

IMPROVING IRRIGATION AND NITROGEN MANAGEMENT PRACTICES IN CALIFORNIA DESERT ONIONS



Jairo Diaz¹, Roberto Soto², Daniel Geisseler³

¹UC ANR Desert Research and Extension Center

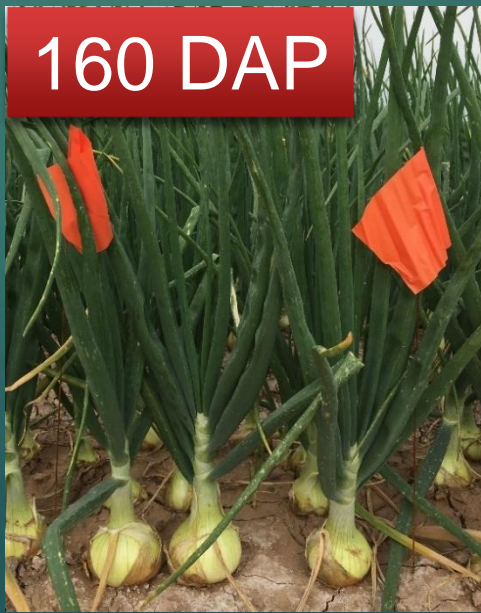
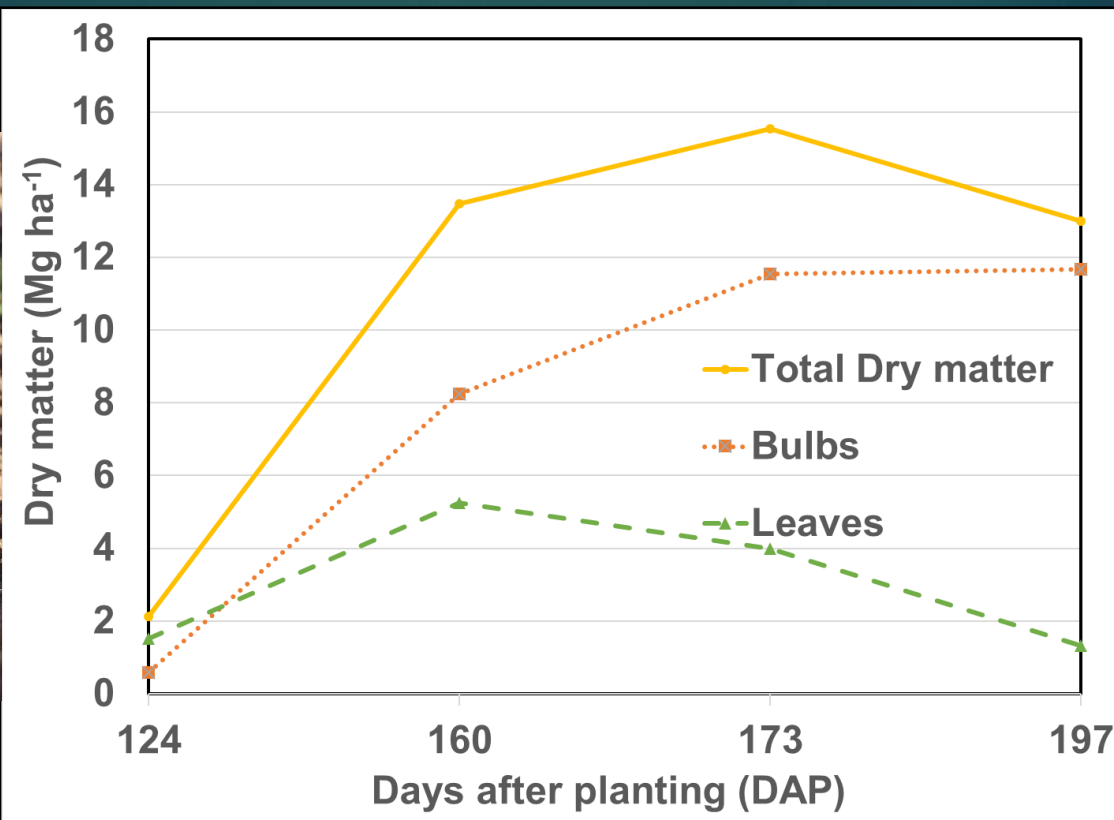
²Universidad Autonoma de Baja California, Instituto de Ciencias Agricolas

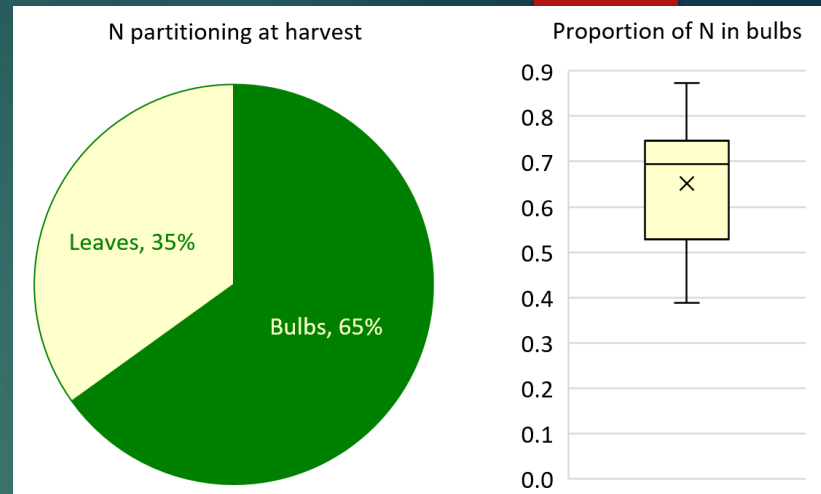
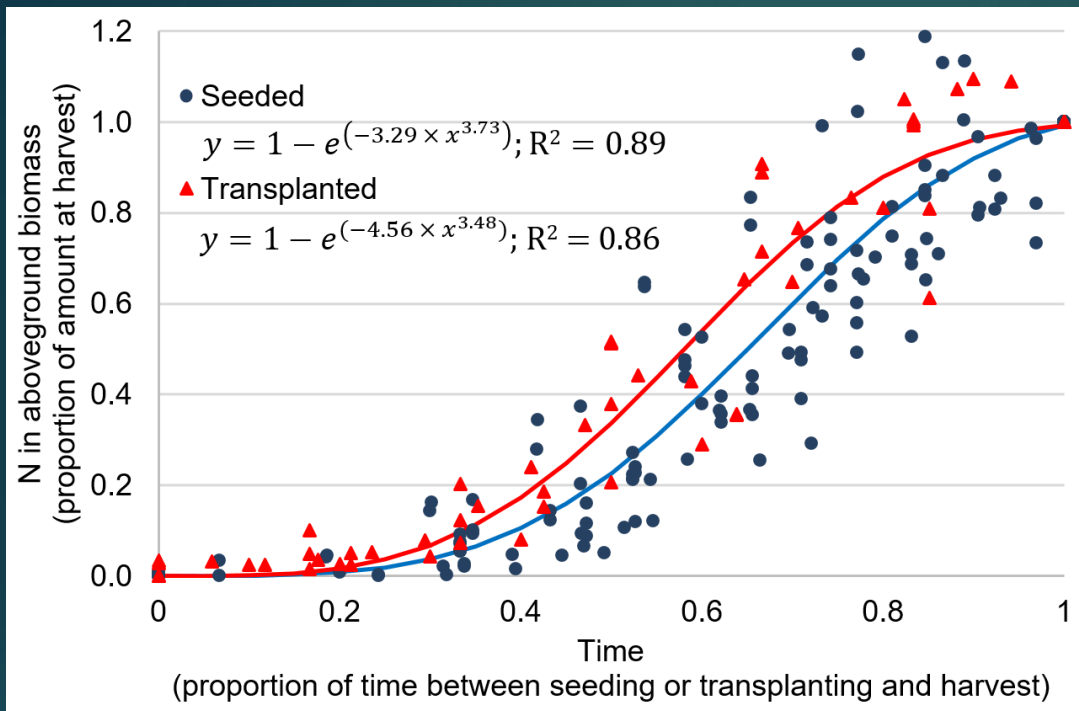
³UC Davis, Department of Land, Air and Water Resources

Valle Imperial, CA

- ▶ Close to 500,000 acres of irrigated land.
- ▶ Arid region: rain < 3 in/y, mild winter, **muy caliente** summer ($T > 115$ °F).
- ▶ Known as the nation's winter salad bowl.
- ▶ 2021 agriculture gross value @ \$2.3 B that relies on the Colorado river water.
- ▶ ~13K ac in onion production in Imperial Valley with a gross value between ~\$45M and ~\$99M .
- ▶ Water cuts in 2022/23: AZ, NV, MX
- ▶ New General Order: N fertilizer reporting and groundwater trend monitoring
- ▶ Need to evaluate tools that help growers and industry to improve irrigation and fertilization practices.







The main goal of this project was to evaluate water regimes and Nitrogen rates in onion production in Imperial County.

Methods

Irrigation Treatments

1. 40% of crop evapotranspiration (ET_c);
2. 70% ET_c;
3. 100% ET_c; and
4. 130% ET_c

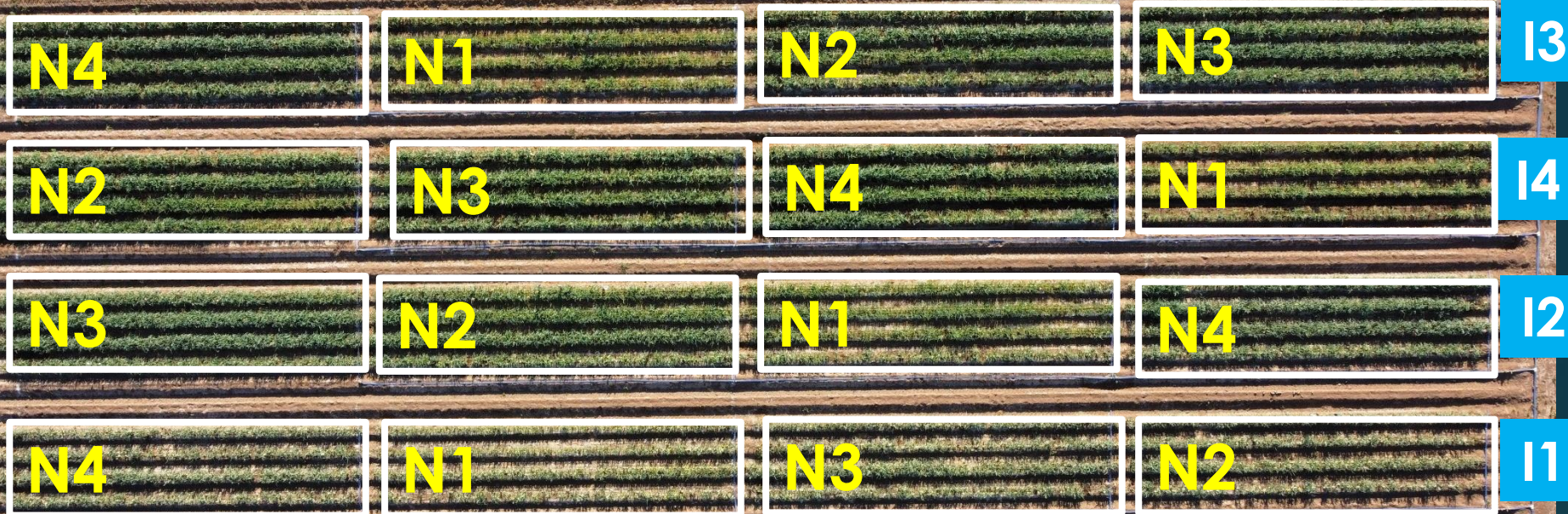
Nitrogen Treatments

1. pre-plant;
2. pre-plant plus 75 lbs N per acre;
3. pre-plant plus 150 lbs N per acre; and
4. pre-plant plus 225 lbs per acre.

- ▶ Seasons: three seasons from 2019 to 2022.
- ▶ Pre-plant N application: 56 lbs/acre in Y1; 0 in Y2 and Y3 .
- ▶ Irrigation scheduling: based on weather data from the DREC's CIMIS station and crop coefficients developed locally by UCCE Irrig Advisor.
- ▶ Onion varieties: Terena (yellow), Hornet (yellow), and Sweet Agent.
- ▶ Treatment size: four, 40-in bed by 50 ft. Four onion lines per bed.

Methods

- Field assessments at the UC Desert REC, Holtville, CA

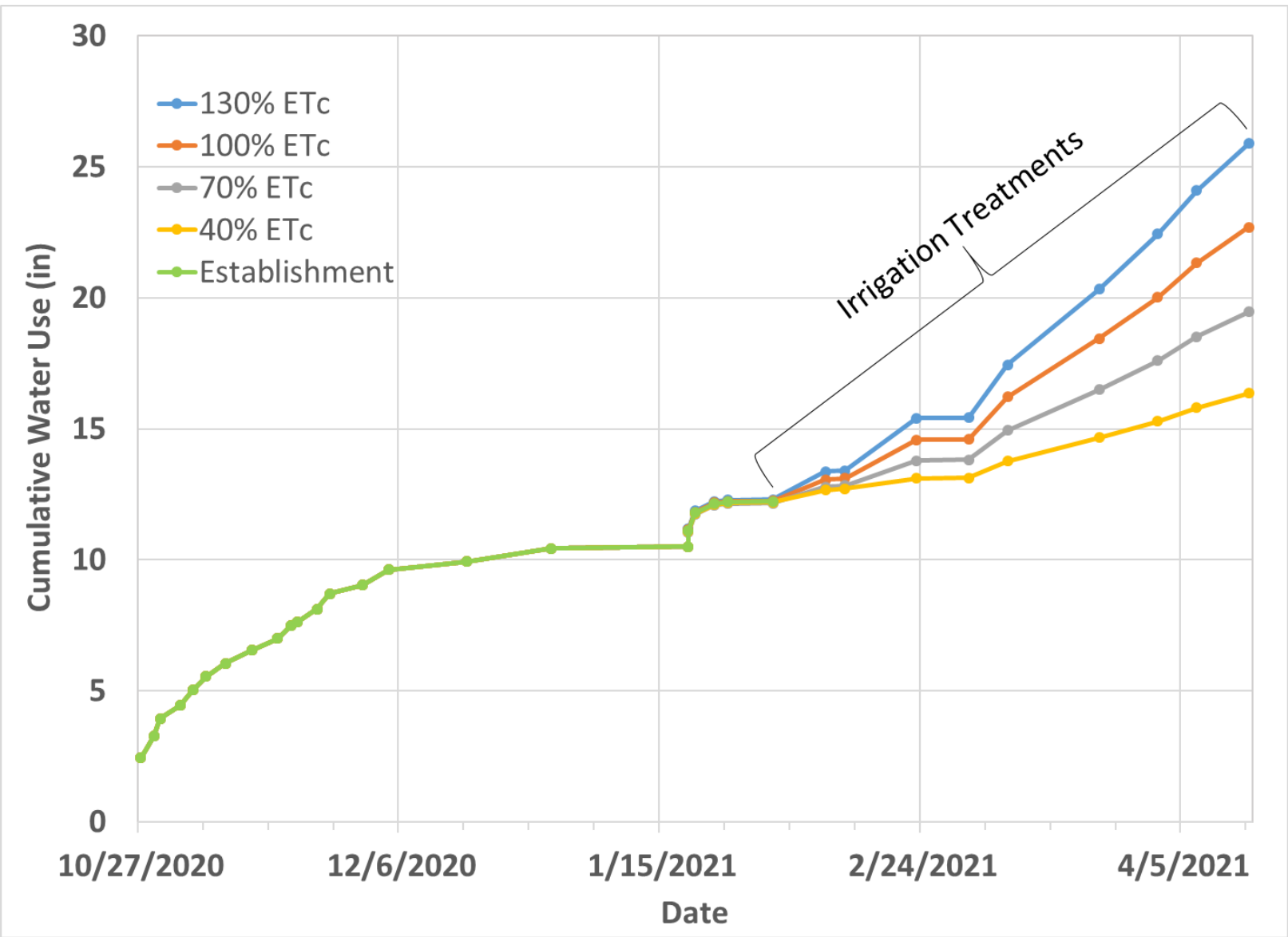


4 replicates per treatment (four, 40-in bed by 50 ft).

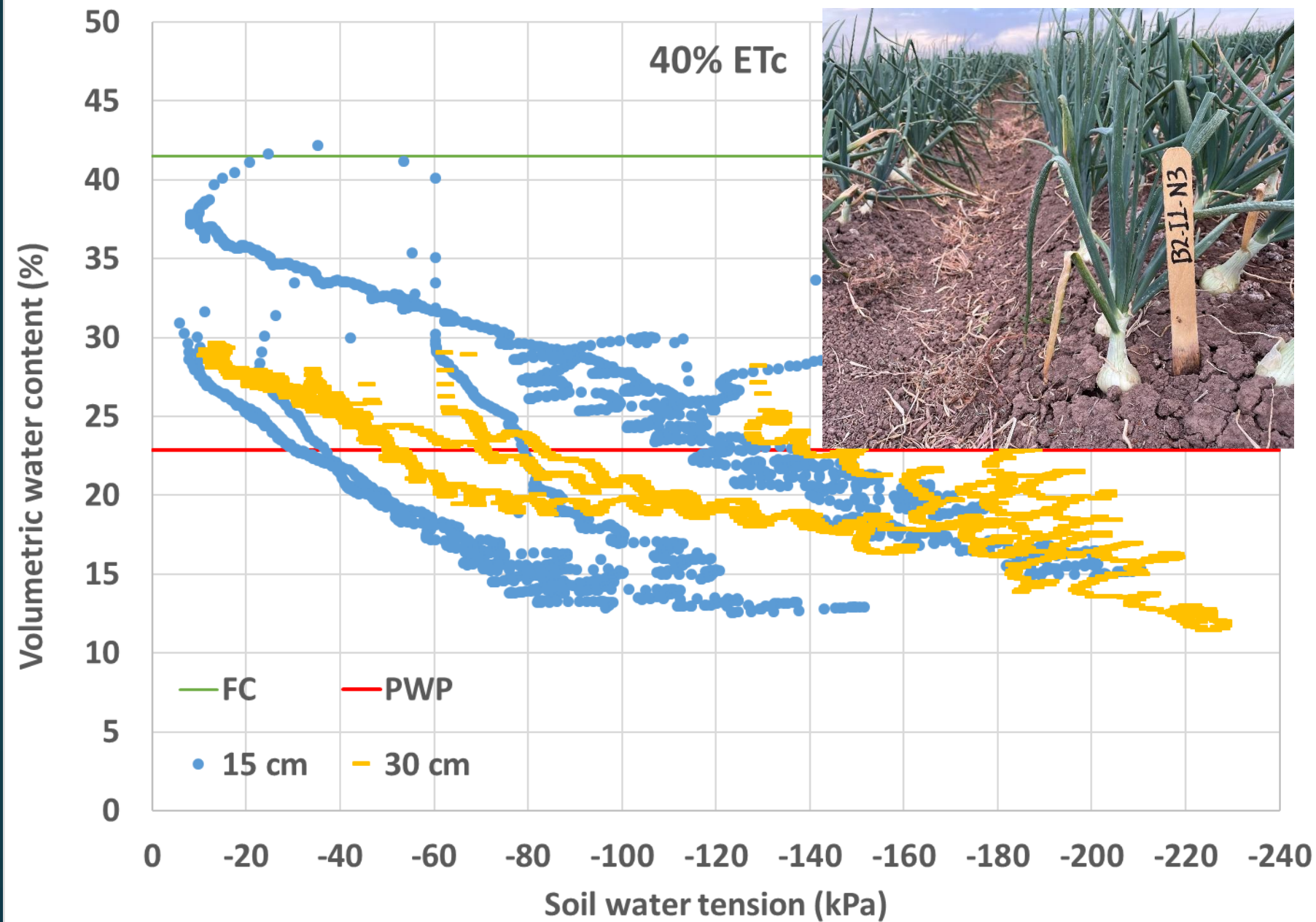
I0 (no irrigation after establishment)

I1 (40% Etc), I2 (70% Etc.), I3 (100% Etc), and I4 (130% Etc).

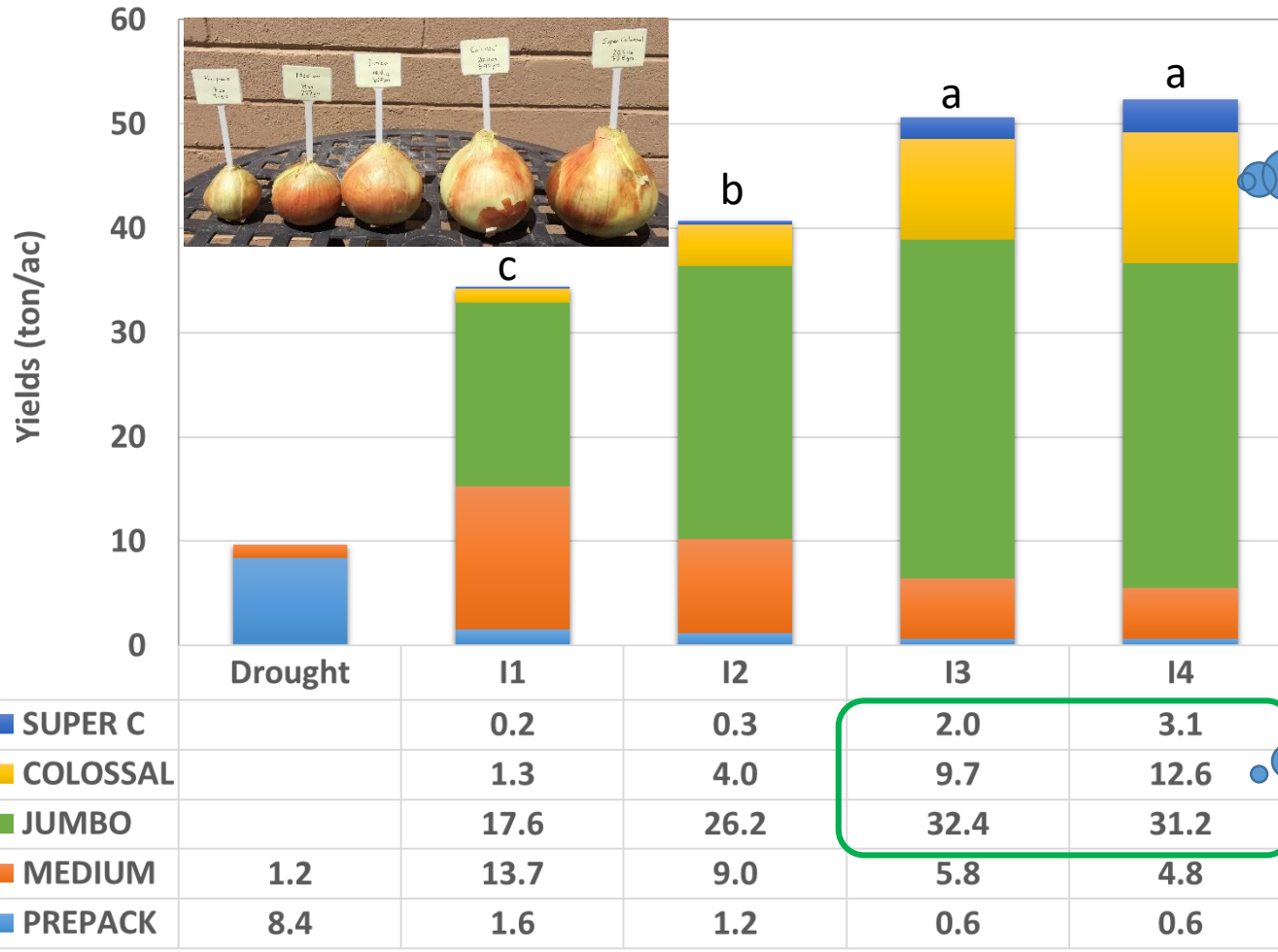
N1 (pre-plant), N2 (pre-plant + 75 lbs N/acre), N3 (pre-plant + 150 lbs N/acre) and N4 (pre-plant +225 lbs N/ac).



Soil Water Retention Curves: 2020-2021



Yields by Irrigation Levels: 2019-2020



Growers' yield expectations: 45 ton/ac

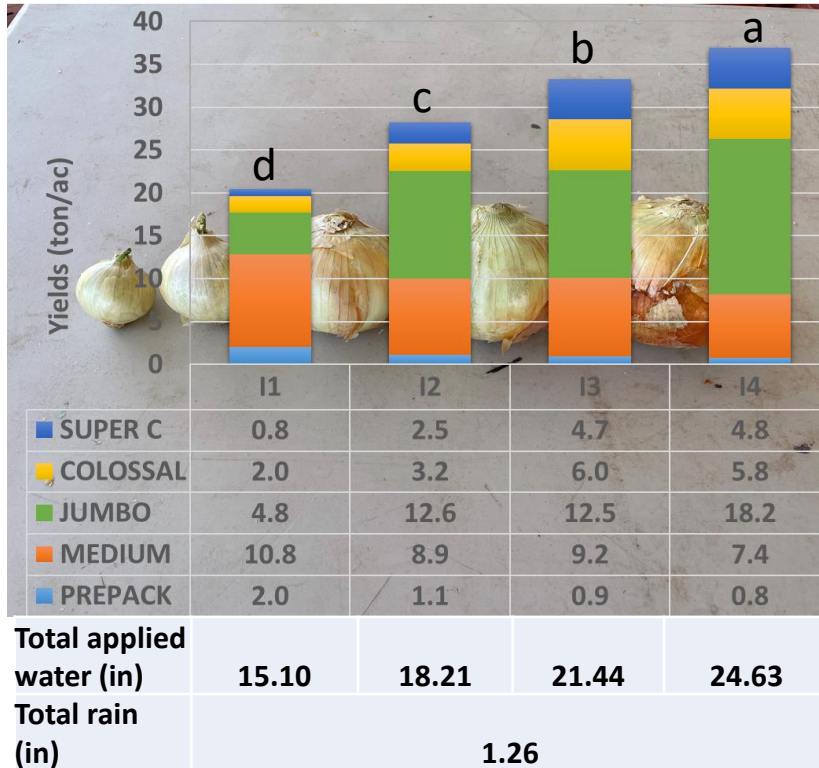
Better prices for largest onions

21-24 in of water for highest yield

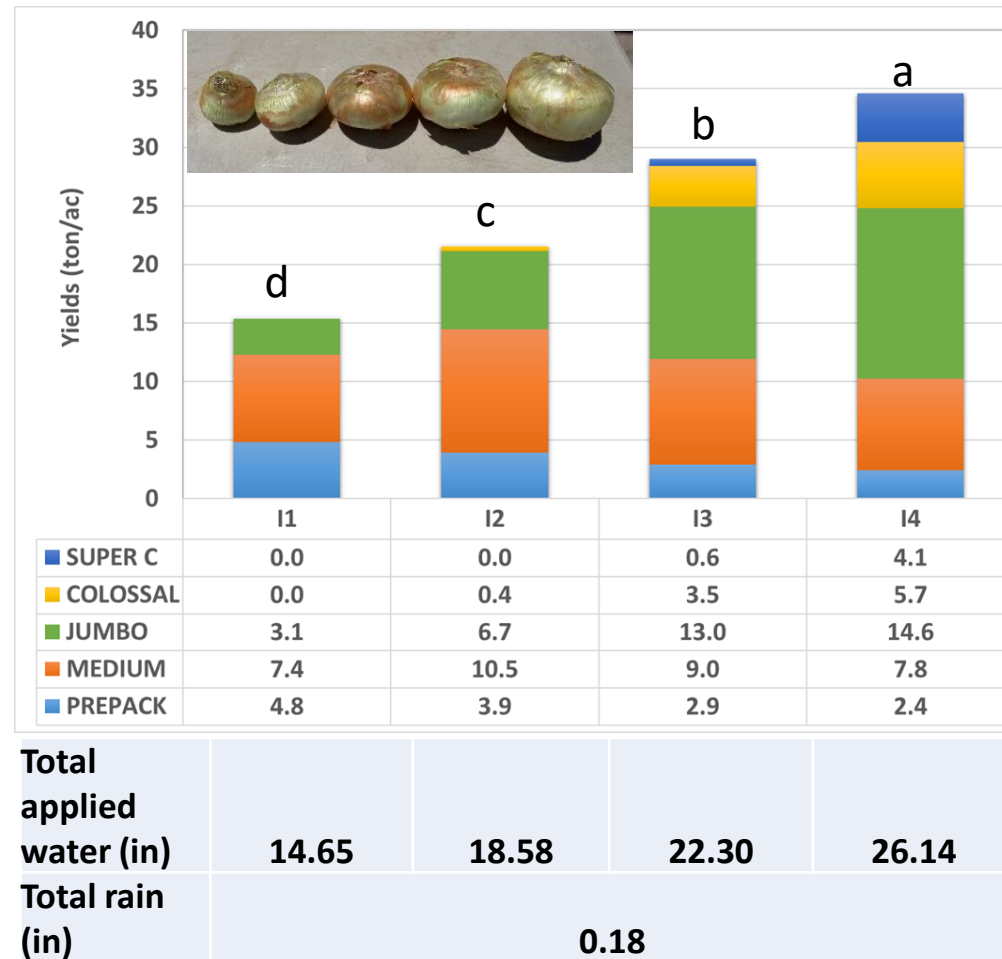
Total applied water (in)	8.86	10.74	12.98	15.94	18.90
Total rain (in)	4.67				

Yields by Irrigation Levels

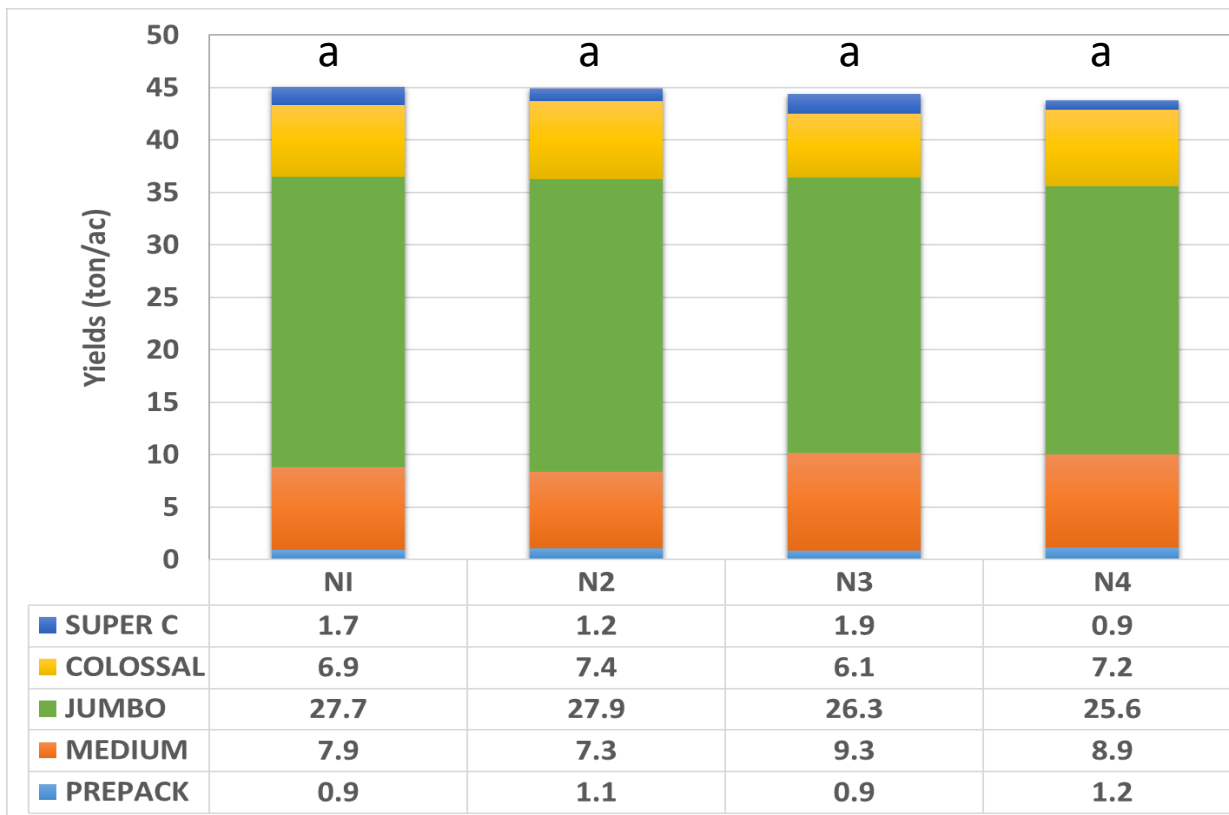
2020-2021



2021-2022



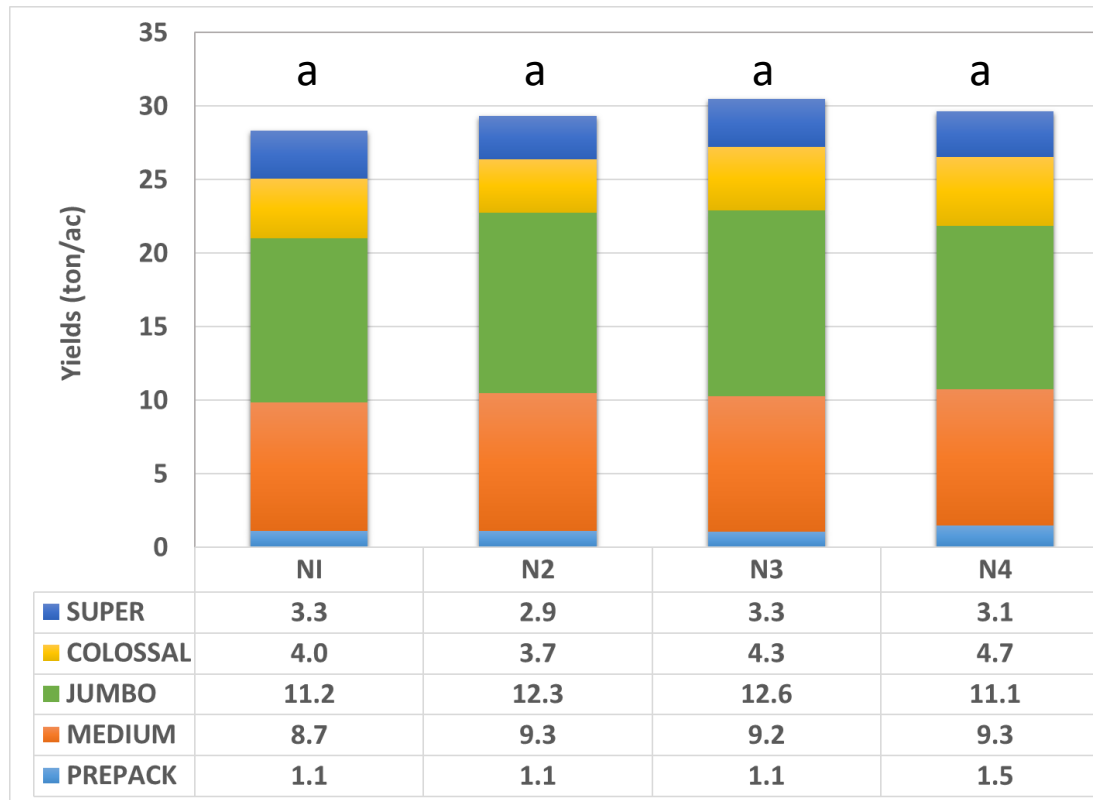
Yields by Nitrogen Treatments: 2019-2020



NT	Initial residual soil mineral N (0-1 ft) lbs/A	Pre-plant fertilizer N applied lbs/A	In-season fertilizer N (UAN-32) applied lbs/A	Total fertilizer N applied lbs/A	Total available mineral N lbs/A
N1	72	56	0	56	128
N2	72	56	75	131	203
N3	72	56	150	206	278
N4	72	56	225	281	353

Pre-plant fertilizer: 11-52-00 and 10-34-00.

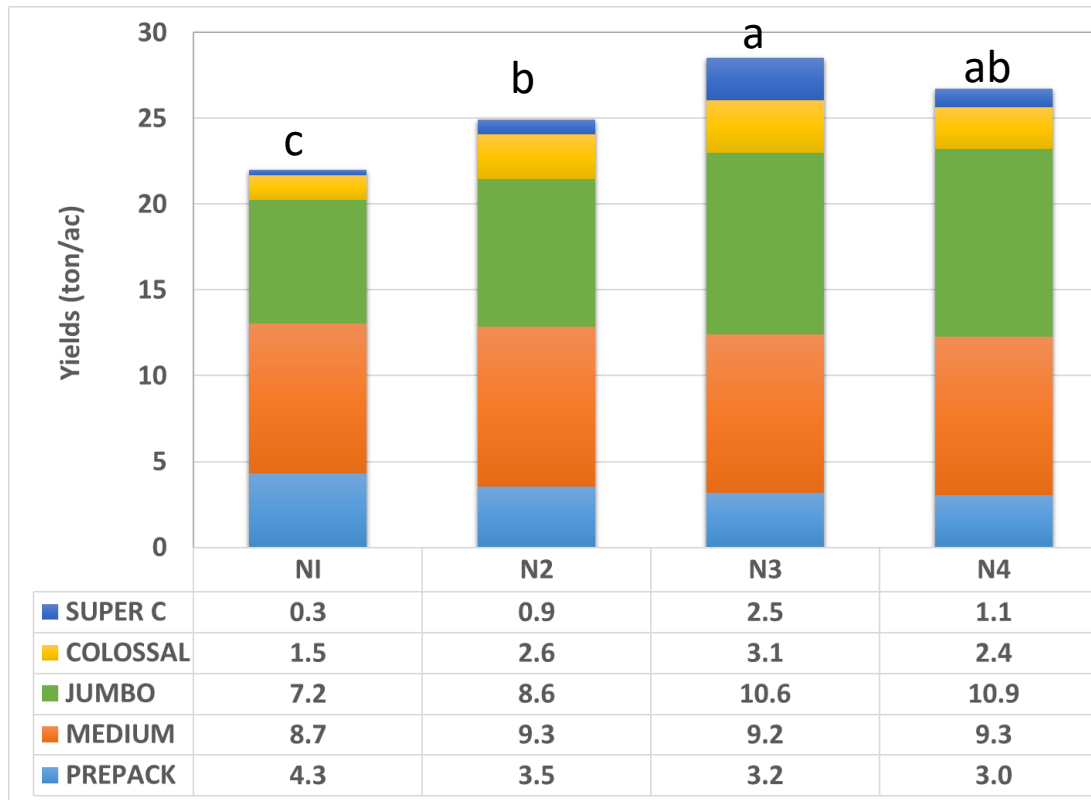
Yields by Nitrogen Treatments: 2020-2021



Alfalfa Field

NT	Initial residual soil mineral N (0-1 ft) lbs/A	Pre-plant fertilizer N applied lbs/A	In-season fertilizer N (UAN-32) applied lbs/A	Total fertilizer N applied lbs/A	Total available mineral N lbs/A
N1	104	0	0	0	104
N2	104	0	75	75	179
N3	104	0	150	150	254
N4	104	0	225	225	329

Yields by Nitrogen Treatments: 2021-2022



NT	Initial residual soil mineral N (0-1 ft) lbs/A	Pre-plant fertilizer N applied lbs/A	In-season fertilizer N (UAN-32) applied lbs/A	Total fertilizer N applied lbs/A	Total available mineral N lbs/A
N1	50	0	0	0	50
N2	50	0	75	75	125
N3	50	0	150	150	200
N4	50	0	225	225	275

Postharvest Quality

	Trait	Terena	Hornet	Sweet Agent
Irrigation	Firmness (lbs)	No SD (8.2-9.7).	No SD (13.3-14.9), but firmness responded to irrigation.	SD (10.1-12.5). Firmness responded to irrigation.
	Brix (%)	No SD (6.9-8.4), but Brix reduced as water increased.	SD (7.2-8.1). Brix responded to irrigation.	SD (7.2-7.9). Brix responded to irrigation.
Nitrogen	Firmness (lbs)	No SD (8.8-9.4).	No SD (13.7-15.1).	SD (10.5-12.5). Firmness increased as N decreased.
	Brix (%)	SD (7.2-8.5). Lowest N level yielded highest Brix value.	No SD (7.7-7.8).	SD (7.4-7.9).

SD = significant difference



Take Home Message

- ▶ Proper irrigation management (amount, timing, and system) will maximize yields, large size distribution, and quality (total soluble concentration) of onion production in CA low desert region.
- ▶ Growers can take a conservative approach while managing nitrogen fertilization of onions planted after alfalfa or other vegetables in conventional fields.



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Desert Research and Extension Center

More info:
Jairo Diaz
Director
760-791-0521
jdiazr@ucanr.edu
<http://drec.ucanr.edu/>



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Desert Research and Extension Center
1004 East Holton Road
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