UC DAVIS
UNIVERSITY OF CALIFORNIA

Department of
LAND, AIR AND WATER RESOURCES
University of California, Davis
Climate Change • Sustainable Agriculture
Environmental Quality • Landscape Processes

Optimizing Nutrient Management – Tools and Approaches

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Russell Ranch Field Day,
May 21, 2015

Fertilization guidelines

http://apps.cdfa.ca.gov/frep/docs/guidelines.html

CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE
INSPECTION SERVICES DIVISION

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Laws & Regs

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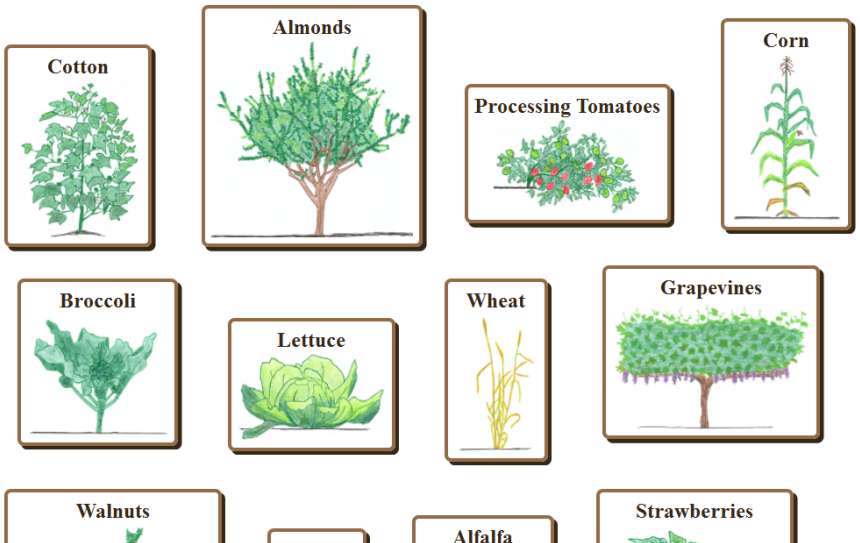
Fertilization Guidelines for Major Crops Grown in California

These guidelines are based on research results from studies carried out in California and elsewhere. For an optimal fertilization program, site-specific information on soil type, climate and crop management need also to be take in into account.

After choosing a crop from the list below, detailed information can be accessed by moving the mouse over any shape with the symbol ⓘ.



Developed in collaboration by

cdfa | FREP (Fertilizer Research and Education Program)

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Soil and Plant Tissue Sampling

- Soil Test Sampling Instructions
- Sampling for Soil Nitrate Determination
- Soil Sampling in Orchards
- Plant Tissue Sampling

Additional Resources, Links

- Organized by Topic
- Organized by Source

New! Nitrogen Partitioning and Seasonal Uptake Curves

Fertilization guidelines

Crop-specific guidelines

Processing Tomatoes Fertilization Guidelines

Funding provided by:

Nitrogen (N)

Soil Test | Leaf Analysis

Preplant N | Starter N | Soil Applied N / Foliar N

Phosphorus (P_2O_5)

Soil Test

Pre-

Potassium (K_2O)

So

Pre-

Acknowledgements

For drip-irrigated processing tomatoes, Hartz and Bottoms[N4] found that a seasonal rate of approximately 175 lbs N/acre is adequate to maximize fruit yields in most soils. Contact your local farm advisor for more information.

Krusekopf and coworkers[N10] carried out a study in the Central Valley in ten furrow irrigated fields. A response to N fertilization was observed in only four fields. In the responsive fields, no significant yield increase with sidedress N application rates above 100 lbs/acre was observed. The total available N in these fields, which included the pre-sidedress nitrate-N in the top 2 feet of the profile and the sidedress N, averaged 170 lbs/acre [N10]. Based on this and other studies, the recommended seasonal N application rate for furrow irrigated tomatoes is 100-150 lbs N/acre [N8].

Soil Applied N / Foliar N

Application Rate

Mode of Application

Fertilizer Type

Time of Application

Fertilization guidelines

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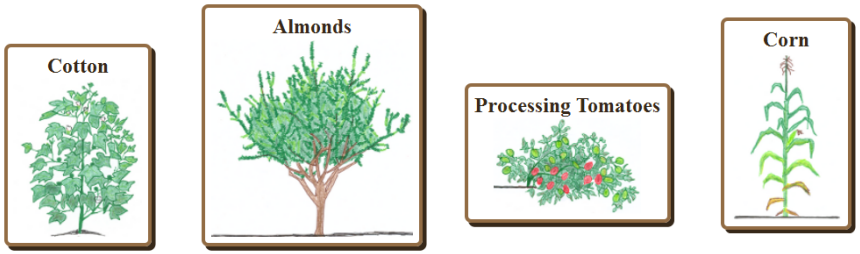

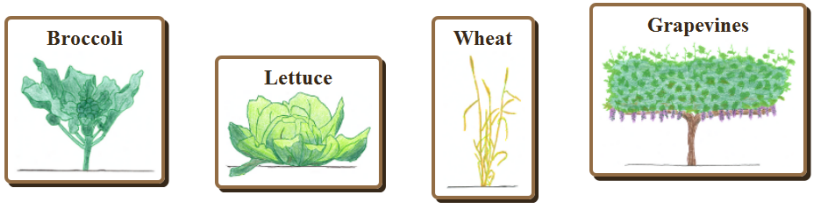

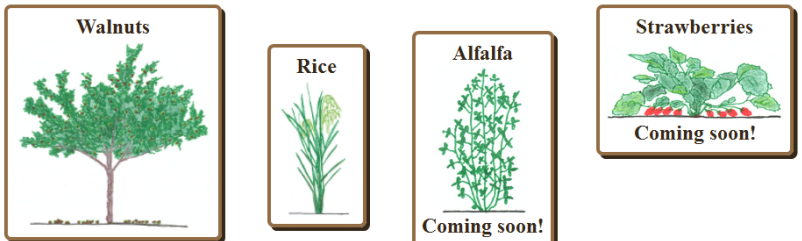

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New! Nitrogen Partitioning and Seasonal Uptake Curves

Fertilization guidelines

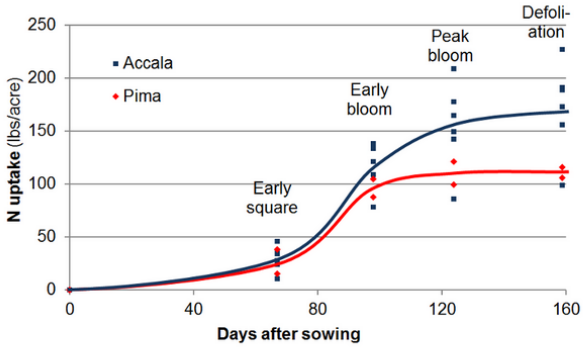
N uptake and removal rates

Crops:

- Almonds
- Broccoli
- Corn for Grain
- Corn for Silage
- Cotton
- Grapevines
- Lettuce
- Pistachio
- Rice
- Strawberries
- Tomatoes
- Walnut
- Wheat

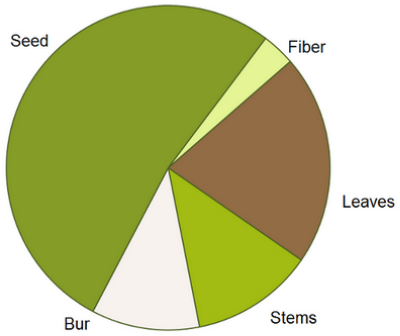
Cotton Nitrogen Uptake and Partitioning

Seasonal N Uptake



Nitrogen uptake of cotton grown in Fresno and Kings County was determined by harvesting the aboveground biomass at different times during cotton development.
Cotton plants took up little N until they reached the early square stage. Most N was taken up between the early square and peak bloom stage (Fritschi et al., 2004).

Nitrogen Partitioning



Measured immediately before defoliation, more than half of the aboveground N of Accala cotton was in the seeds. Nitrogen in the fiber and burs accounted for about 15% (Fritschi et al., 2004).

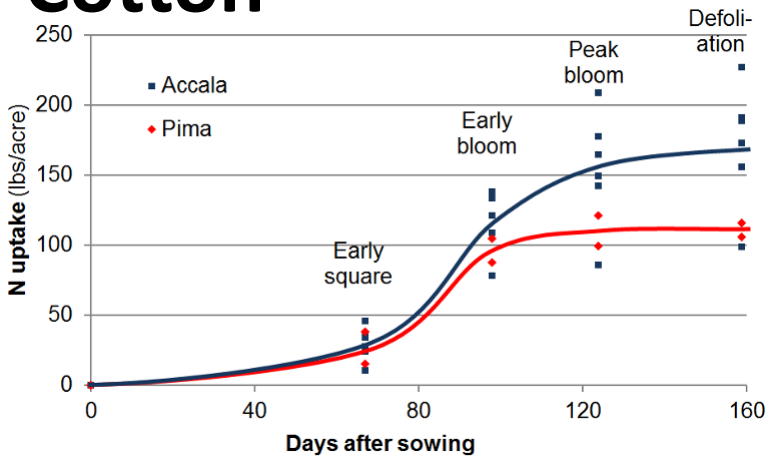
Nitrogen Removed at Harvest

Cotton yield and N removed at harvest. The N application rate was 150 lbs/acre.

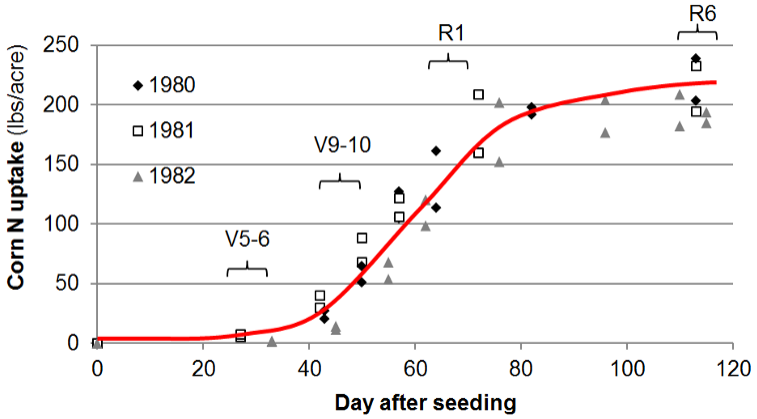
Study location	Years	Lint yield (lbs/acre)	Aboveground N (lbs/acre)	N in seed and lint (lbs/acre)	Source
			Accala Cotton		
Fresno & Kings Counties	1998-2000	1411	172	106	Fritschi et al., 2003; 2004
			Pima Cotton		
Fresno County	1999-2000	1457	113	83	Fritschi et al., 2003; 2004

N uptake curves of field crops

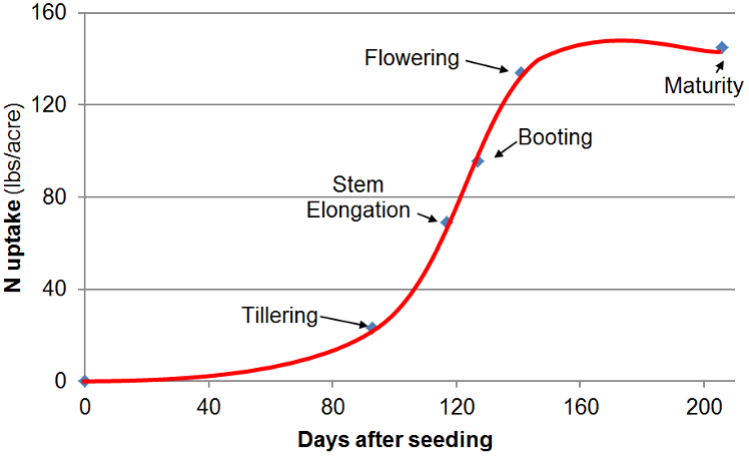
Cotton



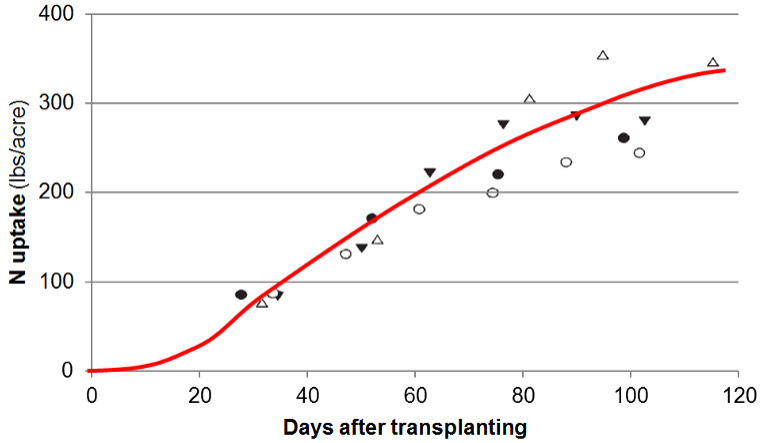
Corn



Wheat



Tomatoes



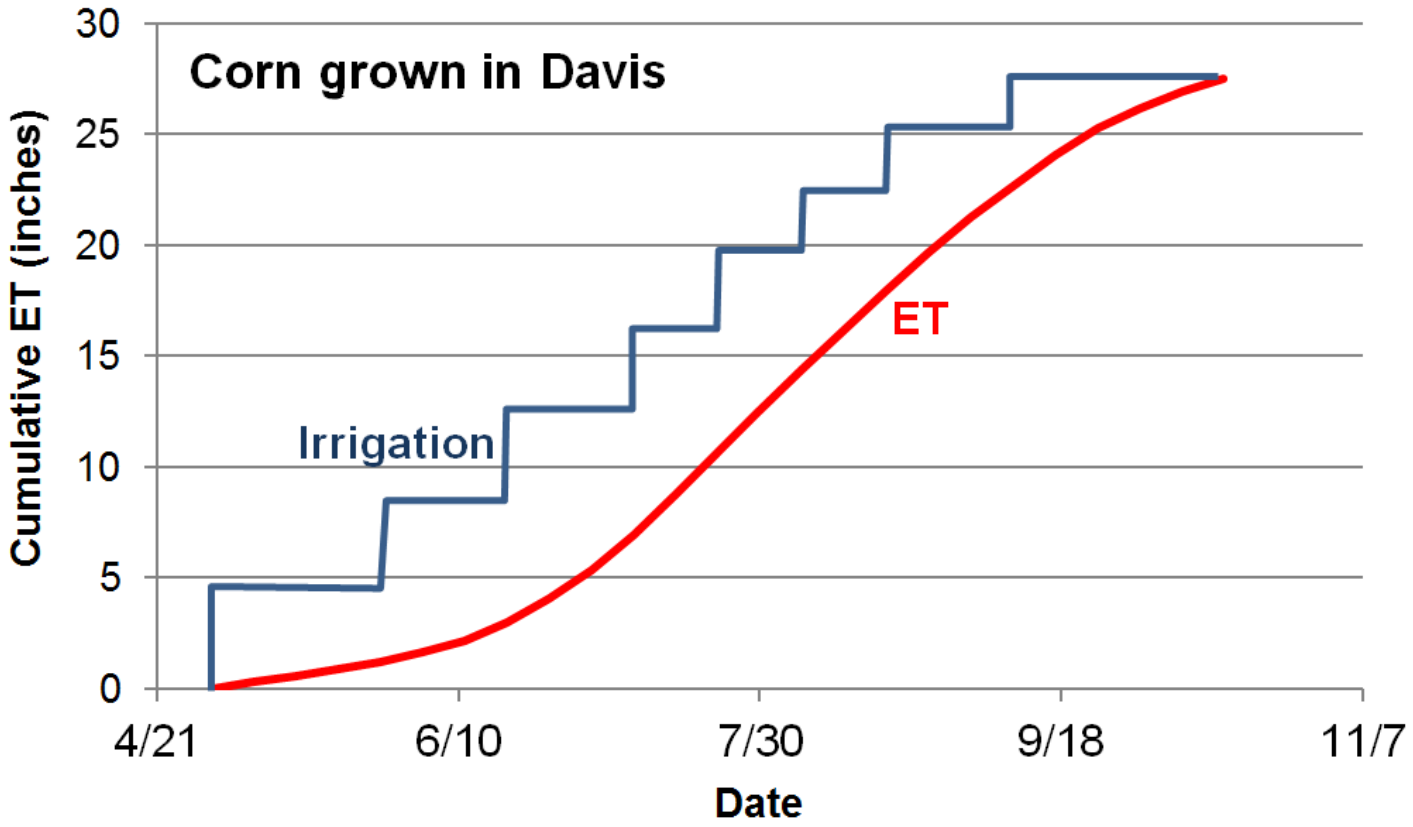
Early growth challenges

- Early-season N uptake low
- Often high residual soil nitrate concentrations
- Shallow root system
- Optimal conditions for growth need to be provided

⇨ Early conditions affect plant development and yield potential

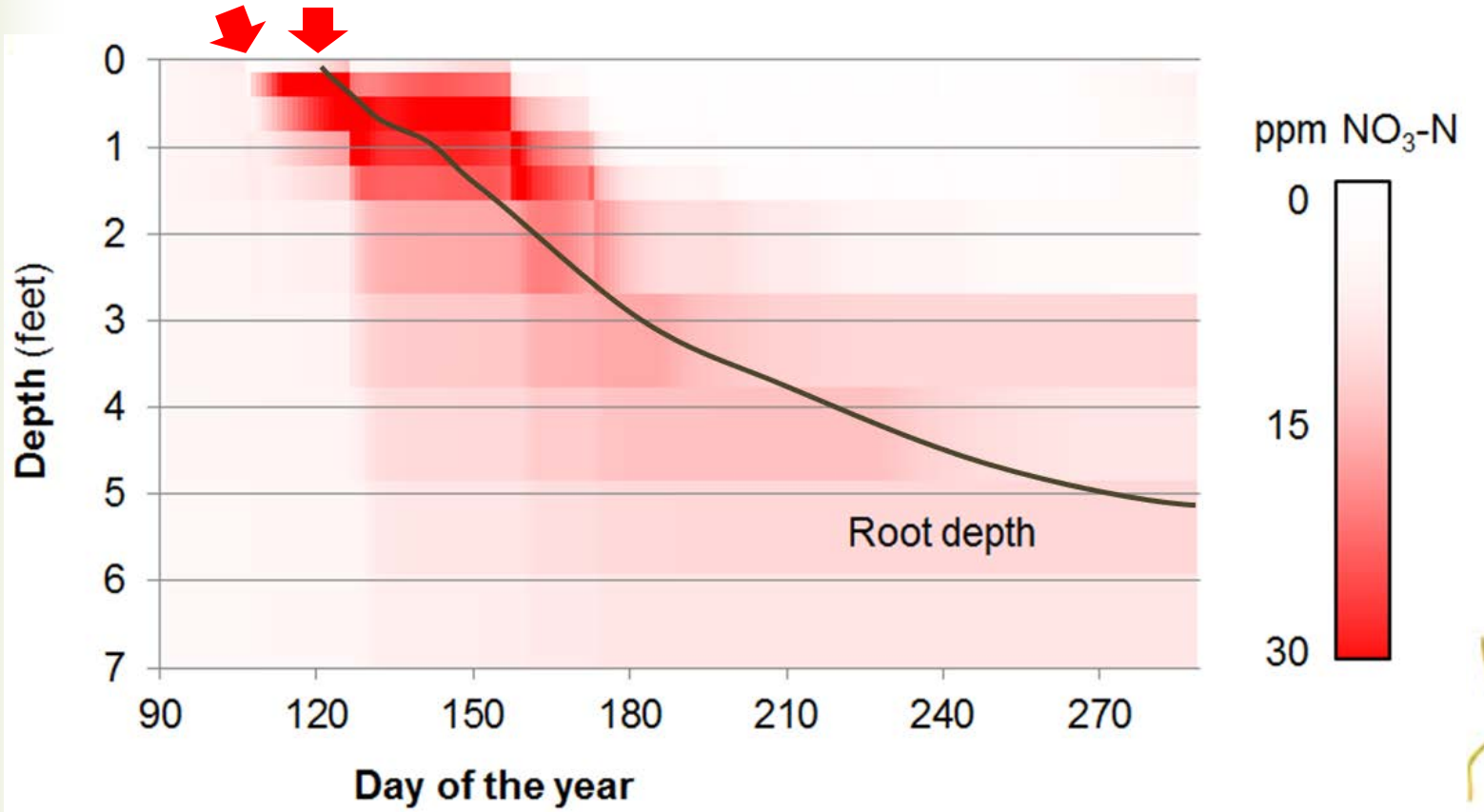
⇨ High risk of nitrate leaching

Irrigation management:
Early season excess water



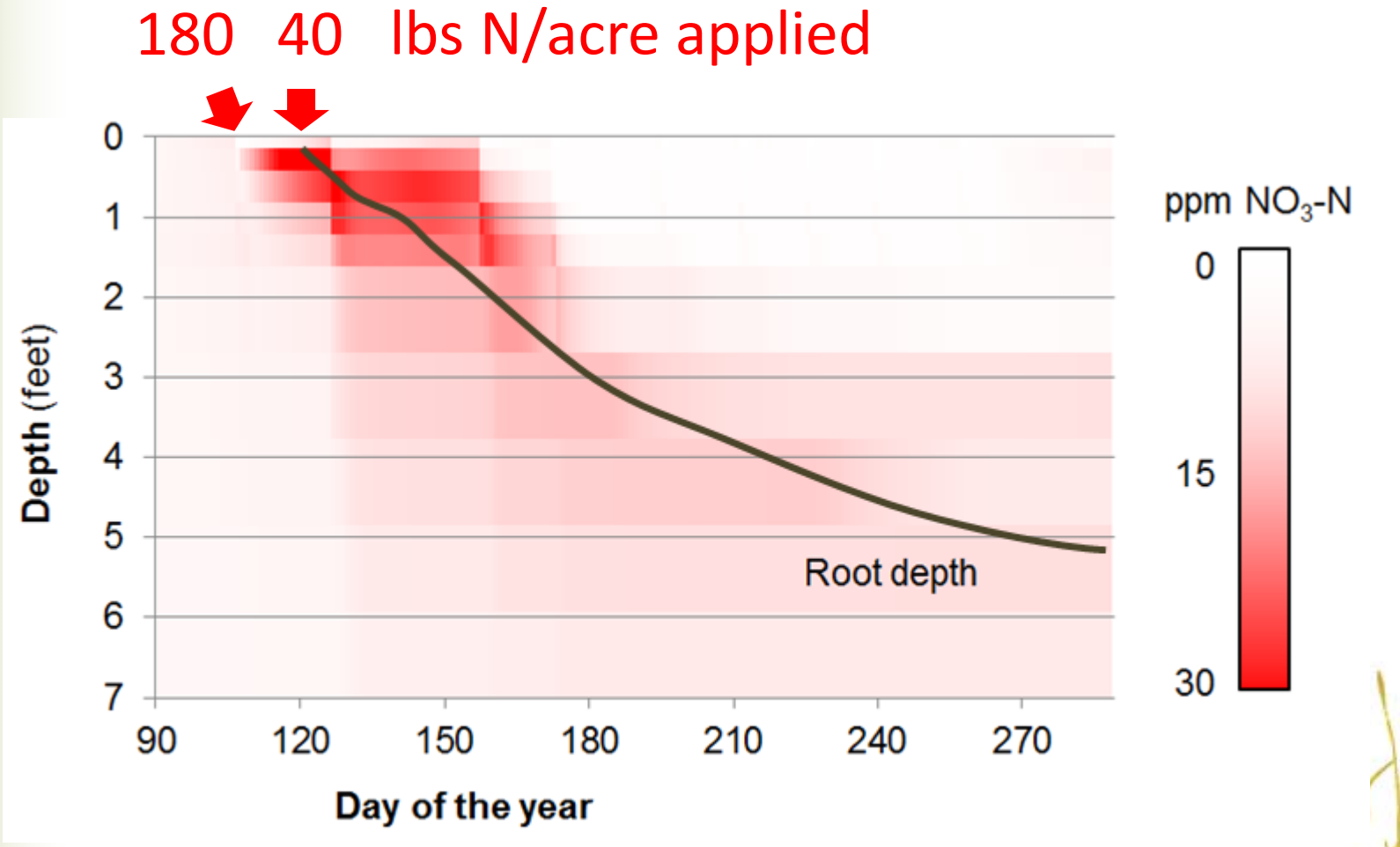
Irrigation management:
Early season excess water

250 40 lbs N/acre applied



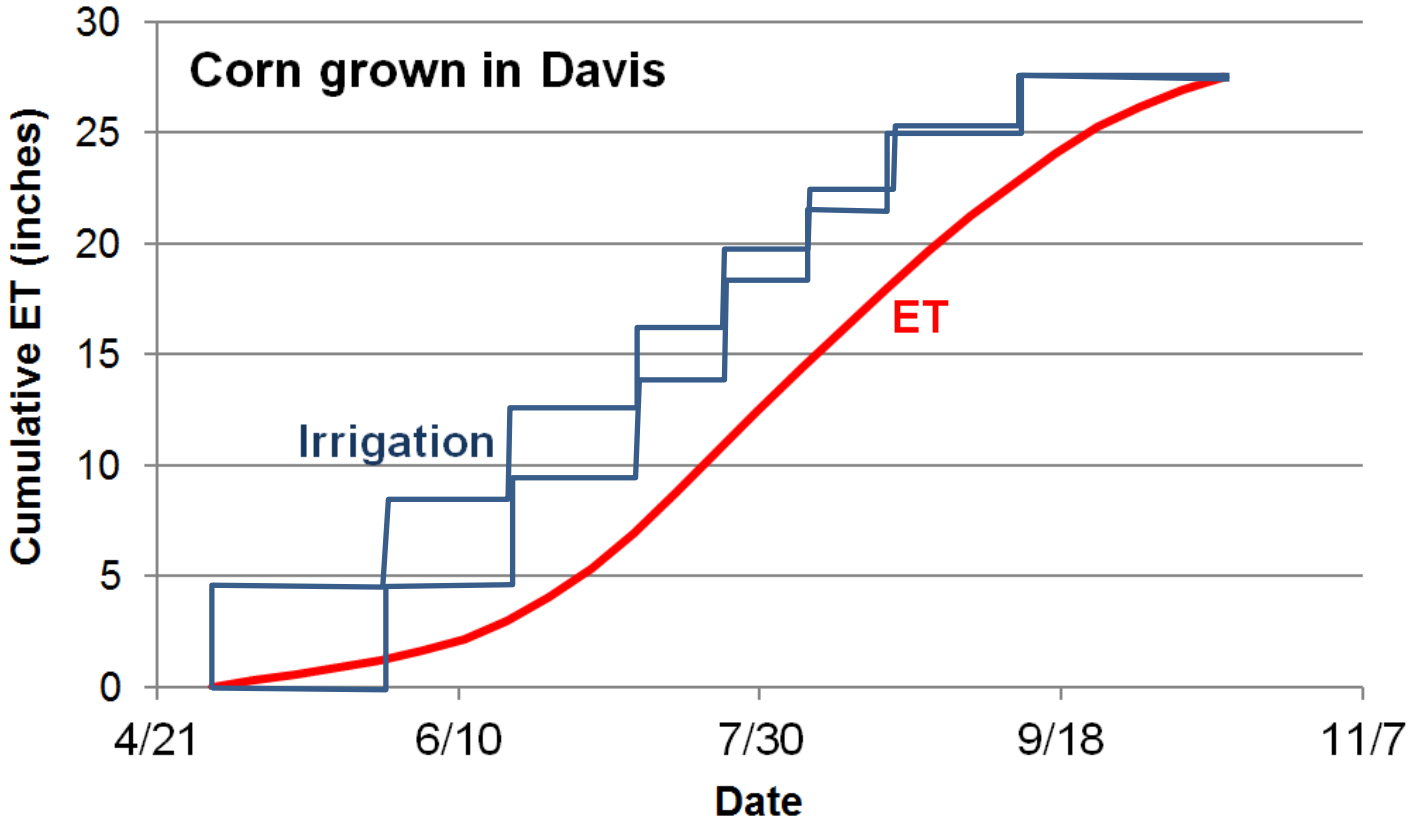
Grain yield: 7,740 lbs/acre

When adjusting N application rate….



Grain yield: 7,210 lbs/acre (-10%)

Irrigation management:
Optimal irrigation timing



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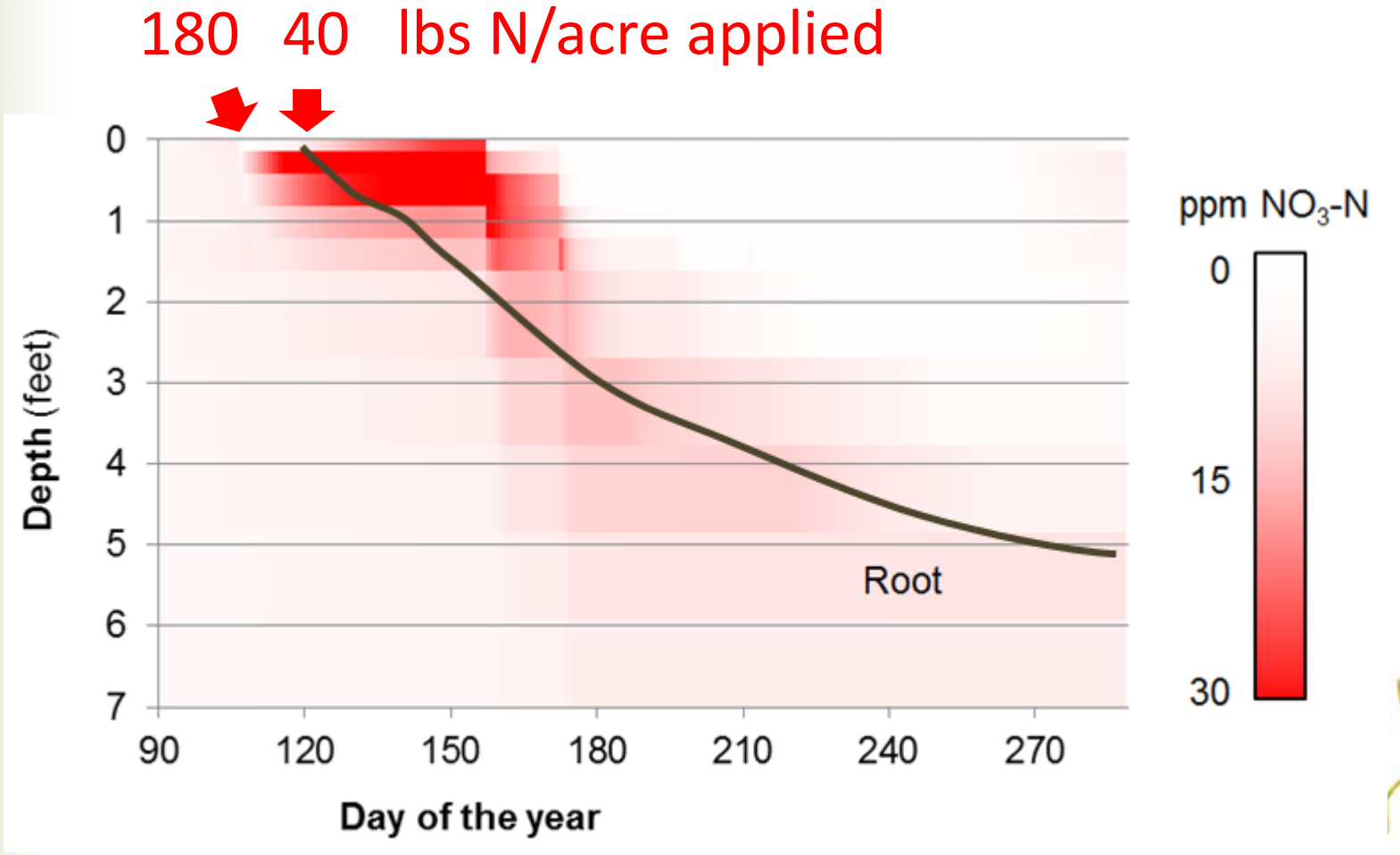
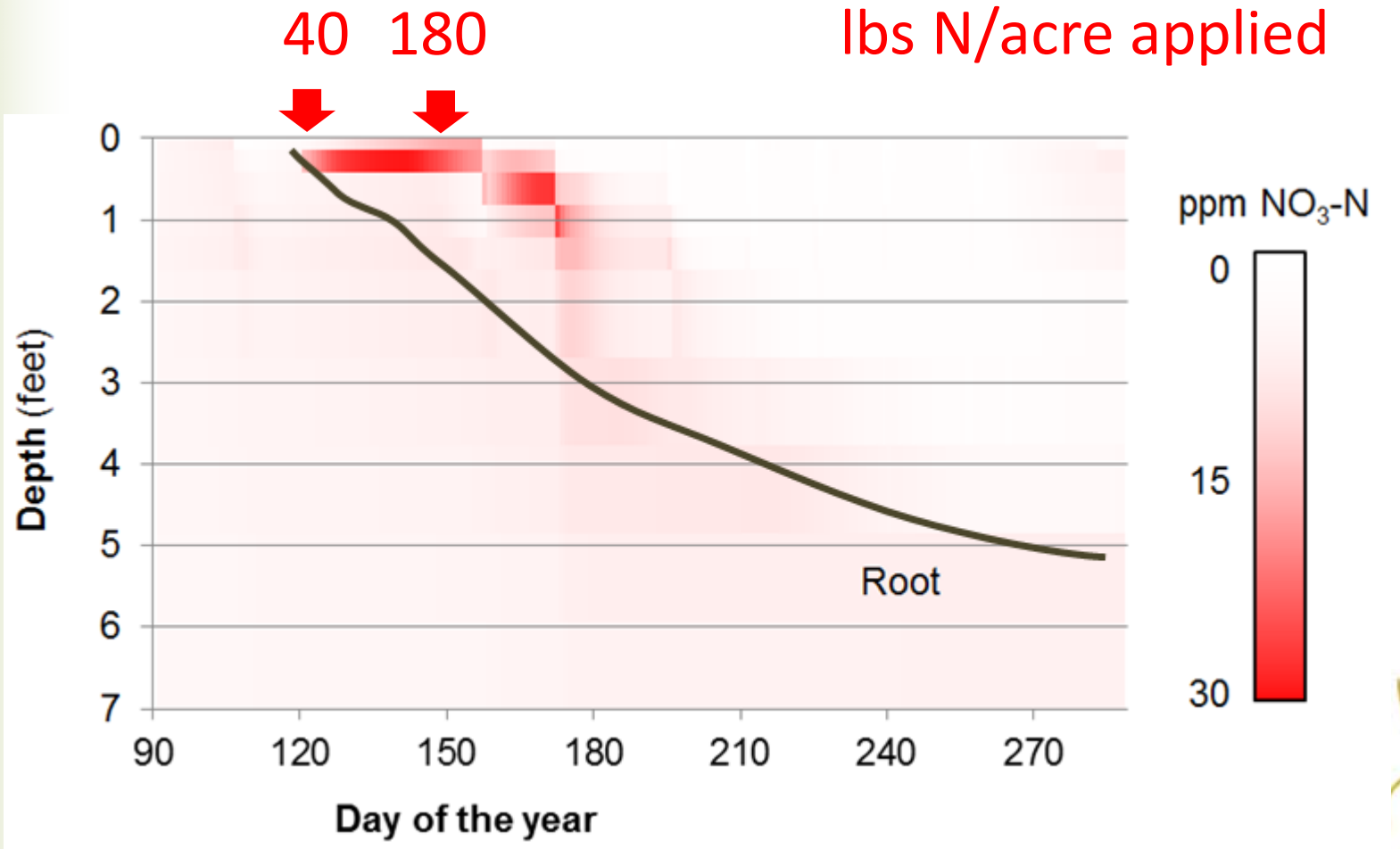


Grain yield: 8,930 lbs/acre (+15%)

Optimal timing of water application and sidedress N



Grain yield: 9,130 lbs/acre (+18%)

Conclusions

- Irrigation management and N use efficiency are closely linked
- Nitrogen fertilizer should not be applied far in advance of crop uptake
- Residual soil nitrate needs to be taken into account
- If N rate needs to be reduced, make sure that fertilizer N is used efficiently (optimize irrigation and time and mode of fertilizer application first)

The 6 Rs of N management in irrigated agriculture