Egan Spring Wheat Management

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Optimizing N and Water Use for Sustainable Wheat Production: A collaborative project with Univ. of Idaho

Egan

- Developed for resistance in wheat midge via *sm1* gene
- Stripe rust resistance (*Yr36*)
- The first variety developed with high grain protein content (*Gpc-B1)* gene

Egan- a pest control tool

- Nitrogen Management
- Water Management

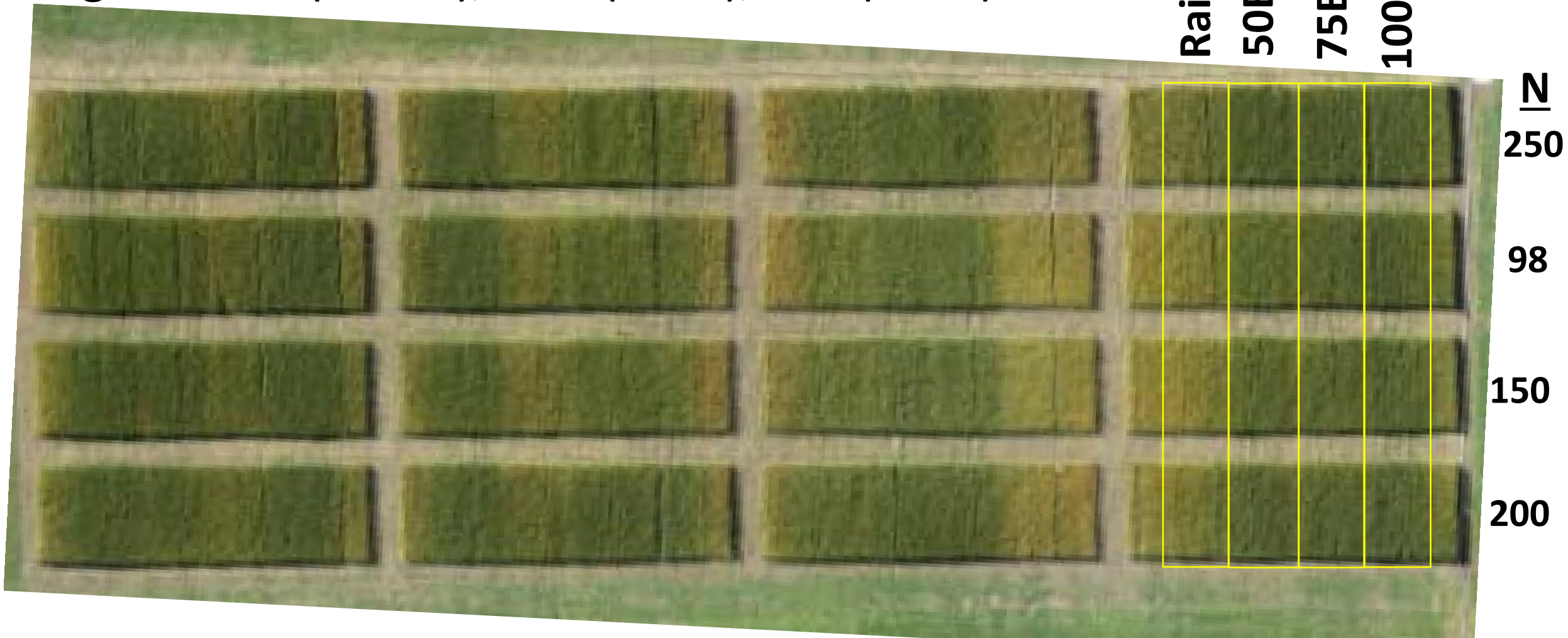
Objective: Determine the optimal N and water requirement for Egan

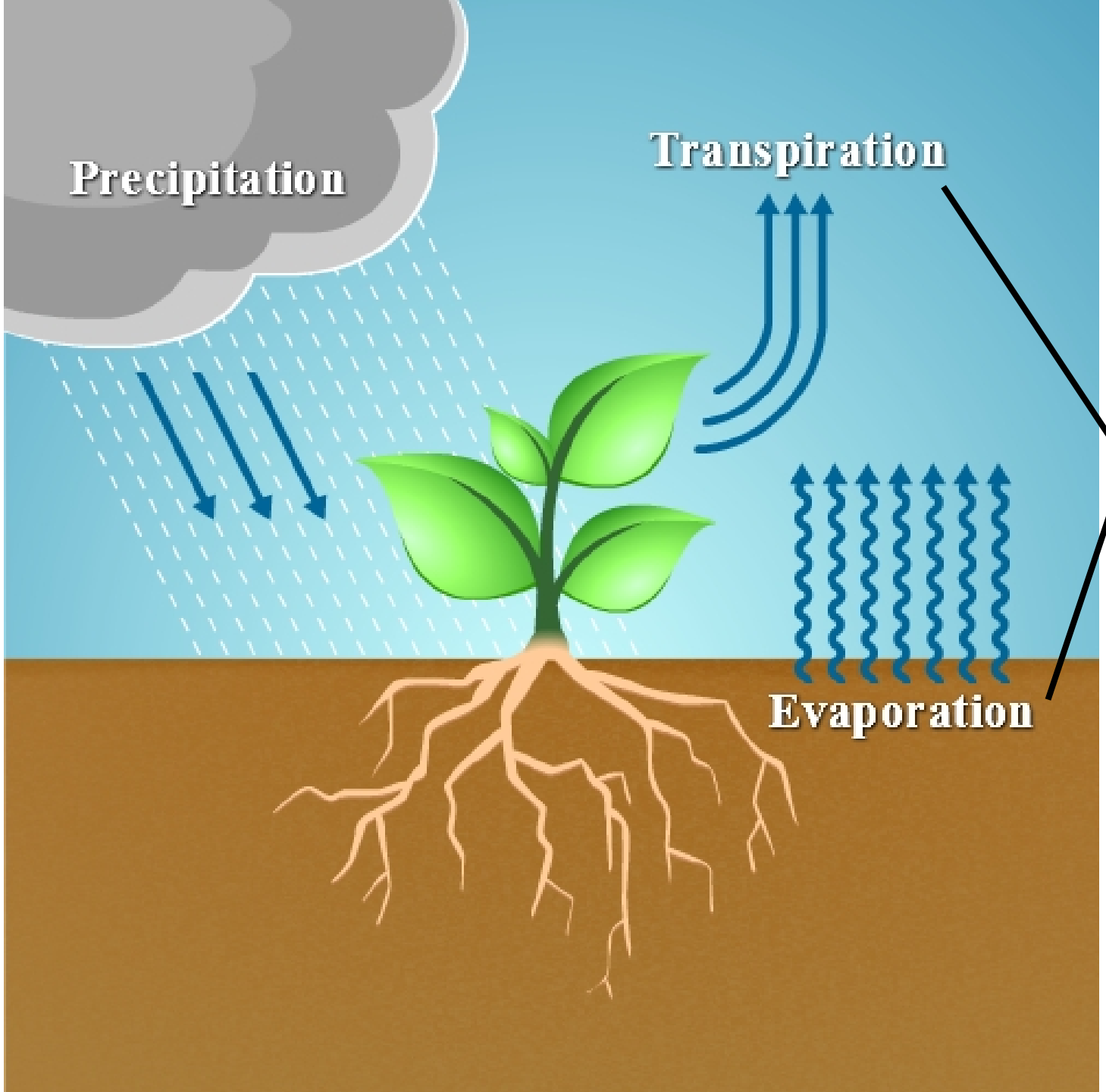
Row spacing: 8 inches; Target population: 25 plants/ft2

Available Soil Water @spring: 2.8”

Total Rainfall: 6.2”

Irrigation: 5” (100ET), 3.8” (75ET), 2.5”(50ET)





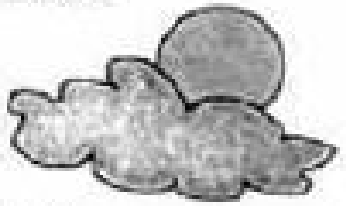
Evapotranspiration (ET)

Creston, Montana AgriMet Weather Station (CRSM)

Latitude: 48.1875 N
Longitude: 114.12777 W
Elevation: 2950'
Installation Date: 4/1/1988

http://www.usbr.gov/pn/agrimet/agrimetmap/crsmda.html

climate



Radiation
Temperature
Wind speed
Humidity

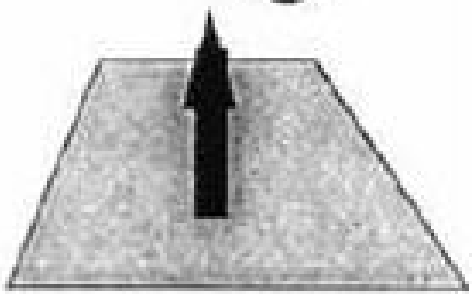
+

grass reference crop

well watered grass

=

ET_o



K_c factor

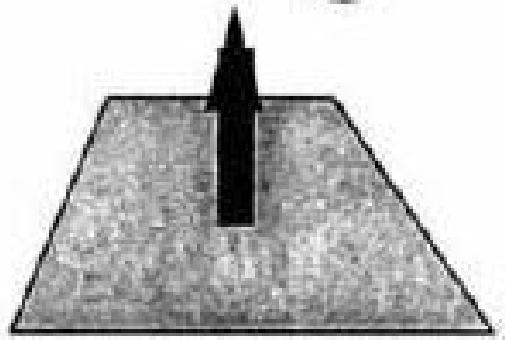
ET_o x

well watered crop

optimal agronomic conditions

=

ET_c



Daily Crop Water Use (Crop ET)

ETc = ETo x Kc

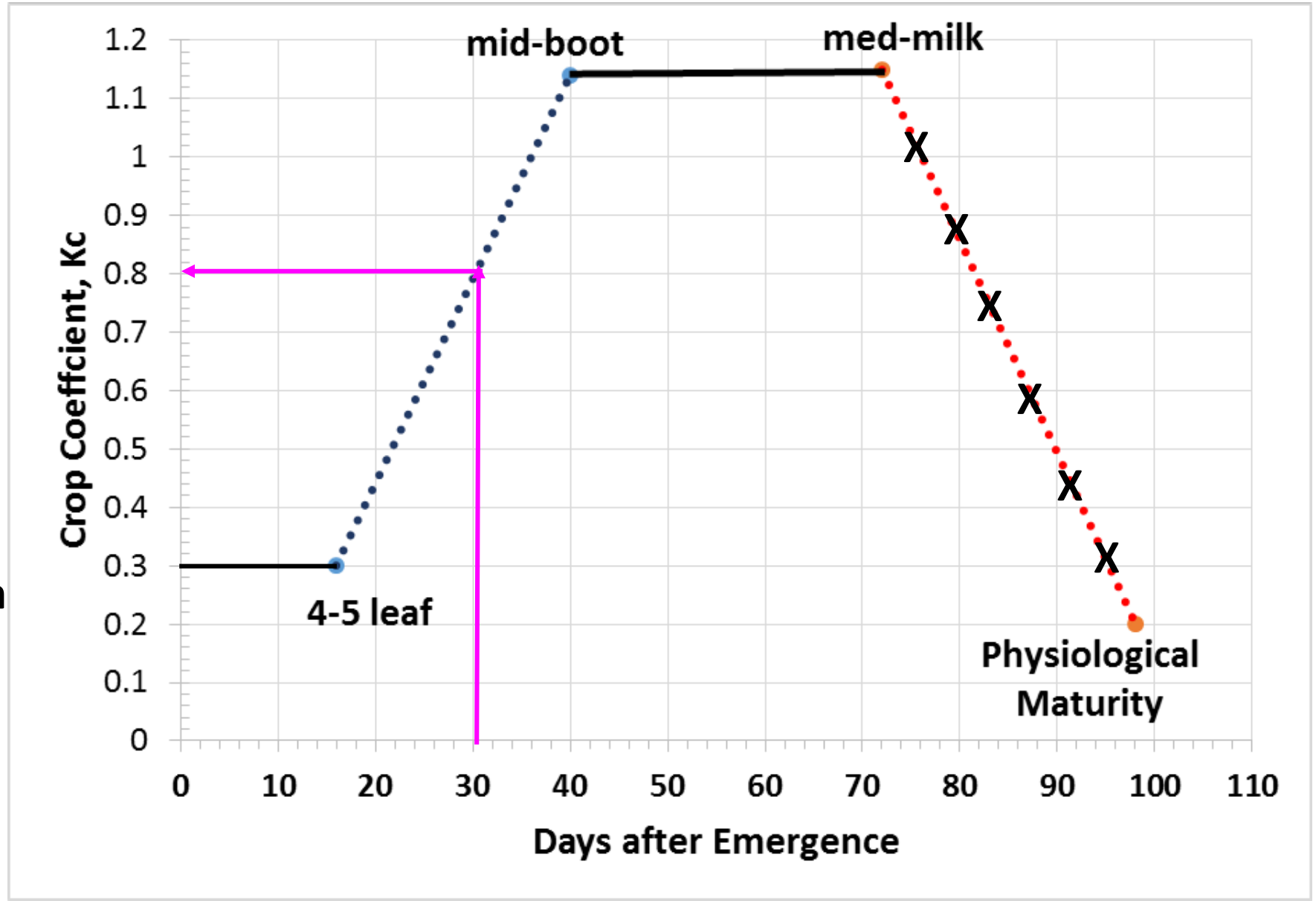
For example:

<u>Creston W. Station</u>

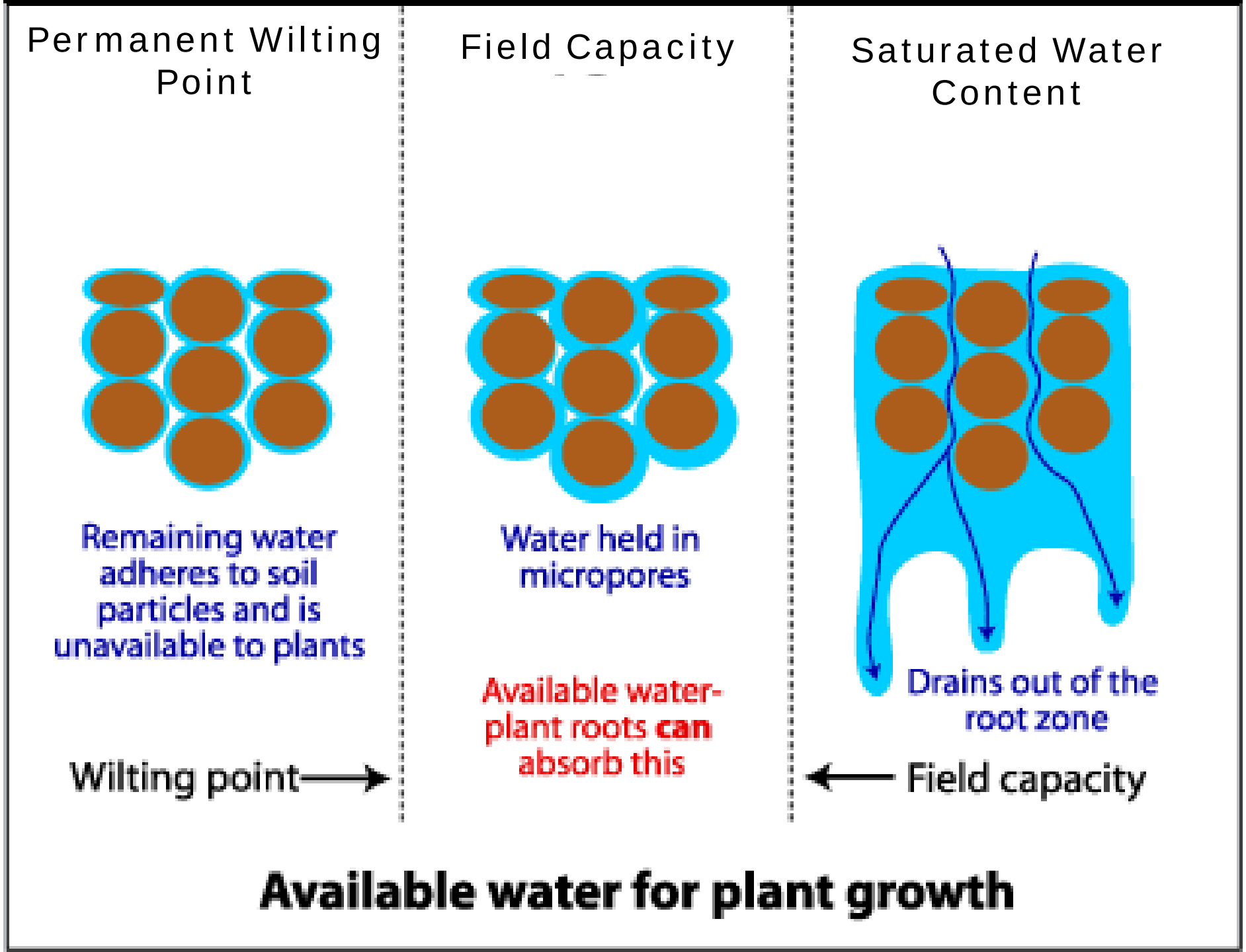
ETo: <u>0.4</u>

Current Kc: 0.8

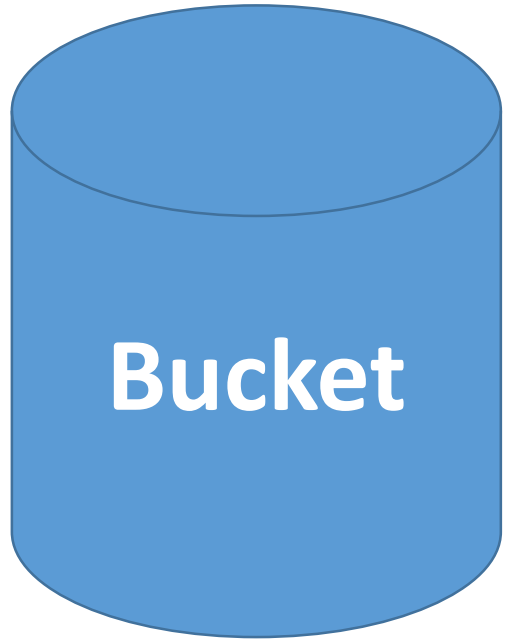
ETc=0.4 x 0.8 = 0.32 in



http://www.usbr.gov/pn/agrimet/cropcurves/crop_curves.html


Permanent Wilting Point
Field Capacity
Saturated Water Content
Remaining water adheres to soil particles and is unavailable to plants
Water held in micropores
Drains out of the root zone
Available water- plant roots can absorb this
Wilting point
Field capacity
Available water for plant growth

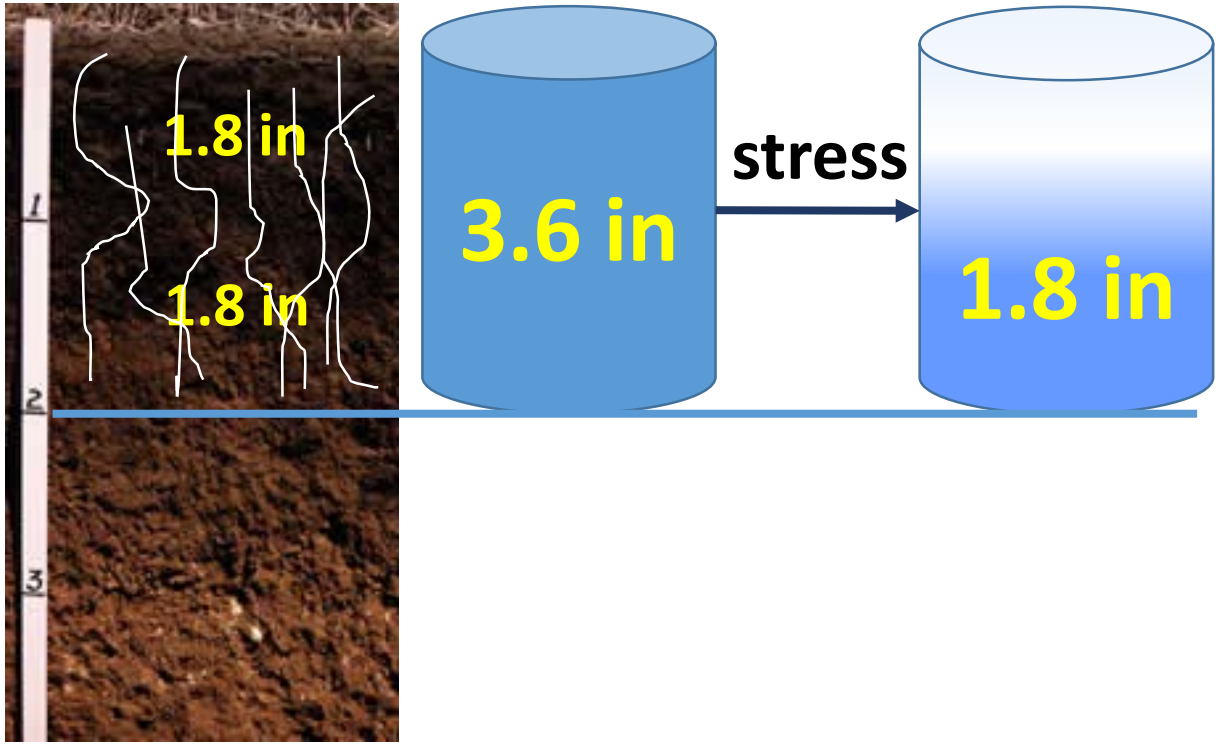
Soil Texture	Water Holding Capacity (in/ft soil)
Coarse sand	0.25-0.75
Fine sand	0.75-1.00
Loamy sand	1.10-1.20
Sandy loam	1.25-1.40
Fine sandy loam soil	1.50-2.00
Silt loam	2.00-2.50
Silty clay loam	1.80-2.00
Silty clay	1.50-1.70
Clay	1.20-1.50



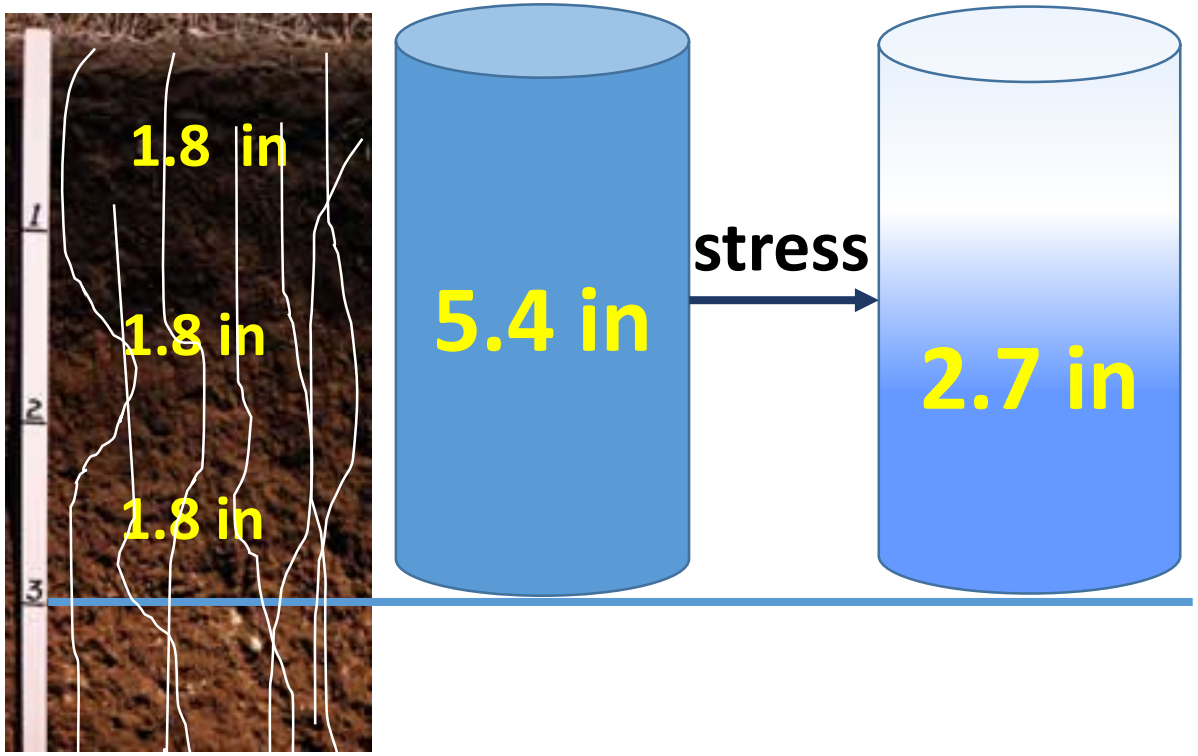
https://casoilresource.lawr.ucdavis.edu/gmap/

https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Water Holding Capacity of a Fine Sandy Loam Soil

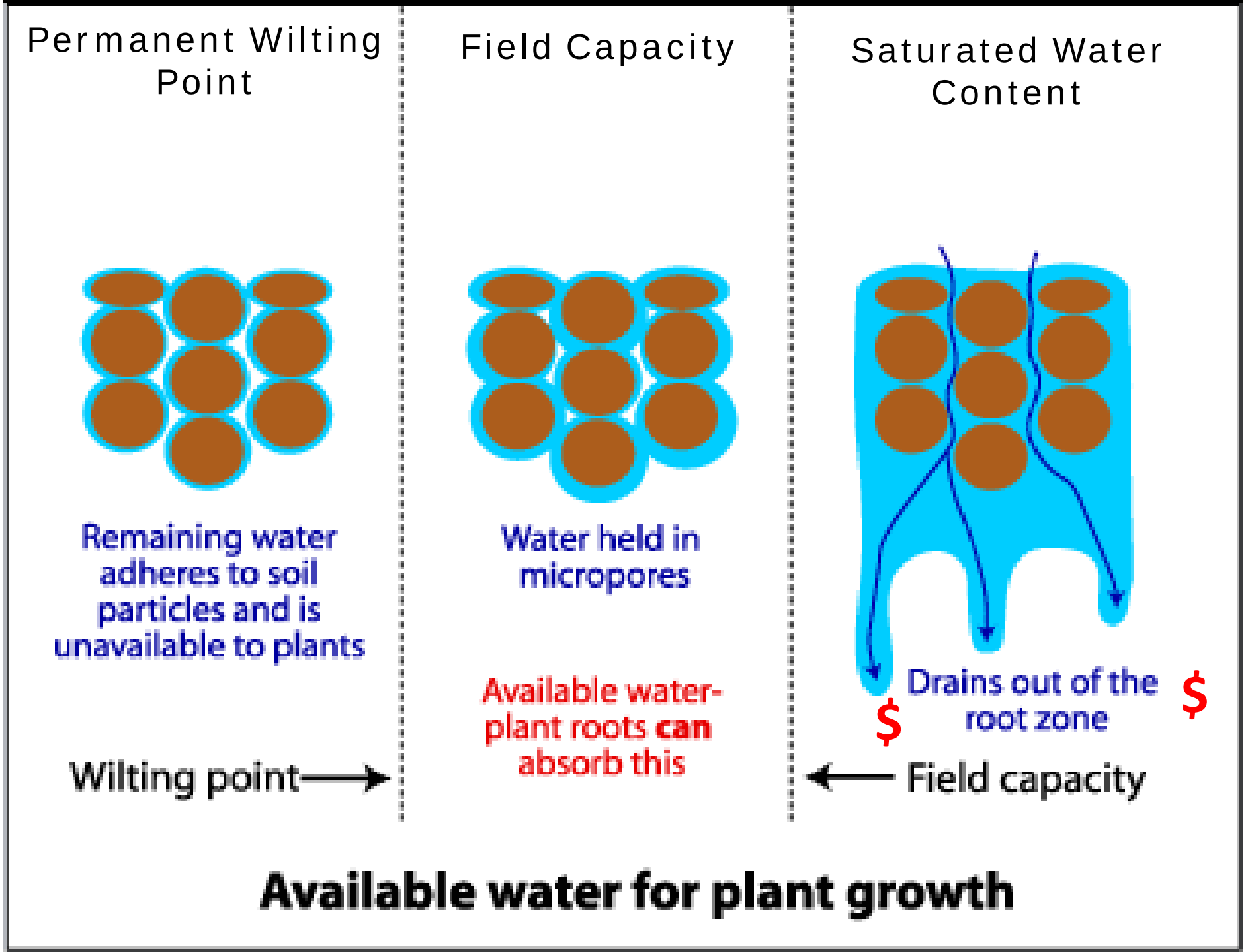


1.5 or 2 ft Soil Depth to Consider: early vegetative



3 ft Soil Depth to Consider: ~Boot

$PAW_{Today} = PAW_{yesterday} - CropET - Other\ Losses + Rainfall + Irrigation$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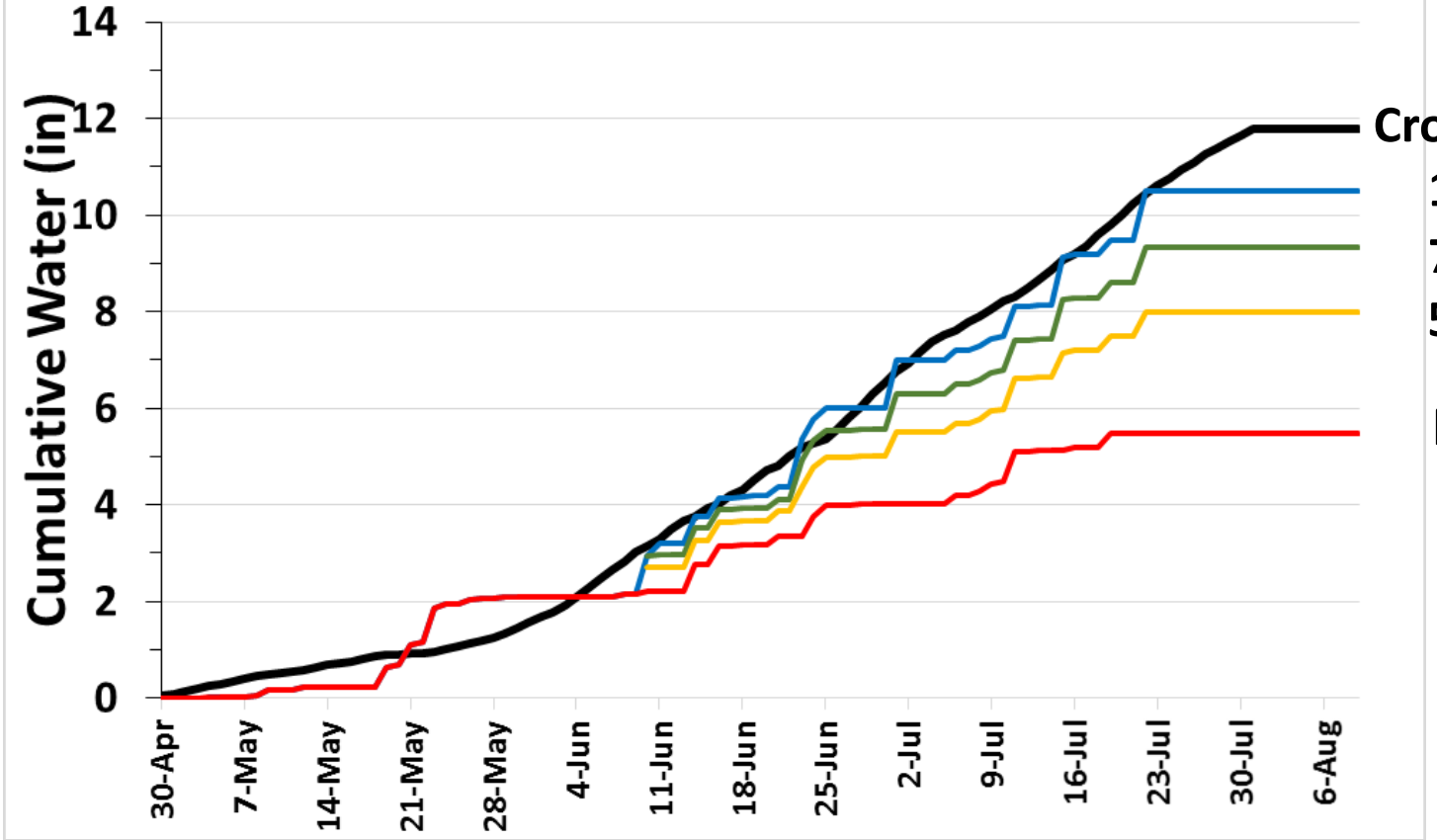
Field Capacity
Saturated Water Content
Remaining water adheres to soil particles and is unavailable to plants
Water held in micropores
Drains out of the root zone
$
$
Available water-plant roots can absorb this
Wilting point
Field capacity
Available water for plant growth



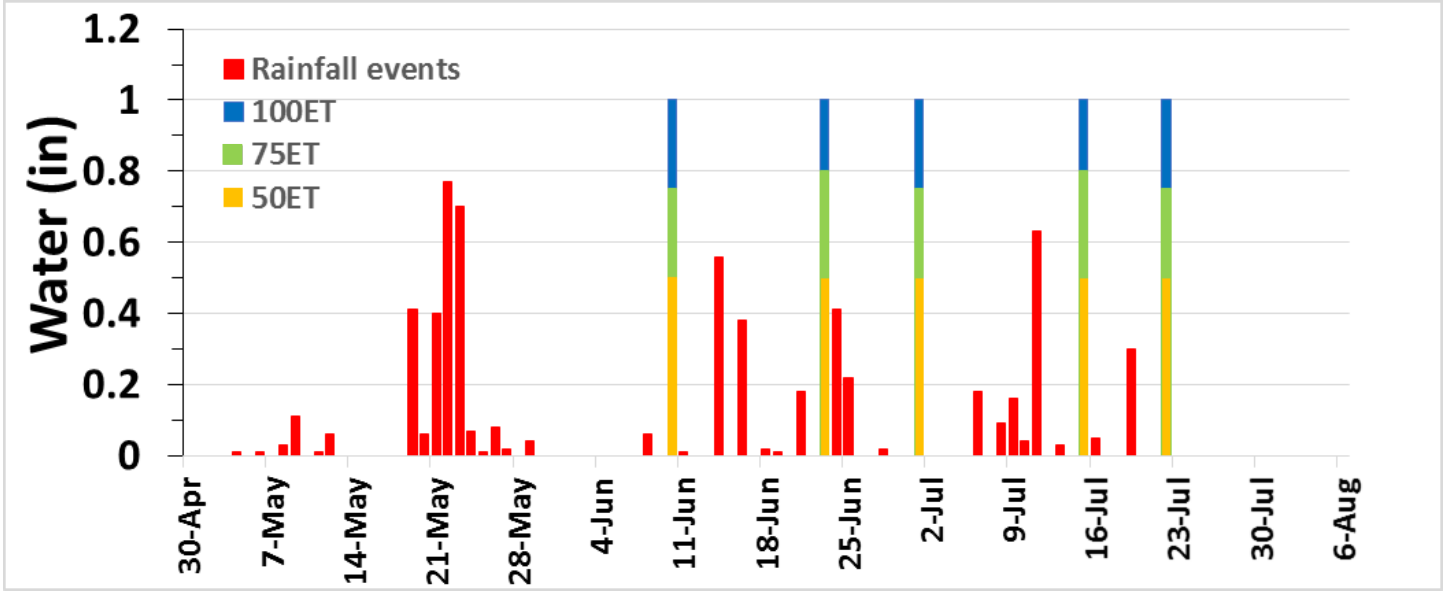
Crop ET : ~12 inches Total

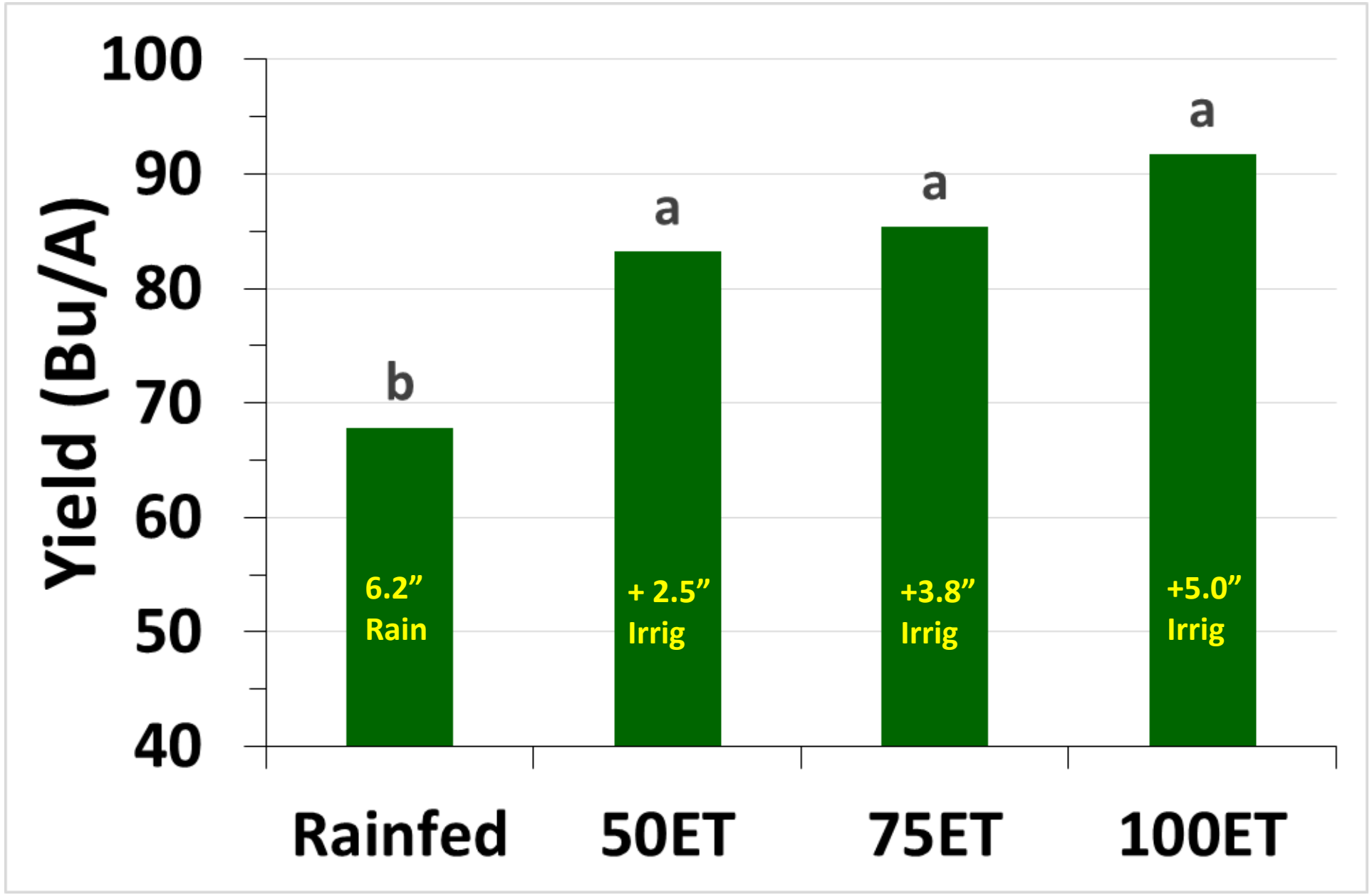
100ET (+ 5.0" I)

75ET (+ 3.8" I)

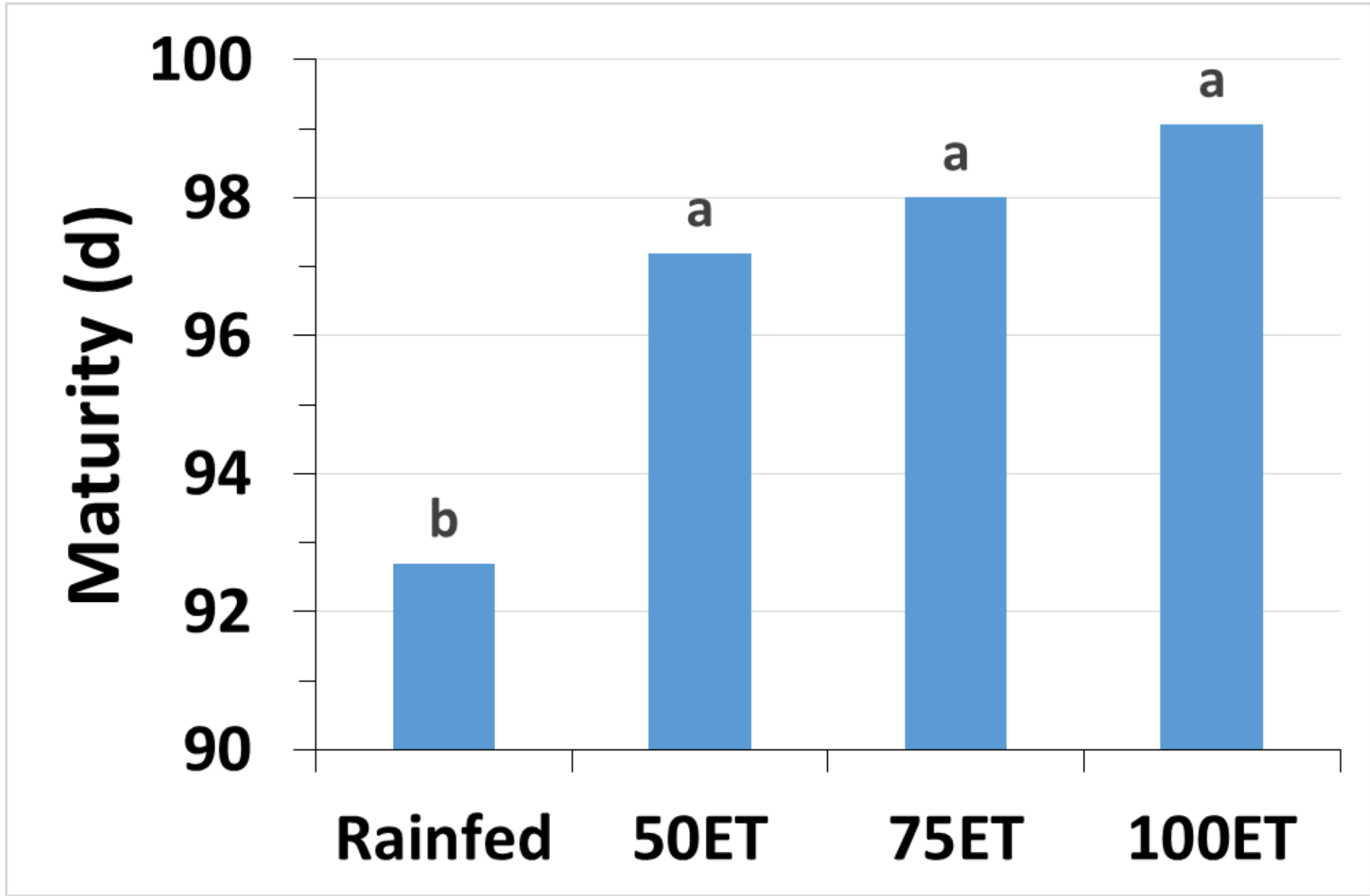
50ET (+ 2.5" I)

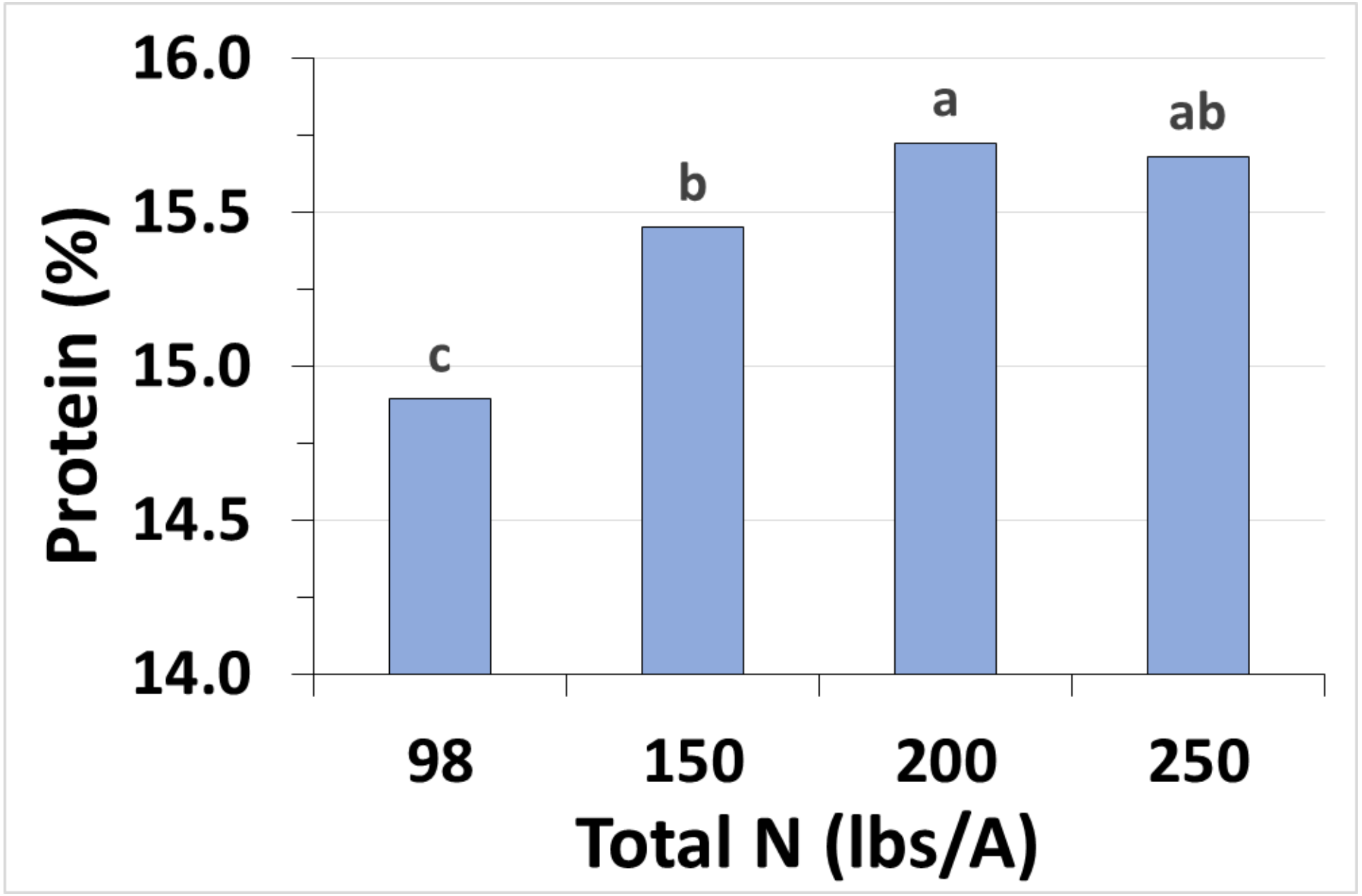
Rainfed



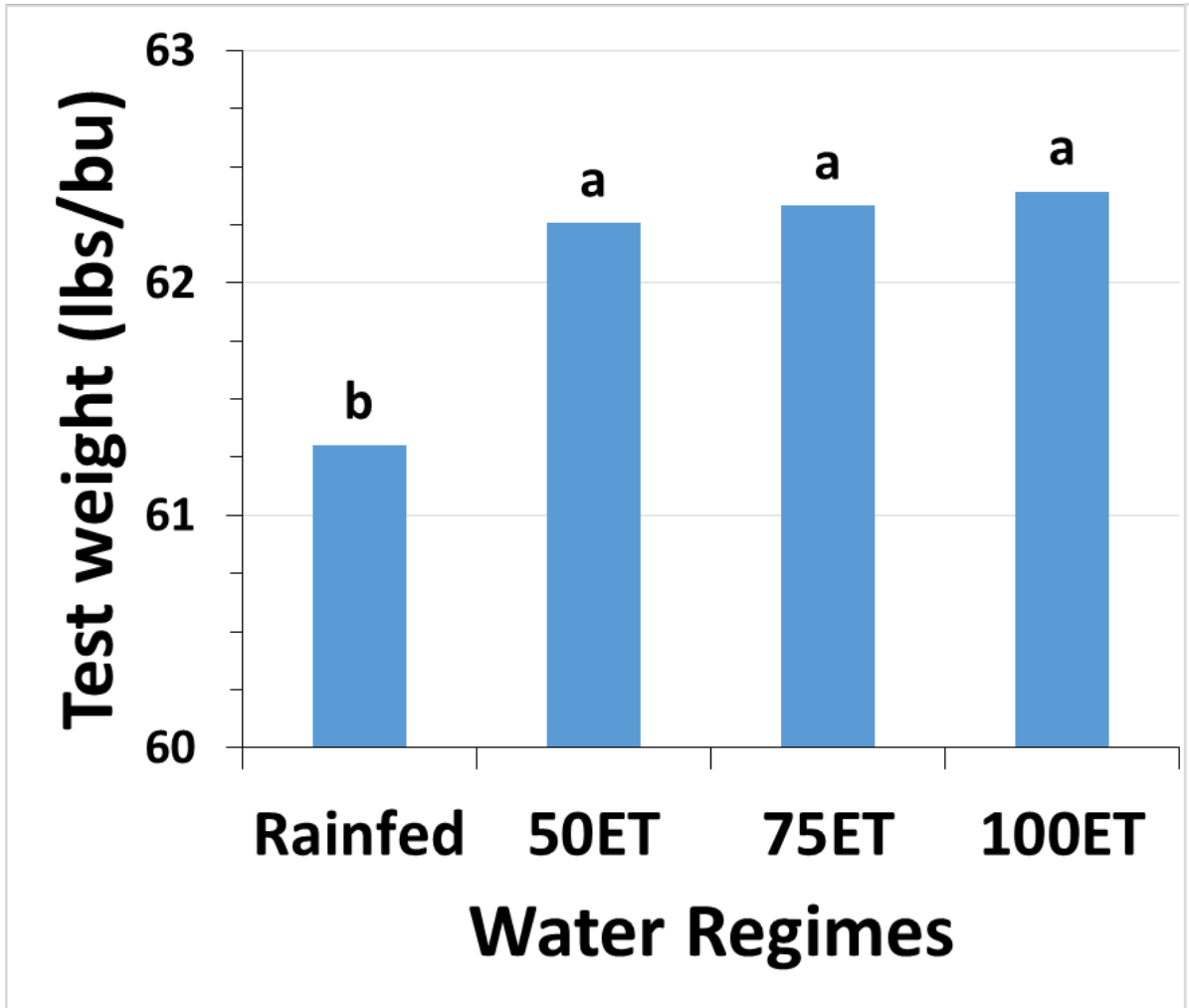


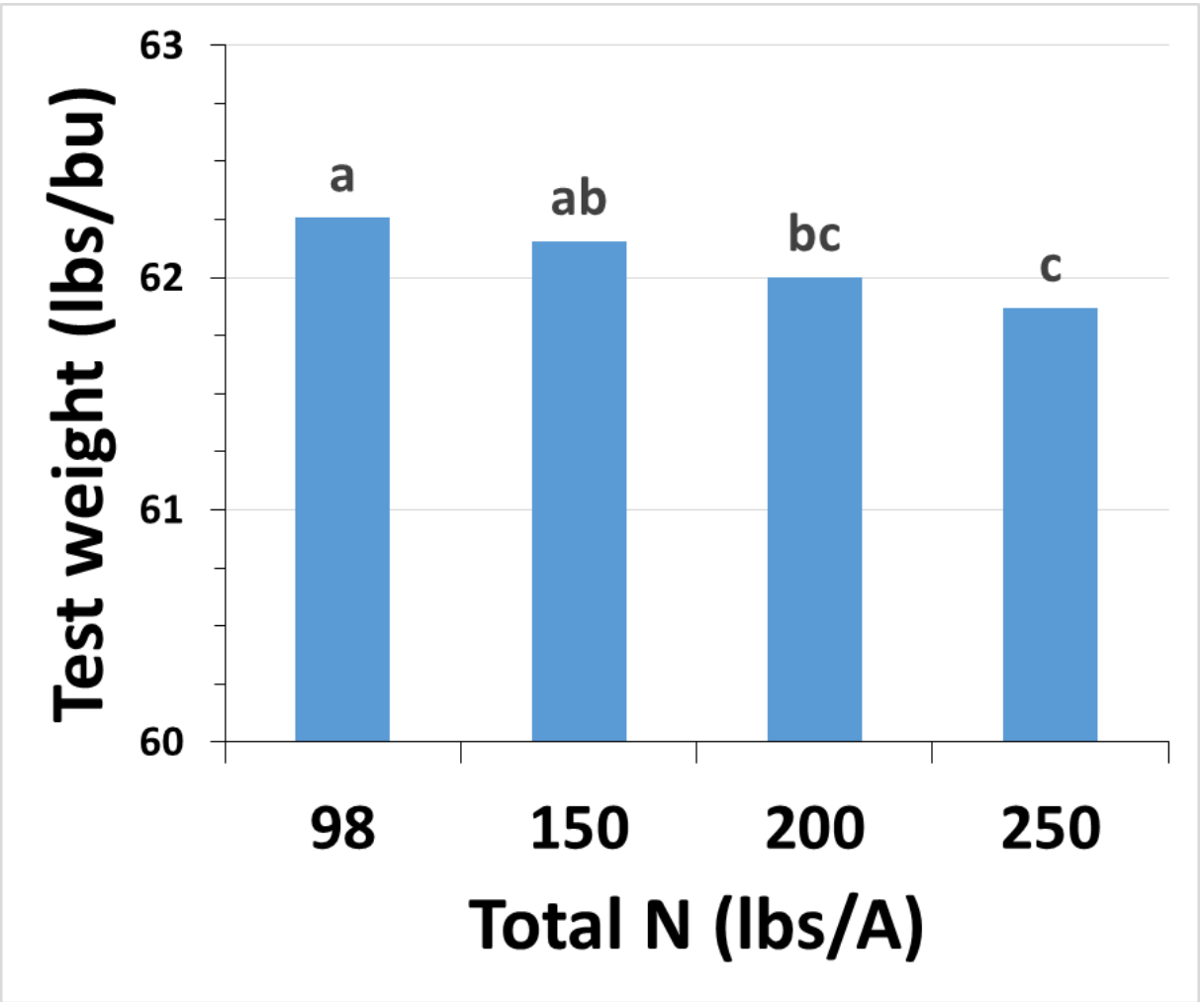
Water: 0.0025
N: 0.2948
Water x N: 0.5526

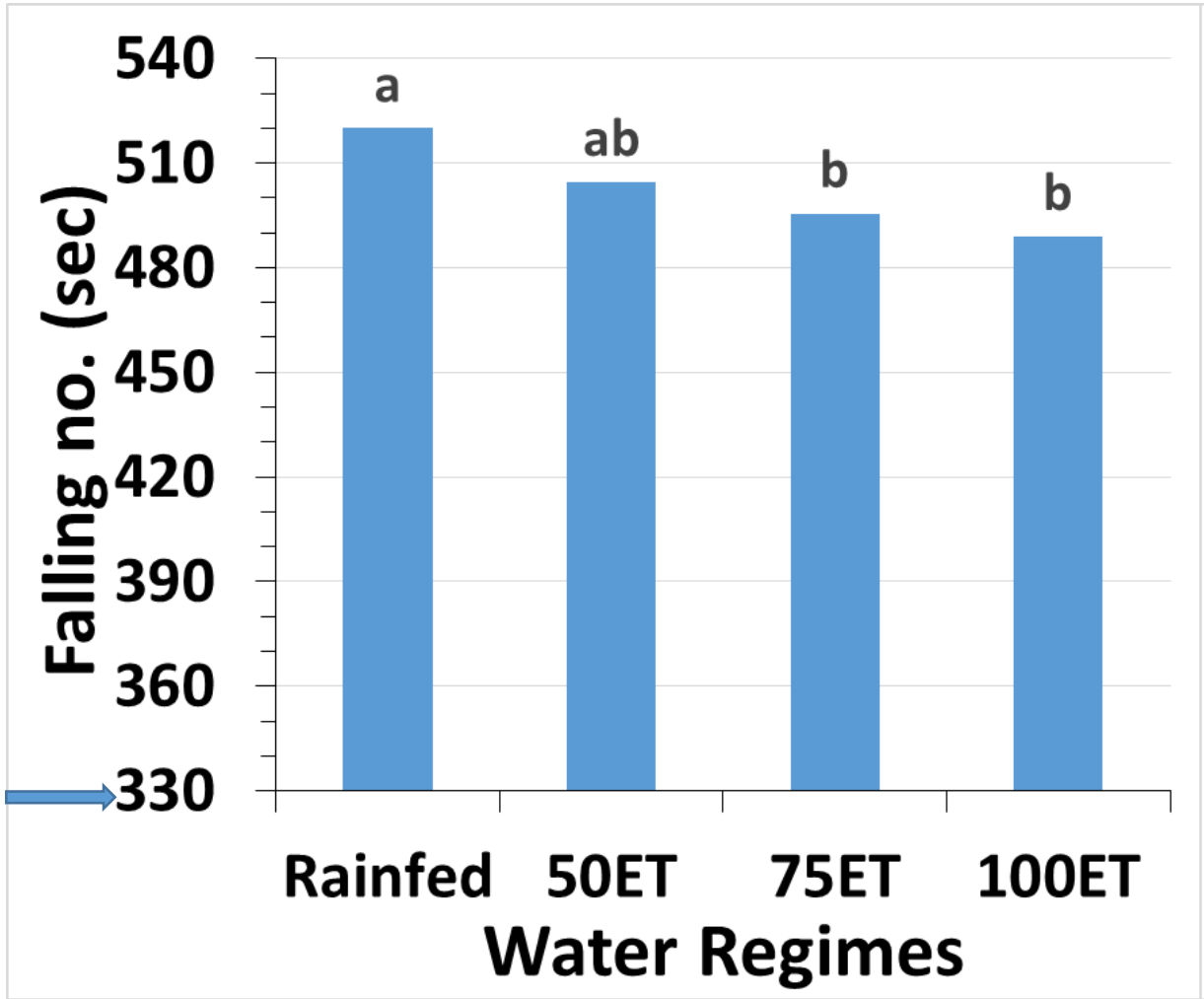

Maturity (d)
100
98
96
94
92
90
b
a
a
a
Rainfed
50ET
75ET
100ET

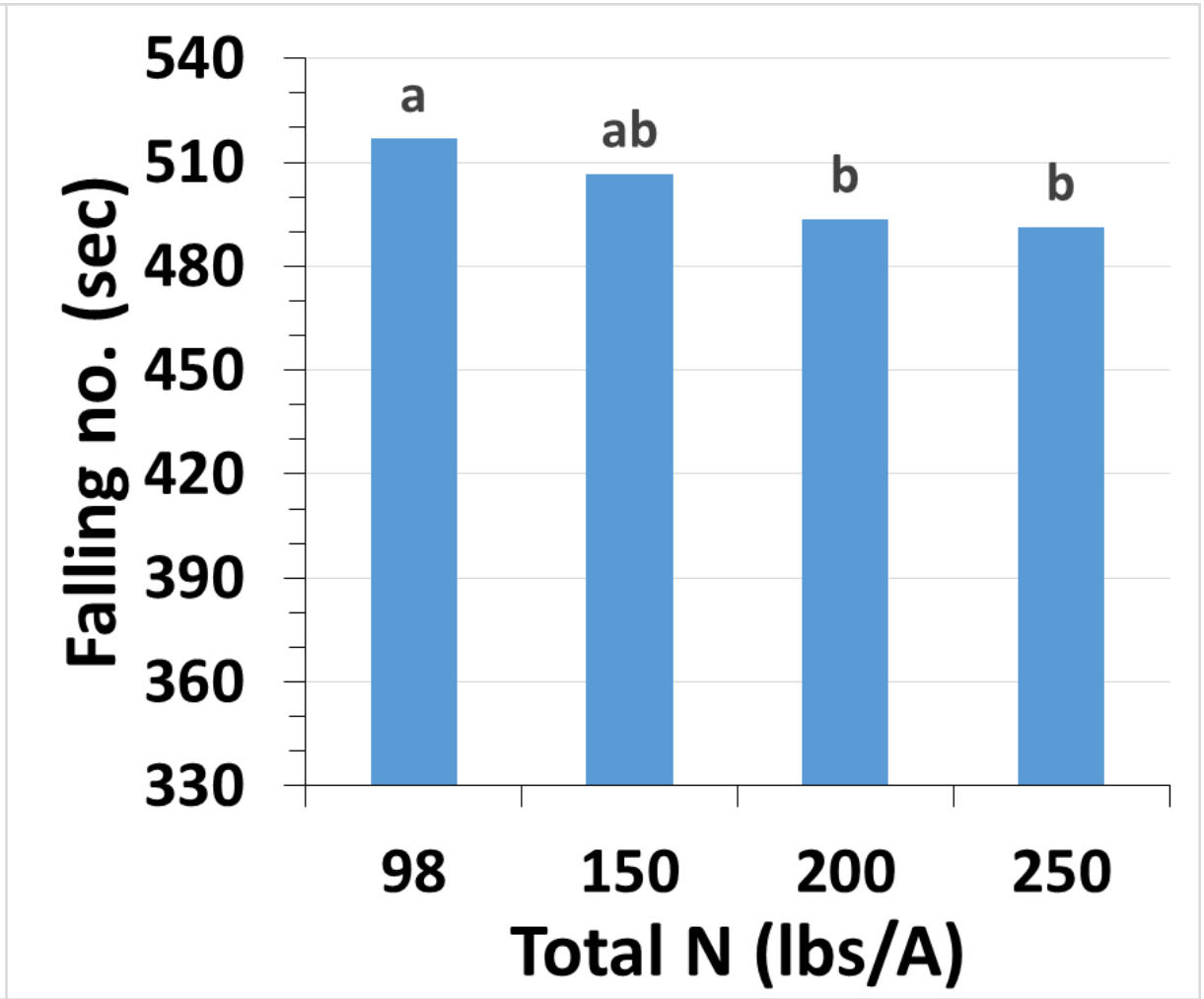


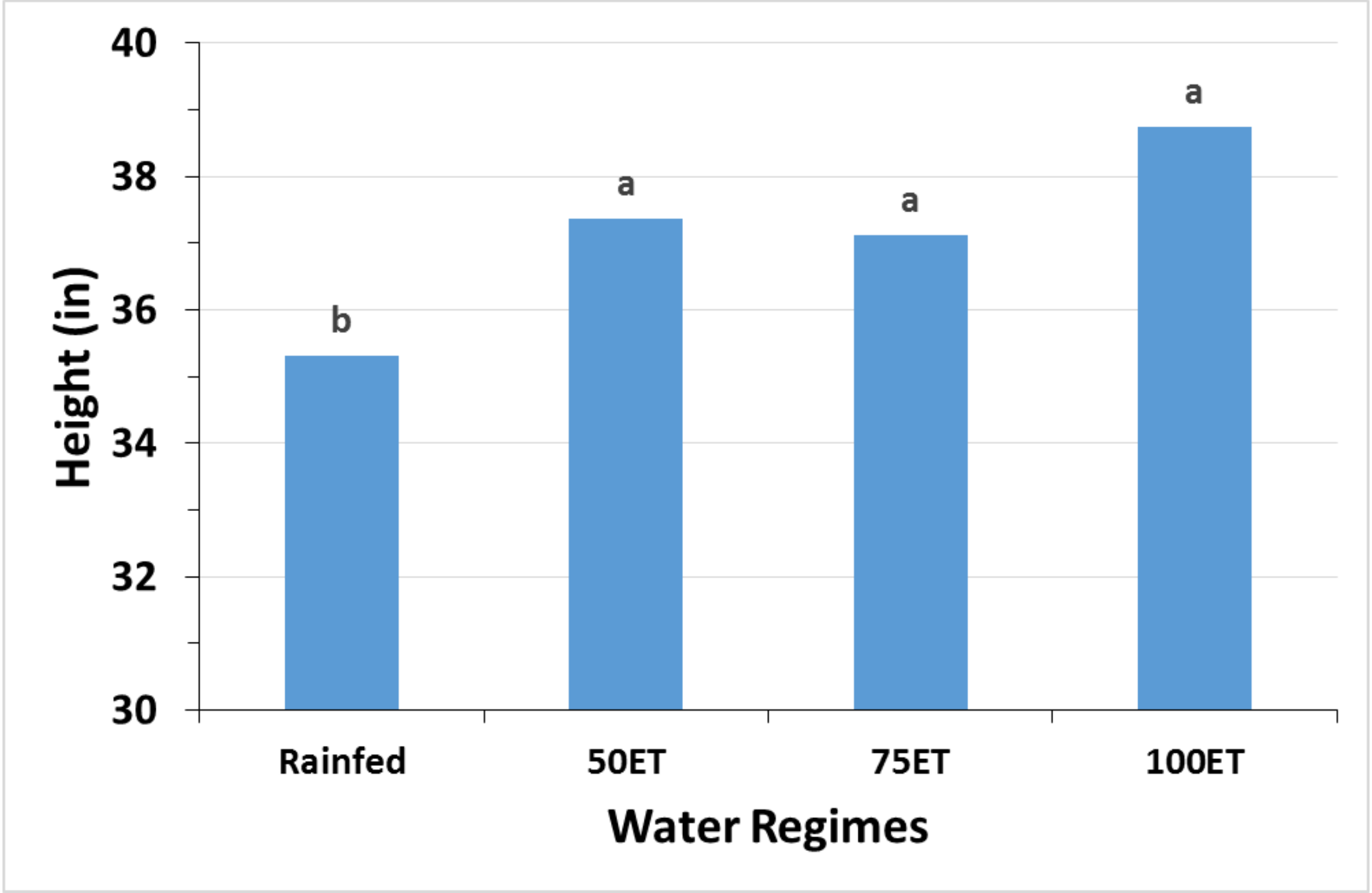
Water: 0.9261
N: 0.0001
Water x N: 0.0662

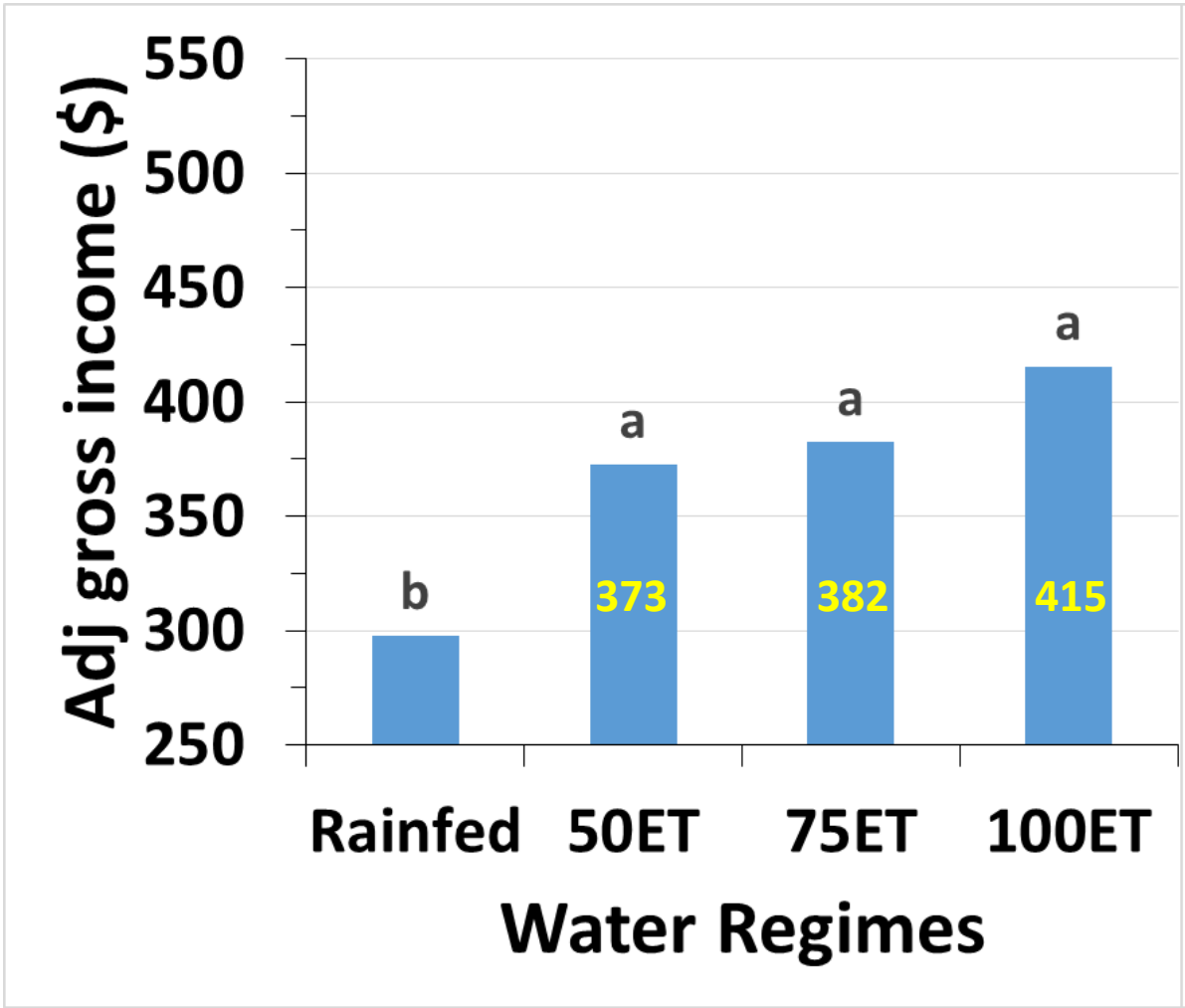

Test weight (lbs/bu)
63
62
61
60
b
a
a
a
Rainfed
50ET
75ET
100ET
Water Regimes

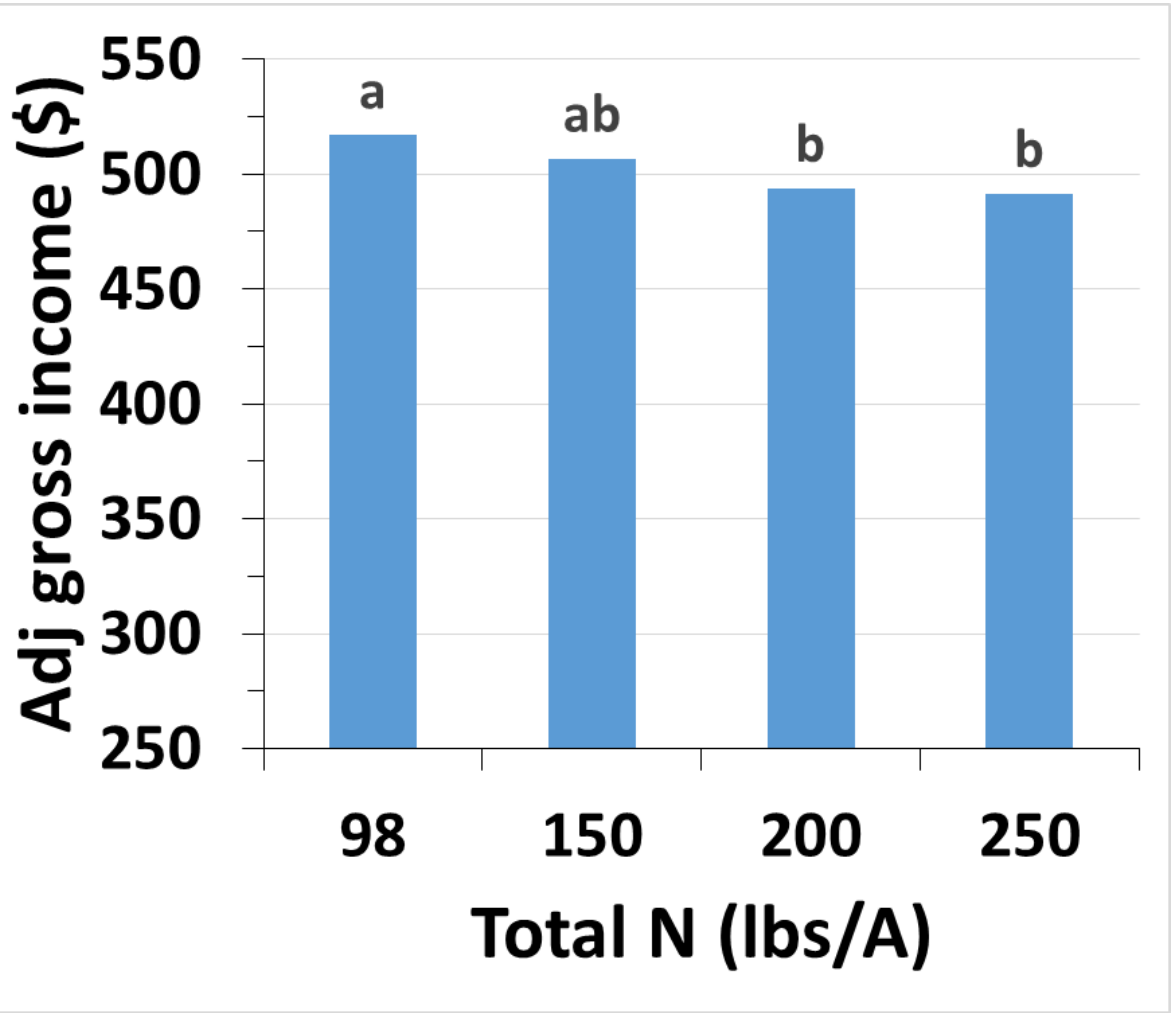

Test weight (lbs/bu)
63
62
61
60
a
ab
bc
c
98
150
200
250
Total N (lbs/A)

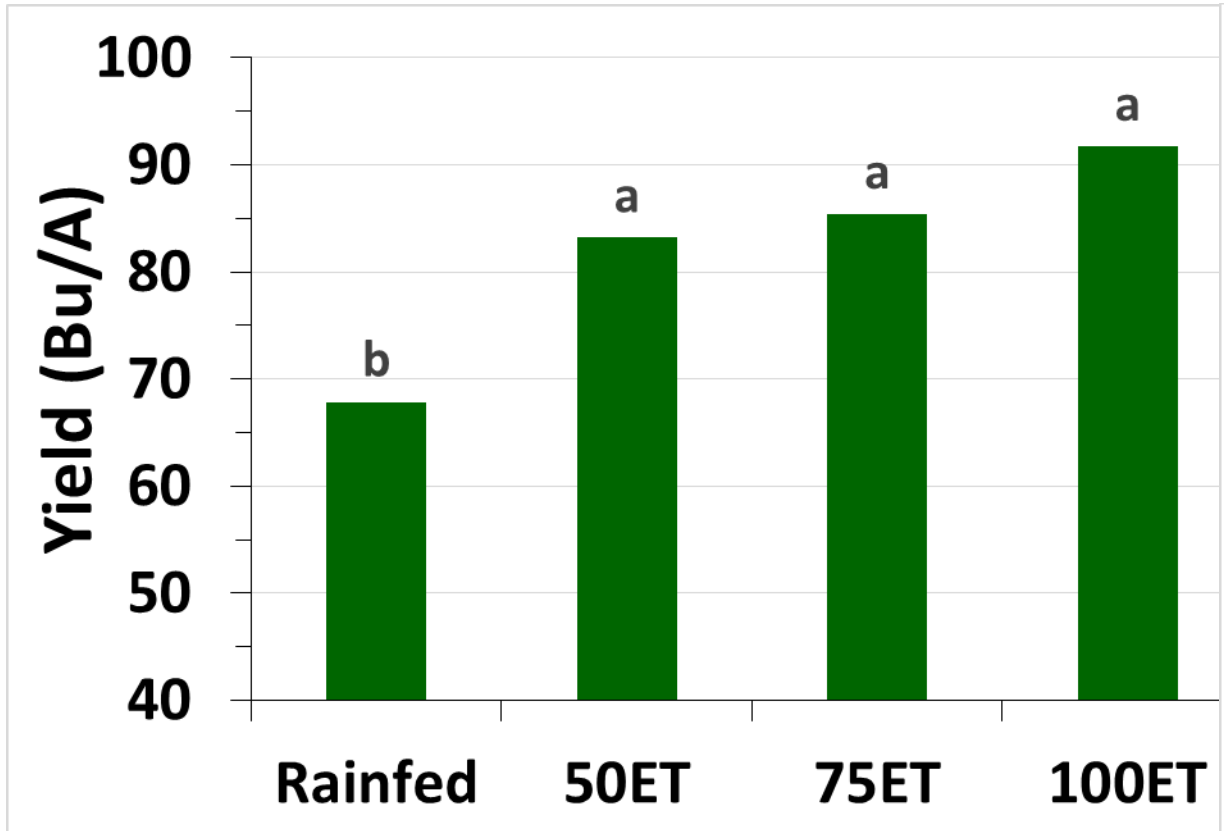

Falling no. (sec)
540
510
480
450
420
390
360
330
a
ab
b
b
Rainfed
50ET
75ET
100ET
Water Regimes

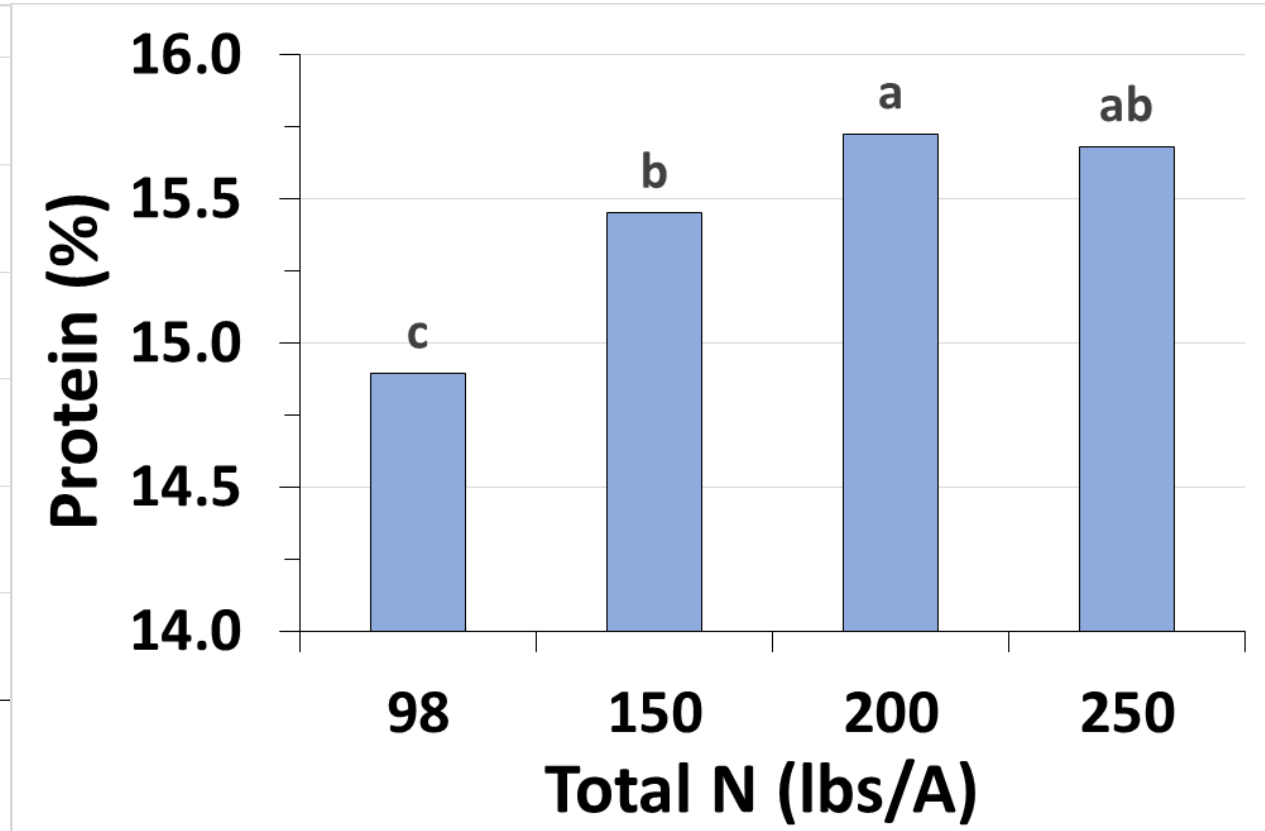

Falling no. (sec)
540
510
480
450
420
390
360
330
a
ab
b
b
98
150
200
250
Total N (lbs/A)


40
38
36
34
32
30
Height (in)
b
a
a
a
Rainfed
50ET
75ET
100ET
Water Regimes


Adj gross income ($)
550
500
450
400
350
300
250
b
a
a
a
373
382
415
Rainfed
50ET
75ET
100ET
Water Regimes


Adj gross income ($)
550
500
450
400
350
300
250
a
ab
b
b
98
150
200
250
Total N (lbs/A)


100
90
80
70
60
50
40
Yield (Bu/A)
b
a
a
a
Rainfed
50ET
75ET
100ET


16.0
15.5
15.0
14.5
14.0
Protein (%)
c
b
a
ab
98
150
200
250
Total N (lbs/A)

Based on 1-yr (2016) data alone

	N Treatment lbs	Irrigation
Yield	98	**50ET**
Protein	200	
Adjusted Gross Income	98 (150)	**50ET**

6.2” R + 2.5” I + ~2.8” spring stored moisture in the soil

DISCUSSION