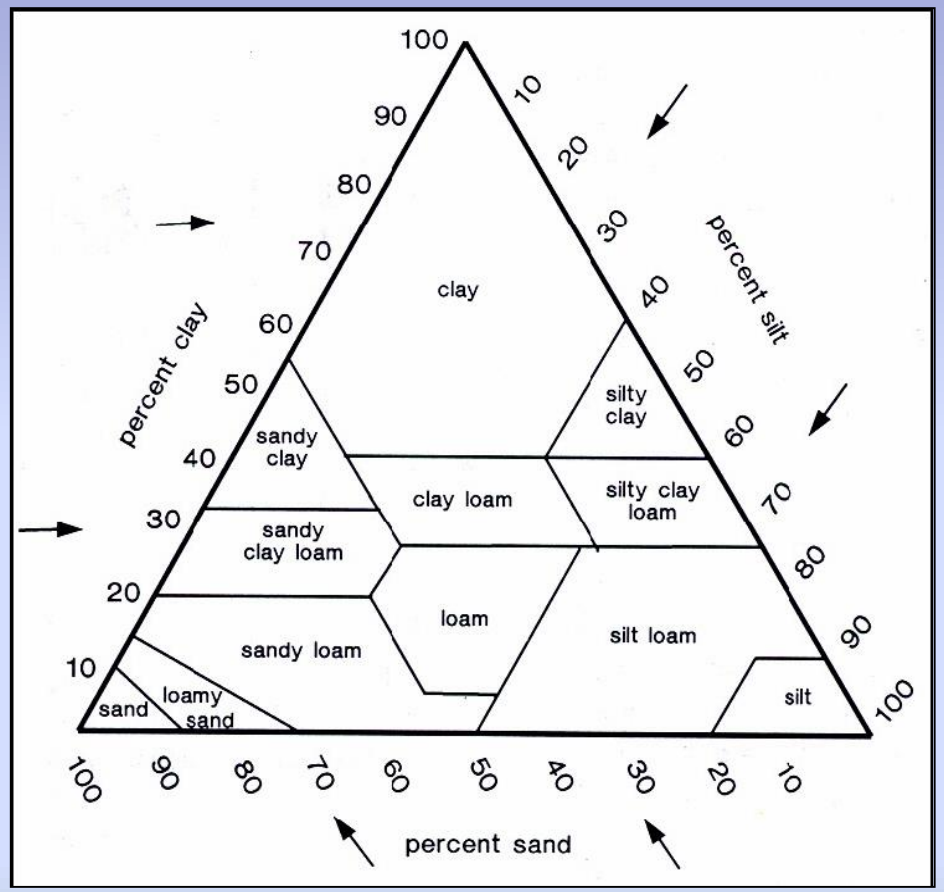




What is Irrigation Scheduling?

- Ensures that water is consistently available to the plant and that it is applied according to crop requirements
- Improve water use efficiency
- Improve profitability

Determining Soil Texture



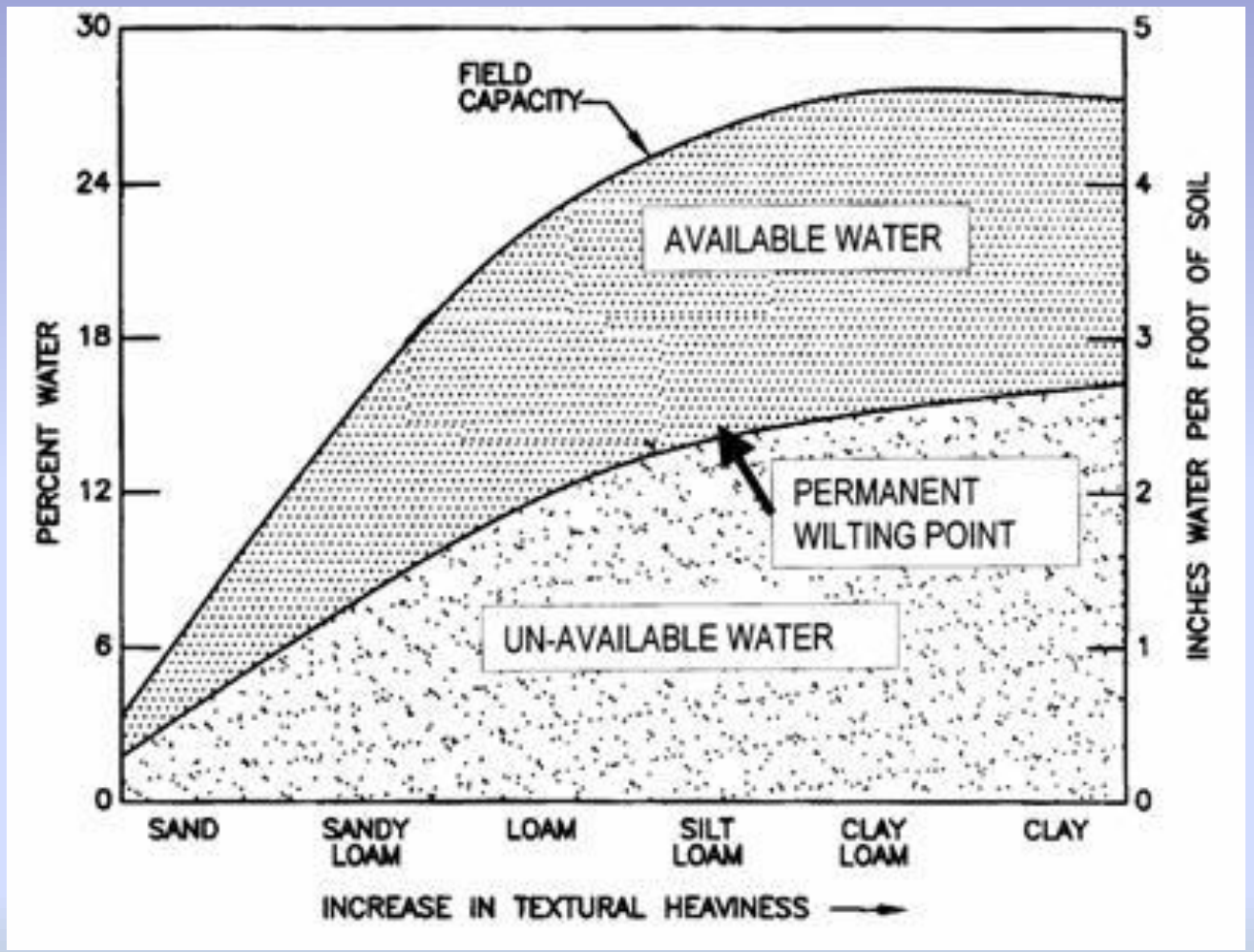
How?

- By feel
- Refer to your Agro-Environmental Report or soil test report

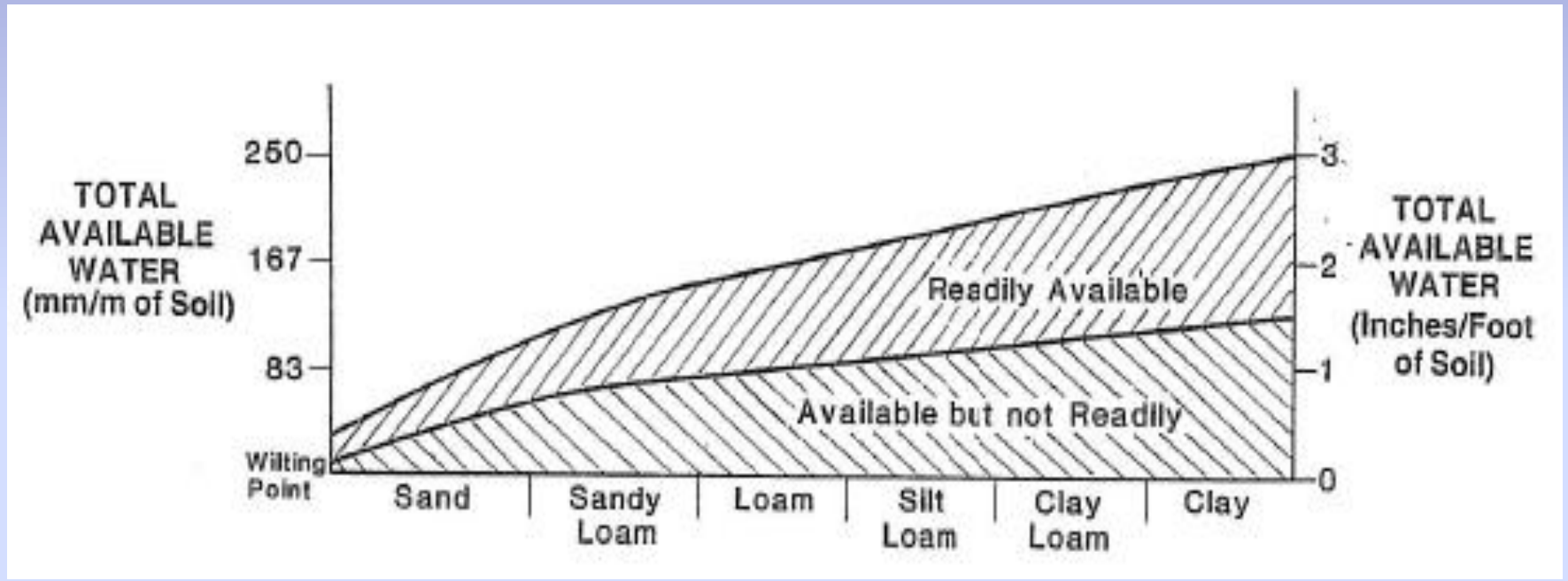
Water Holding Capacities

Texture	Available Moisture inches/foot
Loamy Sand (LS)	0.84
Sandy Loam (SL)	1.68
Fine Sandy Loam (FL)	1.85
Very Fine Sandy Loam (VL)	2.02
Silt Loam (SiL)	2.02
Loam (L)	2.01
Clay Loam (CL)	2.23
Clay (C)	3.02

Soil/Water Relationships

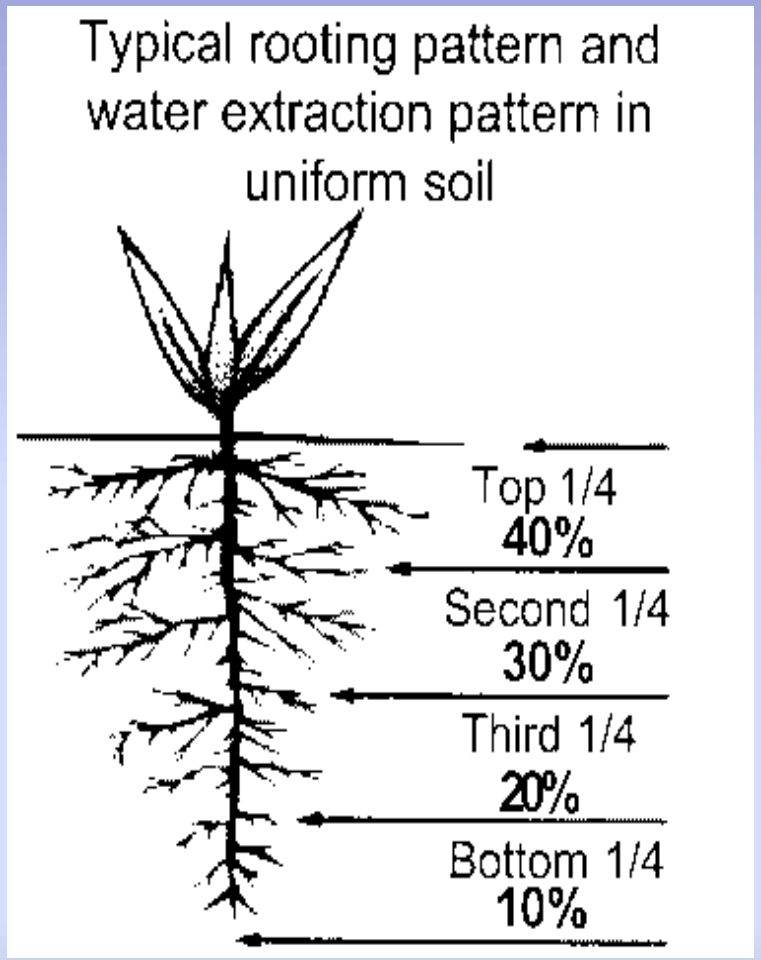


Soil/Water Relationships



Crop Water Relationships

- Rooting zone determines the amount of water available to crop
- Shallow rooting depth = smaller zone to extract water



Soil/Water Relationships

Allowable depletion

- %
- Amount of water that can be removed from the soil before an irrigation application
- Crop specific

Crop	Allowable Depletion (%)
Alfalfa	60
Grass	50
Potatoes	40
Faba beans	35
Corn	
Silage	50
Wheat	
Hard	50
Soft	50
Canola	50
Flax	50
Peas	40
Barley	
Forage	50
Malt	50
Dry beans	40

Irrigation Scheduling

- Keep soil available moisture (AM) between field capacity (FC) and the allowable depletion (AD) limit
  - Readily Available Moisture (RAM)
- Amount of water to apply to reach FC depends on the soil texture

Determining Soil Moisture

Soil based

- Direct Measurement
  - Soil probe and gravimetric analysis
  - “Feel” method
- Indirect Measurement
  - Moisture monitoring equipment
    - Tensiometers, Watermark sensors (electrical resistance)

Feel Method

Loamy sand

Sandy loam

Clay

Clay loam

Silty clay loam

25 - 50%

50 - 75%

75 - 100%

Soil Moisture Monitoring Equipment

Tensiometer

Watermark™ sensor

Gypsum blocks

Irrigation Scheduling so far ..

- Soil texture and water holding capacity
- Know how much water can be removed
  - AD limit
- Keep AM between FC and AD
  - Monitor AM weekly

Next …

- Determine and monitor the crop water use

Crop Water Requirements

Evapotranspiration (ET)

- Amount of water used by plant for growth and cooling plus the water that is lost from soil surface
- Total seasonal ET = crop consumptive use

Crop	Seasonal Crop Water Use (mm)
Alfalfa	620
Grass	500
Potatoes	520
Faba beans	610
Corn	
Silage	470
Wheat	
Hard	460
Soft	480
Canola	480
Flax	410
Peas	400
Barley	
Forage	390
Malt	430
Dry beans	380

Crop Water Requirements

Crop	Peak Moisture Use (mm/d)
Alfalfa	8.0
Grass	7.0
Potatoes	6.0
Faba beans	8.0
Corn	
Silage	6.0
Wheat	
Hard	7.0
Soft	7.0
Canola	7.0
Flax	7.0
Peas	6.0
Barley	
Forage	7.0
Malt	7.0
Dry beans	6.0

Crop	Critical Water Requirement Period
Alfalfa	All the time, especially after cutting
Grass	All the time
Wheat:	
Hard spring	Tillering and flowering
Soft spring	Tillering and flowering
Barley	Tillering through flowering
Canola	Late vegetation/spiking through flowering and pod development
Flax	Flowering
Corn:	
Grain	Tasseling and grain filling
Grazing	Tasseling and grain filling
Silage	Tasseling and grain filling
Peas	Beginning of flowering
Potatoes	Tuber initiation and tuber bulking
Dry beans	Late bud through pod formation
Faba beans	Beginning of flowering

Irrigation Scheduling

- Know how much water can be removed
  - AD limit
- Monitor AM and calculate RAM in root zone (usually top 60 cm)
  - Keep AM between FC and AD limit
- Determine weekly crop water use
- Provide a scheduling recommendation

Scheduling Scenario

Field Situation

- SL soil (top 2 feet)
- Canola at flowering stage
- Weather is 25^0C or higher (mid-July)
- Field at 65% Field Capacity

Scheduling Scenario

Text Book Facts

- SL soil holds 1.68 inches/foot at FC
- Canola at flowering uses .27 inches/day
- Allowable depletion for canola is 50% of FC
  - Plant under stress when below 50 % of 1.68 or .84 inches/foot

Scheduling Scenario

Calculations

- Field is at 65% FC
- Water below 50% FC is not readily available
- 15% of total water is available
- 15% x 1.68 inches/foot = .25 inches/foot
- 2 feet x .25 = .5 inches RAM
- Crop use is .27 inches/day

Scheduling Scenario

Recommendation

- Only 2 days of RAM in top 2 feet
- Need to start irrigating ASAP
- Apply 1.5–2.0 inches over 5-6 days to meet crop demands

What is adequately irrigated?

- Assumptions:
  - Stored soil moisture and precipitation = 8.5 inches (cereals, oilseeds, pulses, potatoes)
  - Stored soil moisture and precipitation = 9.5 inches (corn, perennial forages)

Source: ICDC Economics and Agronomics 2010

What is adequately irrigated?

Inches Applied				
6	**7**	**8**	**9**	**10**
Lentil	Dry bean	Peas	Malt barley	HRSW
	Barley silage	Flax	Feed barley	Durum
				CPS
				Potato

Inches Applied				
11	**12**	**13**	**14**	**15**
SWSW	Grain corn		Alfalfa	Timothy
Canola	Grazing corn		Pasture	
Silage corn				
Potato	Potato	Potato		

Irrigation Operation

- Canola can require 11 inches irrigation
- Centre pivot efficiency = 0.80
  - Irrigation applied = 14 inches
- Designed for 7 US gal/minute/acre (900 gpm)
  - 0.3 inches/acre/day
- Need to operate system 47 days to apply 14 inches


Thank you!
Questions??