
Mature tree management
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Soil berms

- Prevents water from collecting around root ball of tree.
- It is ideal to allow berms to settle over winter before planting

- The vast majority of olives grown worldwide are not irrigated
- The olive has evolved under harsh and dry Mediterranean climate conditions.
- Thick and leathery leaves; waxy cuticle.
- Olive water use is directly related to crop load.
- The olive is tolerant to poor water quality

Water Supply

- In most irrigation systems delivery rate is 10 gallons per minute per acre.
  - Thus a 250 GPM well would be capable of irrigating 25 acres of orchard in one set.
- A 3 or 4 set system is optimal, more than 4 sets can create difficulty in meeting water demands during summer months and heavy cropping.

Water Supply cont.

Maximum water demand is in spring and early summer; April to July and September

Water will be needed in the winter months

Historical water usage in CA SHD orchards ranges between .8 and 2.0 acre/ft. per A

This number will probably be higher in TX

Why do we Irrigate Oil Olives?

- Most growers ask how often and how much should I irrigate my olives.
- Very few growers understand why they irrigate olives for oil and when it is important.
- Water demand varies considerably during different stages in crop development and by crop load.

Bloom period is sensitive to dry soil conditions; especially if hot

Olive shoot growth in June and July is critical so one can read their trees.

Poor soil water conditions can lead to a reduction in nutrient absorption

Suggested Production goals

- 1. Production of high quality fruit to maximize;
  - Volume of fruit yield at sustainable level
  - Oil quality
- 2. Generate regrowth adequate to support consistent crop load for following year.

- 3. Maintain basic metabolic functions in tree and maintain a healthy balanced tree.

Goal: Sustainable fruit yield

- Fruit production is optimized when tree is provided with adequate moisture and nutrition at key development stages
- Pre bloom and during bloom are the most critical stages where moisture stress can reduce fruit set

- Final fruit weight is influenced by moisture content at time of harvest
- Moisture content of fruit is critical for fruit removal at harvest

Goal: maximize oil content

- Oil begins to accumulate in fruit after pit hardening.
- After pit hardening the fruit becomes the tree's priority for allocation of both water and nutrients.
- Managed irrigation after pit hardening to minimally maintain fruit can increase oil content

Goal: Oil quality and extractability

- Both excessive and inadequate irrigation can cause oil quality problems.
- Insufficient moisture in fruit causes fruit shrivel.
- Shriveled fruit tends to exhibit advanced color with reduced oil content, can be misleading.
- Shriveled fruit may require the miller to add water during processing thus slowing processing and damaging quality
- Excessive fruit moisture produces washed out flavor and low oil% yields

Goal: regrowth to support balanced crops

- The olive is an alternate bearing plant in that crop yields fluctuate between “on” and “off” years.
- A significant factor in alternate bearing is the crops demand for water and nutrients thus limiting the trees ability to produce regrowth.
- If regrowth is limited there will not be sufficient fruit buds to support a consistent crop from year to year.

- The olive tree has two periods of rapid vegetative growth;
    - Early spring growth (March through May) corresponding with rising soil temperatures
    - Early fall normally corresponding with fruit veraison.
- The spring growth period is generally the most efficient time to encourage regrowth as the tree is not also supporting fruit and oil accumulation.

- Moisture supports basic photosynthesis and metabolic function
- Severe moisture stress at any period during the year will cause increased stress and exposure to disease pressure and frost damage.
- Growers often neglect to maintain moisture in the soil profile during dry winter months increasing frost damage.

Methods and concepts for practical irrigation management

- 1. Physical inspection of soil moisture in the wetted area
- 2. Understanding the volume of the wetted area, root depth, and root mass.
- 3. Understanding the time required to replenish moisture in the available wetted area.
- 4. Using evapo-transpiration or Et for determining baseline irrigation targets
- 5. Concept of regulated deficit irrigation or RDI during key periods.
- 6. Monitoring and understanding fruit moisture content and the effects of high and low fruit moisture at different stages.

1. Physical inspection

- Always the first and last determinant in irrigation timing and duration.
- Check soil depth from 0 to 20”
- Check area immediately under emitter and at edge of wetted area.

- Make sure orchard staff and farmer have uniform understanding of adequate moisture and terms.
- Backhoe soil pits are helpful to understand soil profile and rooting depth

2. The wetted area

- The olive is a relatively shallow rooted tree.
- Roots will grow and retract as the wetted area changes.
- Volume of the wetted area can be managed by;
  - Emitter spacing
  - Emitter flow rate
  - Multiple hoses
  - Irrigation duration and frequency
- Wetting pattern varies by soil type and infiltration rates.
- Short frequent irrigations often create small root mass

3. Irrigation duration

- The length of time water is applied can be determined using several factors;
  - Rate of application in terms of gallons per hour
  - Relative soil moisture holding capacity
  - Infiltration rate of water into soil considering any infiltration issues
  - Depth of roots
  - Hard pan, water table, salt intrusion or other physical limiting factors
- Applied irrigation should saturate soil to a minimum depth of 24”

- Irrigating for the same amount of time week after week can result in salt accumulation and limited root growth, it is good practice to vary duration occasionally.
- Consider water quality issues and soil conditions when planning irrigation duration, monitor for runoff.

4. Using et for basic irrigation guide

- Et is the measure of the loss of water to the atmosphere through transpiration, evaporation, and leaching.
- Et is calculated using a baseline of the water use of one acre of fully irrigated grass
- Crop coefficients can be used to adjust Et to crop specific use, known as Kc or crop coefficient.

- Olive crop coefficient is between .55 and .75 depending on stage of tree development, crop load, and canopy area.
- Et forecasts and historical data is available look for station nearest your grove.
- Et is best used during the period after pit hardening and verasion for deficit irrigation planning.

5. Deficit irrigation after pit hardening

- Multiple studies in several countries have shown reduced irrigation levels after pit hardening are successful in;
  - Improving oil quality
  - Increasing oil quantity
  - Advancing maturity
  - Maintaining year to year cropping

- Et used in base planning with fruit moisture the best determinant of stress level
- Fruit condition must always take priority for irrigation timing.

The taper method; pit hardening through verasion

- Several multi year studies in California indicated the most successful method of deficit irrigation after pit hardening was the gradual reduction of applied irrigation using Et.
- Irrigation levels were roughly 50% Et (no crop coefficient) at pit hardening.
- Applied irrigation was reduced by 5% Et weekly with minimum irrigation level of 20% Et.

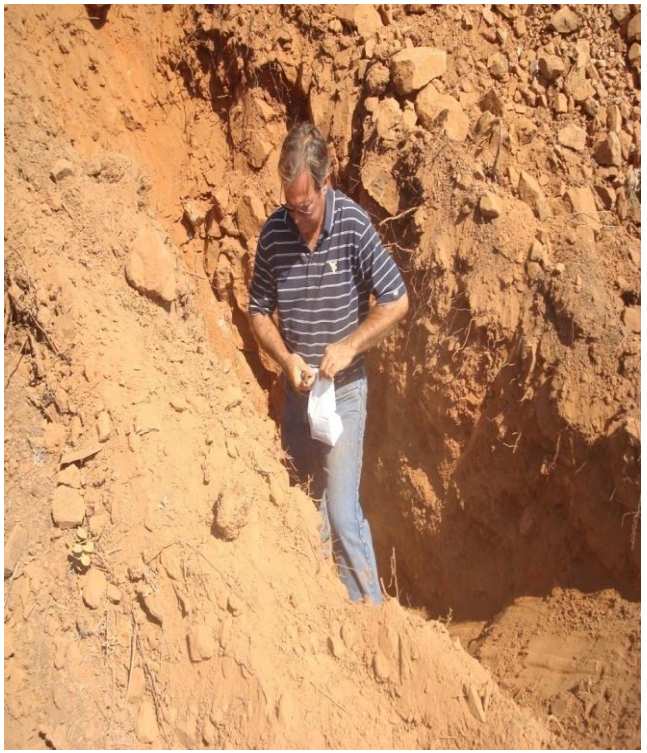
- at time of verasion irrigation levels were increased to roughly 30% Et although fruit moisture level was used to adjust irrigation after verasion.
- Several long irrigations (12 to 16 hours) were applied 4 to 7 days before harvest
- **Taper method increased oil quantity and improved oil quality over 6 years of trial.**

Strategies for severe water limitations

- If water supply is not sufficient or reliable to produce a commercial crop consider removal of crop at bloom or after fruit set.
- Compounds are available for foliar application to remove fruit after pollination and set.
- If crop is eliminated water can be concentrated during spring and early summer to produce regrowth for 2015 crop and allow for limited fertigation.

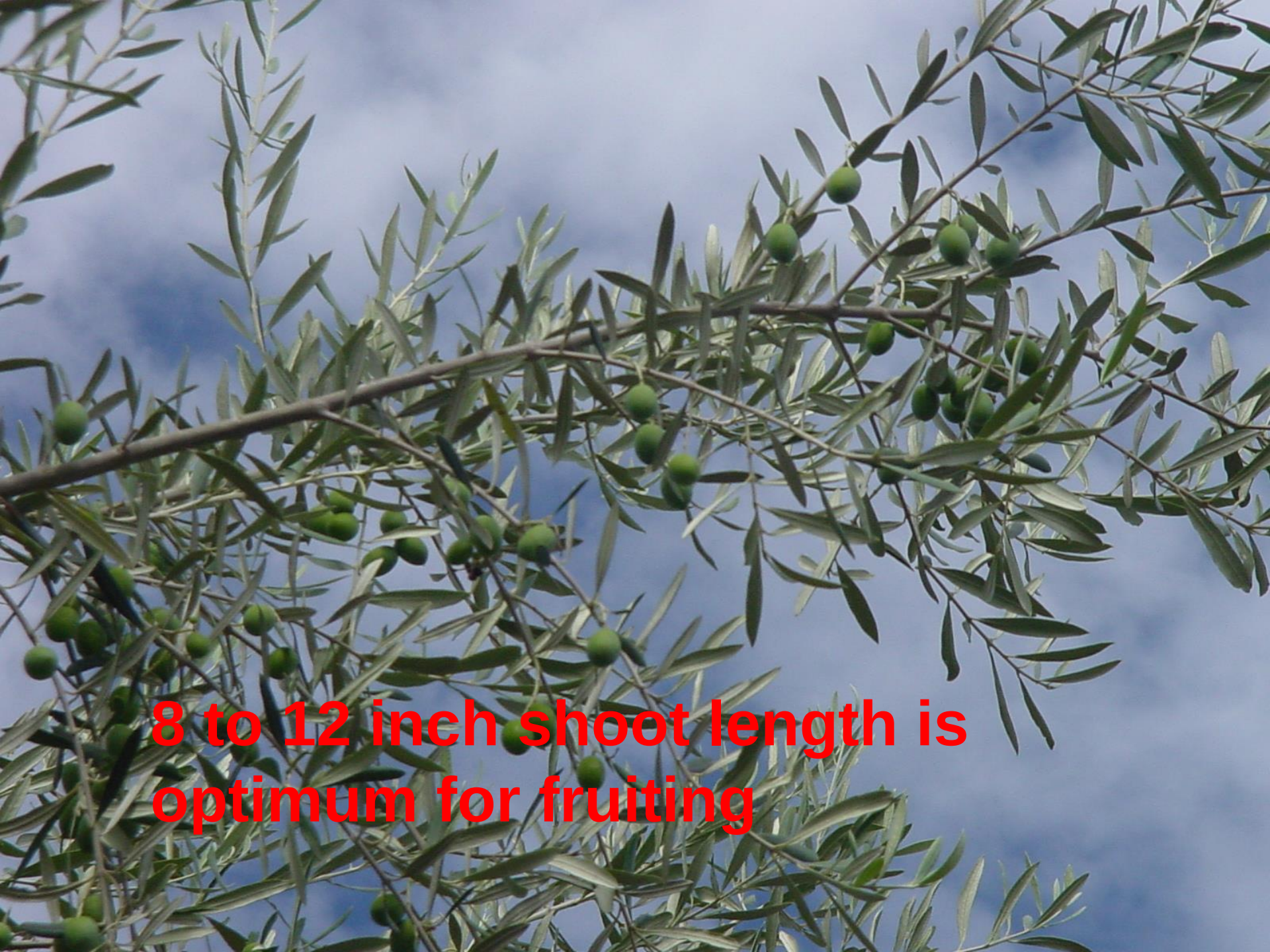
Soil Chemistry

- Ideal pH between 6.5 and 7.5
- Many olives grown worldwide on calcareous soils with pH above 7.5
- pH below 6.5 can be problematic and requires amendment with lime prior to planting



- Boron in excess of 2ppm can be toxic

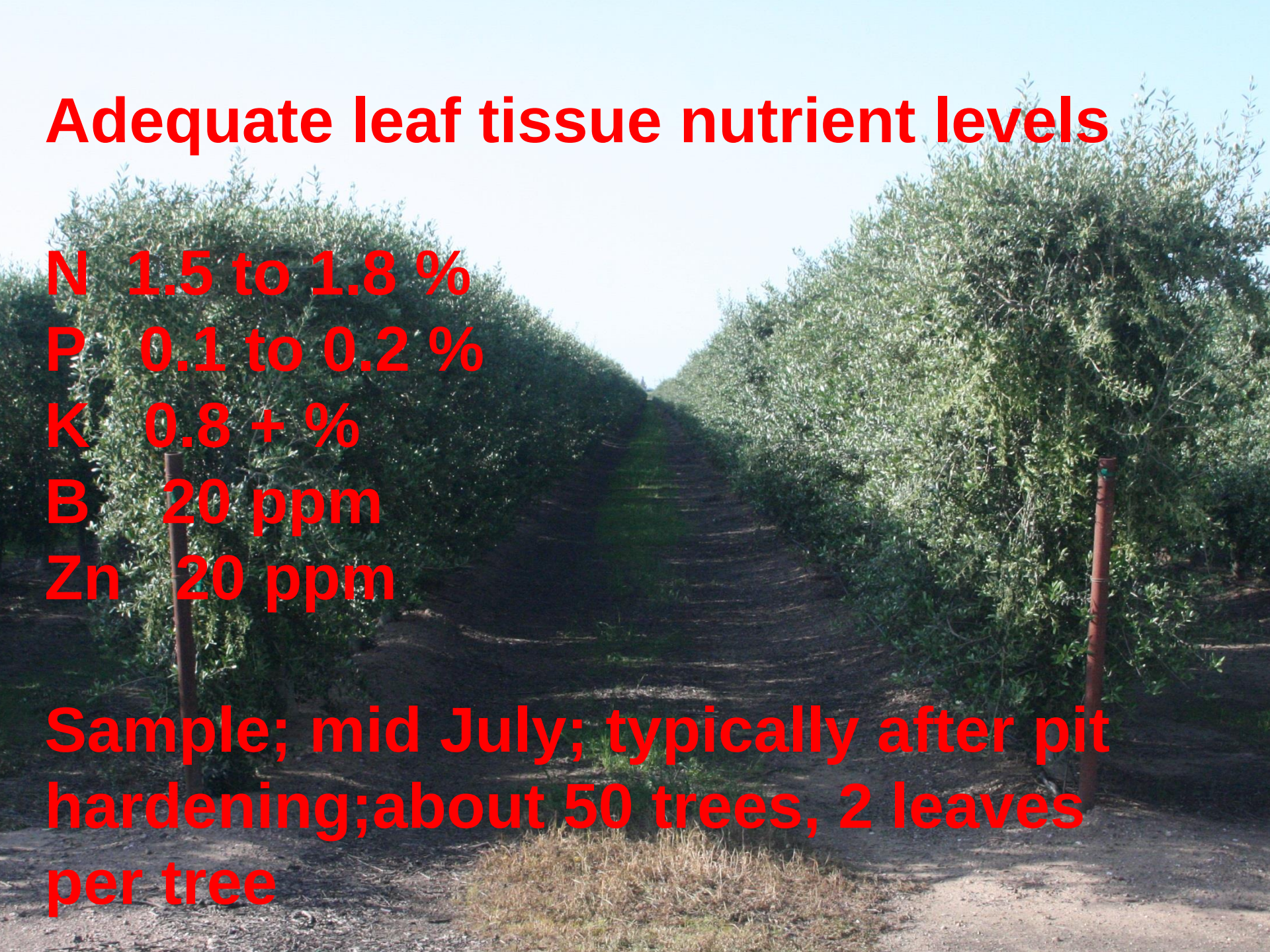

Tolerant of less fertile soil
Shallow soils promote less excessive growth
Too much nitrogen can lead to a big crop of fruit and alternate bearing
Correlation between high yield and leaf Potassium


8 to 12 inch shoot length is
optimum for fruiting

Adequate leaf tissue nutrient levels

N 1.5 to 1.8 %
P 0.1 to 0.2 %
K 0.8 + %
B 20 ppm
Zn 20 ppm

Sample; mid July; typically after pit hardening;about 50 trees, 2 leaves per tree




Sample from the middle of nonbearing shoots

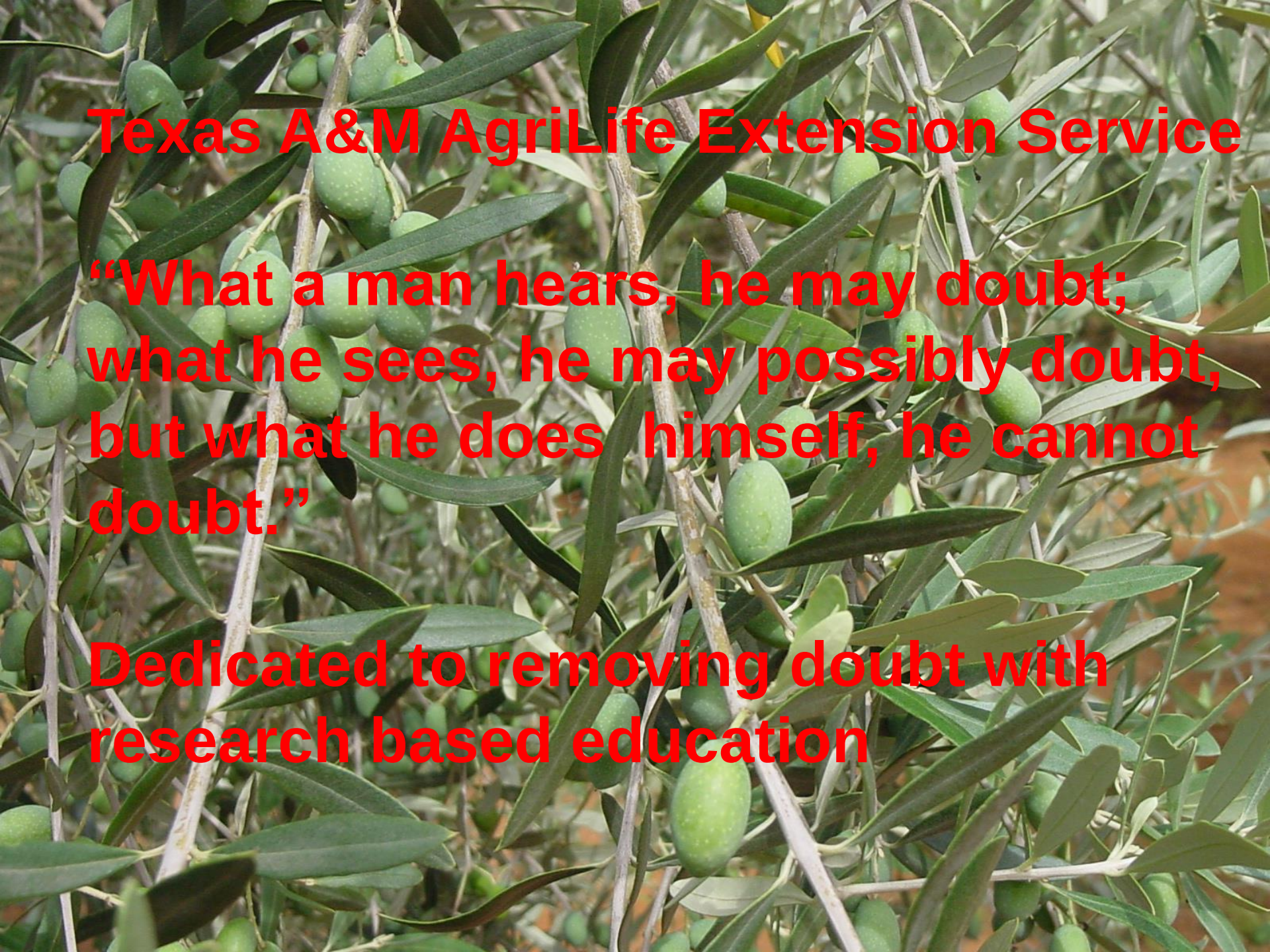

Ground applications are typically all that is needed
Foliar sprays are typically not worth the money


Standard fertility recommendation:
30 units of nitrogen per acre
Best way would be to inject N-32
Ammonium sulfate
Urea
Usually P and K will be sufficient


Harvest challenges


Shaker damage


Problem diagnosis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“What a man hears, he may doubt; what he sees, he may possibly doubt, but what he does himself, he cannot doubt.”
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Typical protocol is to work through the county Extension agent
Three fruit specialists
Regional Program Leaders