End of Season Irrigation Strategies in Small Grains

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In the SJV, Wheat (ET)Evaporation Transporation is 19 inches but water use for wheat is about 22 inches for a grain crop

16 inches for a forage crop cut at soft dough

9 inches for a forage crop cut at boot

Barley uses 16 inches

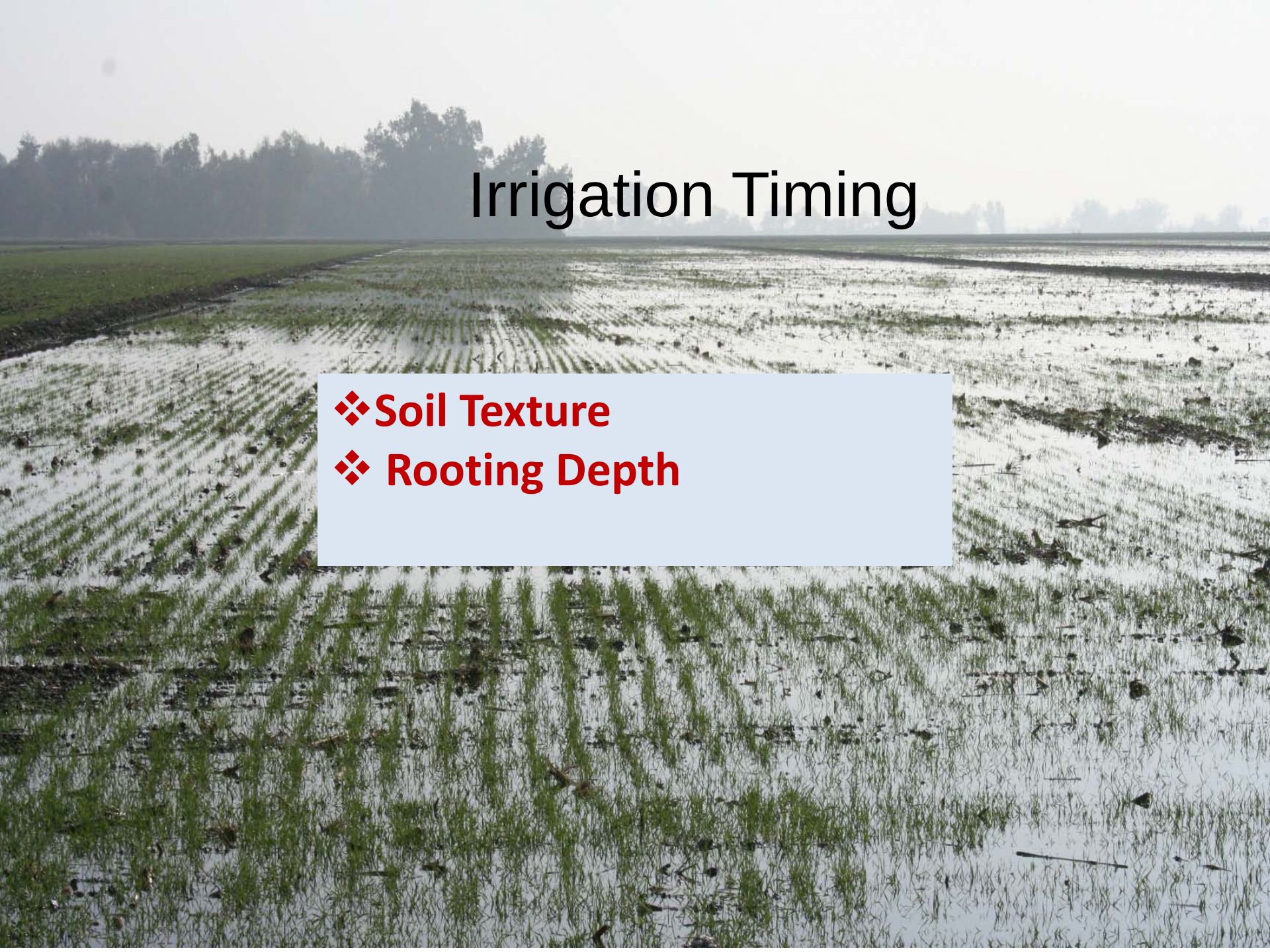
•**Germination irrigation**

-Advantage of germinating weed seeds & allowing a dry soil mulch to be made at planting that provides a favorable environment for wheat seeds germination & emergence.

-Disadvantage is increased turnaround time between crops, the window when the soil is in condition for planting is narrow, & rainfall can delay planting.

-Irrigating up has the advantage of convenience but the disadvantage of the possibility of forming a soil crust (with flood irrigation) & cooling the soil which leads to delayed emergence.

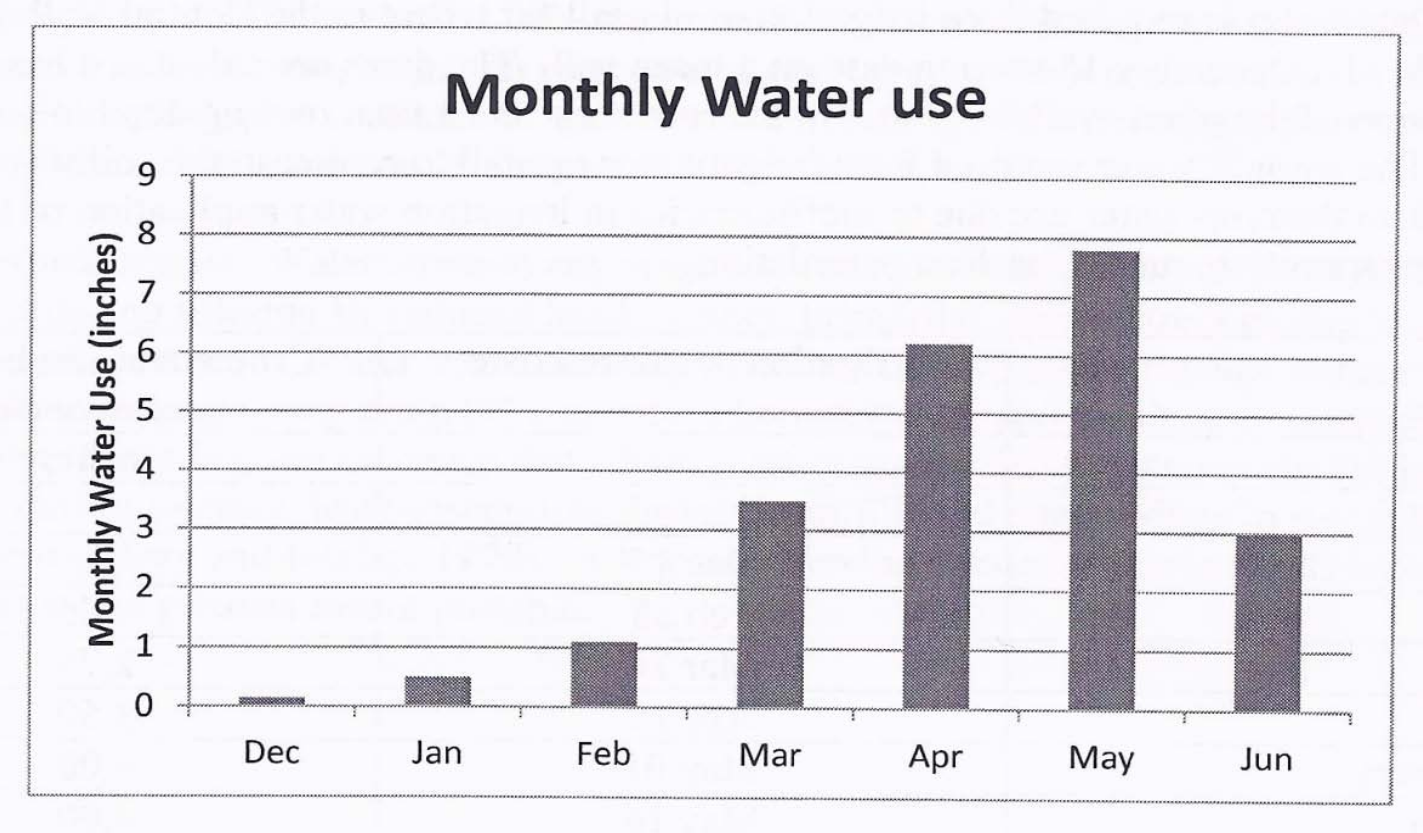
Applying the first irrigation too early can result in loss of soil nitrogen by leaching or denitrification (loss as a gas).



Irrigation Timing

- **Soil Texture**
- **Rooting Depth**

Wheat Grain Water Use



- Average monthly water use of wheat planted on December 15 in the San Joaquin & Sacramento Valleys.

Irrigation Timing

Last irrigation

-should be applied at the beginning of soft dough for most loamy soils, earlier for heavier soils & later for lighter soils. April 25-May 15

-Applying an unnecessary irrigation at the end of the season wastes water, contributes to lodging, reduces protein & may delay harvest.

-Conversely, water stress at the end of the season may result in smaller & shriveled kernels, accompanied by reduced kernel weight, test weight, & yield.

Irrigation scheduling Methods

- Irrigations can be scheduled using:
    - Predetermined calendar dates or days between irrigations
    - Methods that directly measure soil moisture or crop stress,
    - Balance (checkbook) method using evapotranspiration data.

- Predetermined calendar dates or days between irrigations can be useful for scheduling irrigations under average conditions, but requires adjustment for weather conditions that vary from normal.

- The soil water balance method can estimate soil moisture & impending crop stress without the investment in sensors & collection of the data they provide, but some accuracy may be lost compared to direct measurements.

Ottman et al., 2006

• Average available water holding capacity for various soil textures. Actual values for a particular soil texture can vary depending on soil type.

Soil Texture	Avail. Water Capacity (inches/foot)
Sandy	0.7
Sandy Loam	1.4
Loam	2.0
Clay	2.3

Water Stress

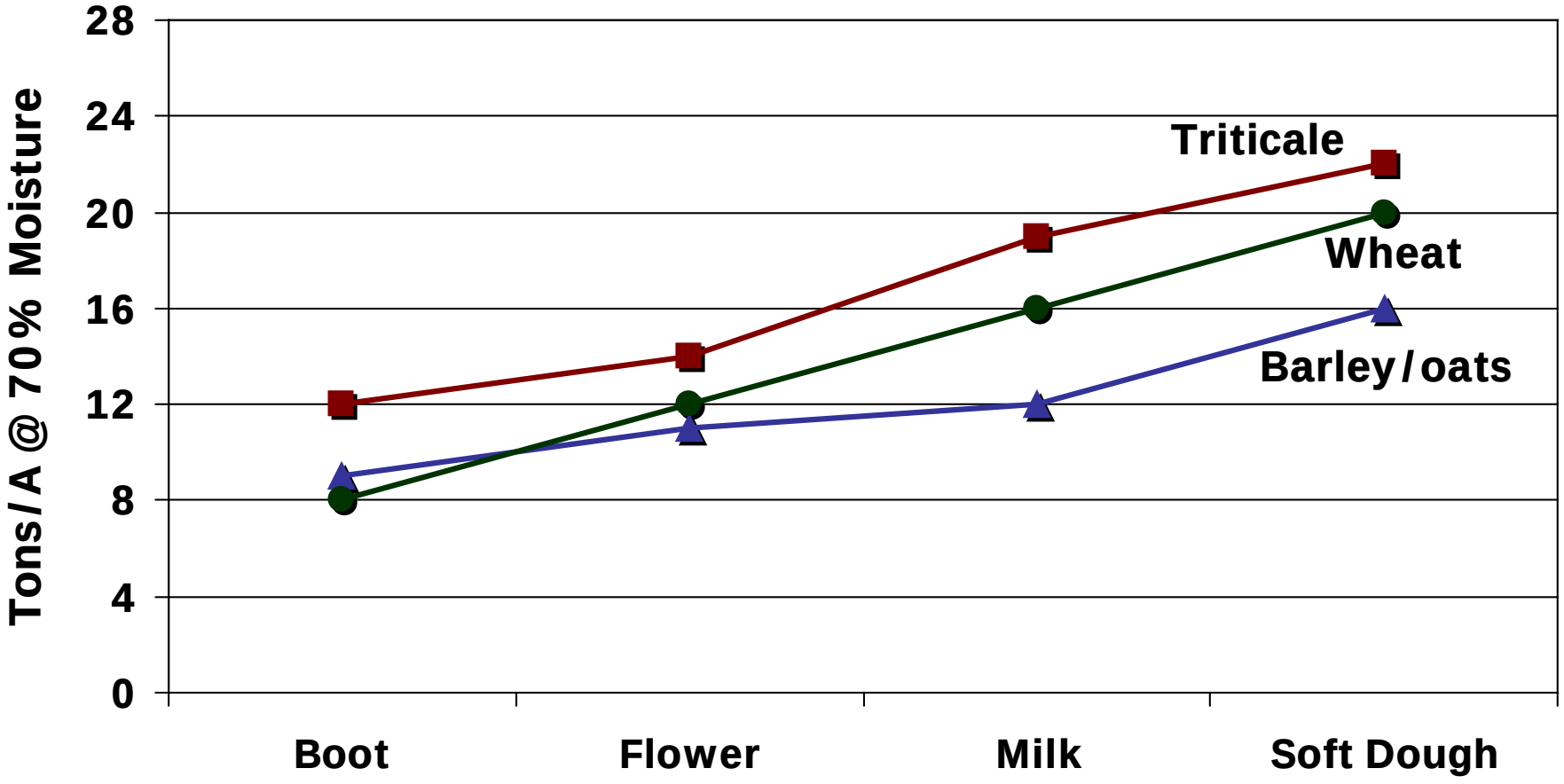
Critical growth stages

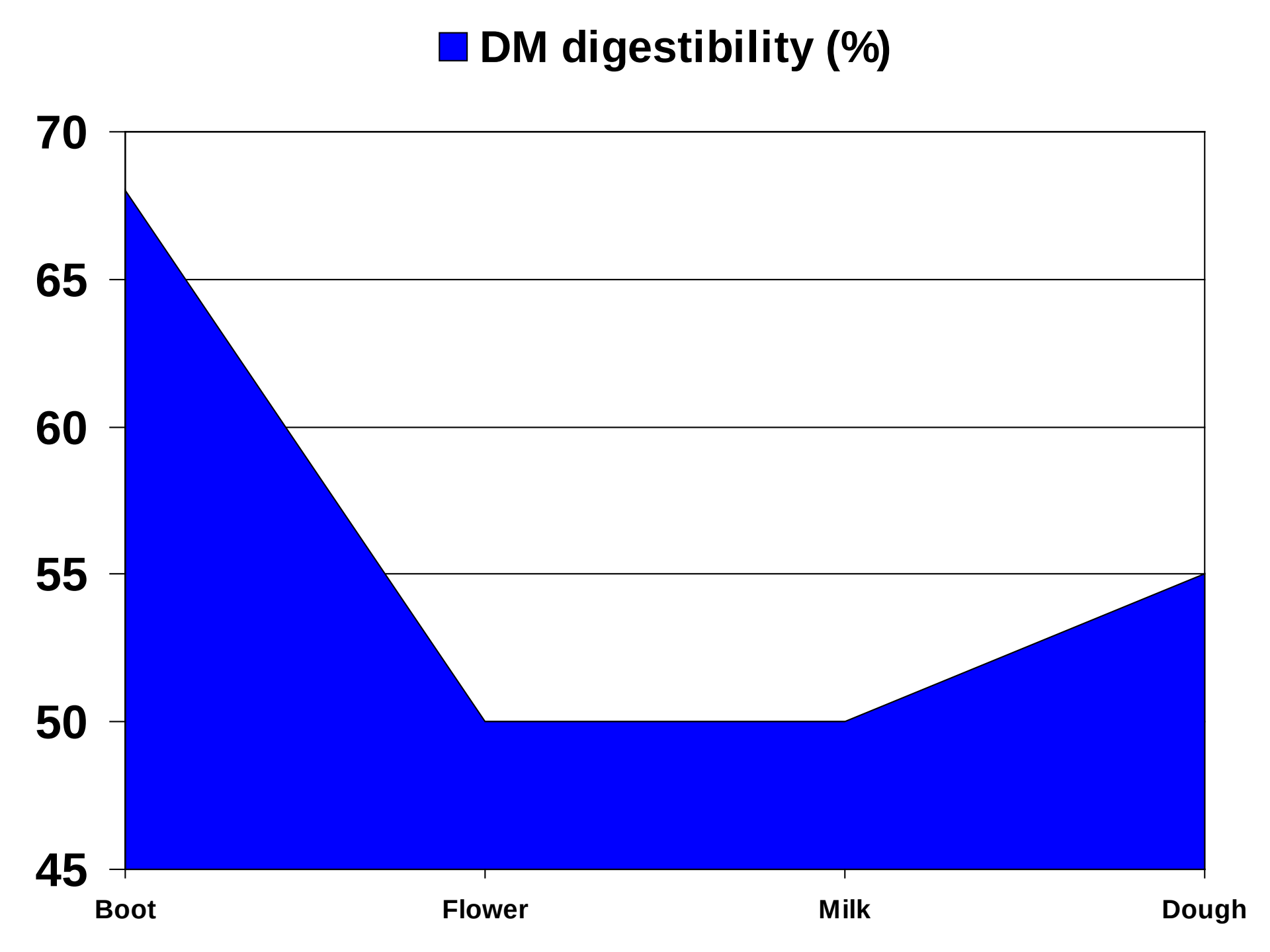
- Water stress during :
  - Tillering by reduced head number, primarily.
  - Jointing reduces kernels per head.
  - Pollination can cause sterility and reduce kernel number.
  - Grain fill can reduce kernel weight & result in unacceptable grain test weights.

- There is some evidence that wheat is most susceptible to water stress (or lack of irrigation) during jointing, least susceptible during grain fill, & intermediate in susceptibility during tillering (Day and Intalap, 1970).

Effect of Small Grain Forage Stage on Yield

UCCE (1984-2013) S. Wright, T. Shultz, C. Collar, N. Silva Del rio




DM digestibility (%)
70
65
60
55
50
45
Boot
Flower
Milk
Dough

Summary

- water use for wheat is about 22 inches for a grain crop, 16 inches for a forage crop cut at soft dough, and 9 inches for a forage crop cut at boot (Fulton et al., 2006).

- The amount of irrigation water required to meet this water use depends on rainfall and the efficiency of the irrigation system, air temperature, soil texture.

- The first post-emergence irrigation for wheat is when soil is dry based on where the roots need to go.

- Irrigations can be spaced about 12 to 18 days apart until soft dough, when the last irrigation is needed on most soils.

- A key to achieving maximum grain yields is to avoid water stress to the greatest extent possible.