Navigating Watermelon Fertilization and Irrigation Management amidst Erratic Rainfalls

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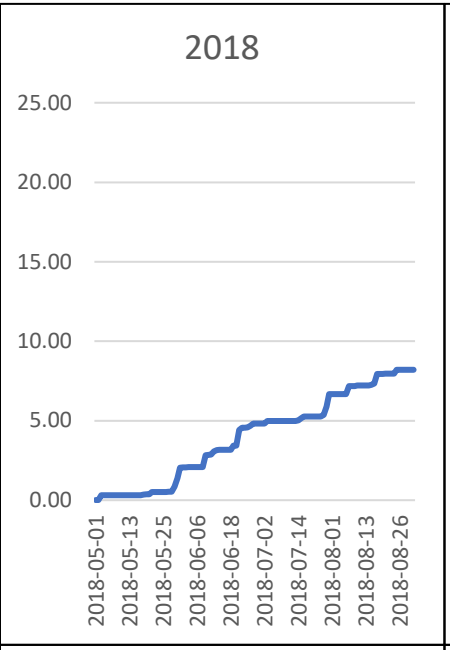
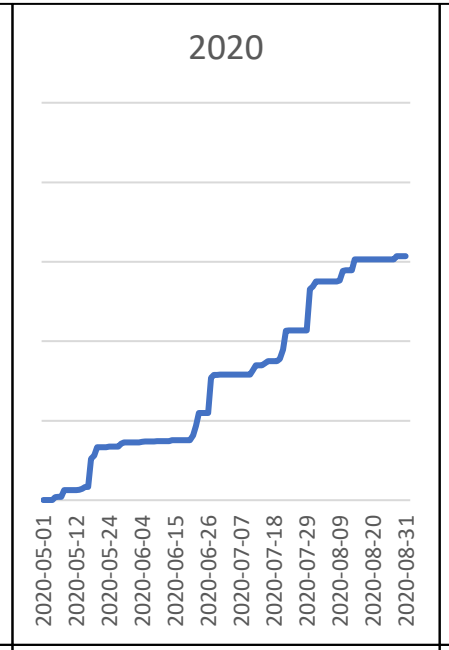
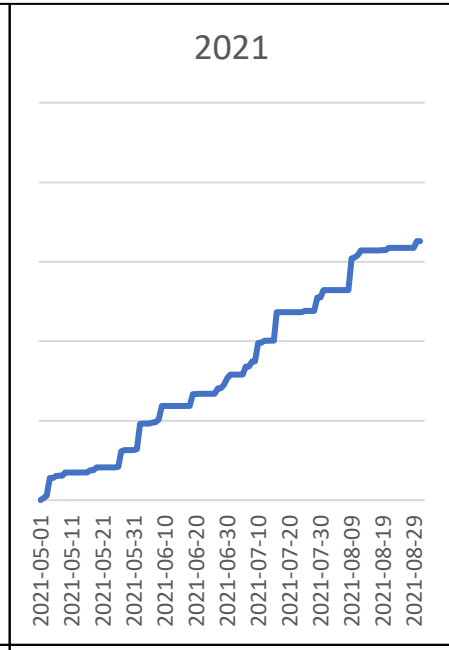
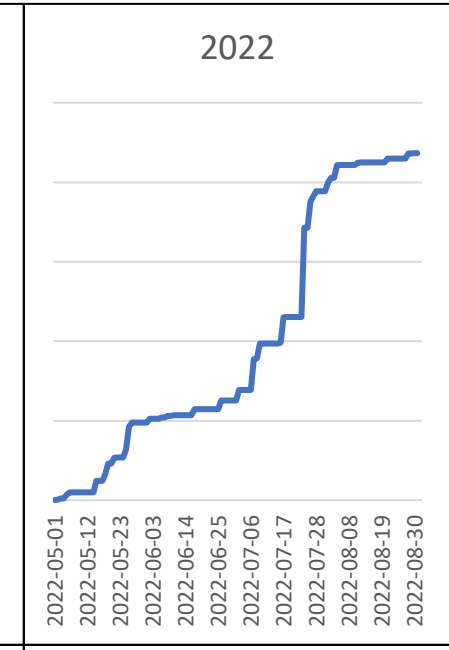
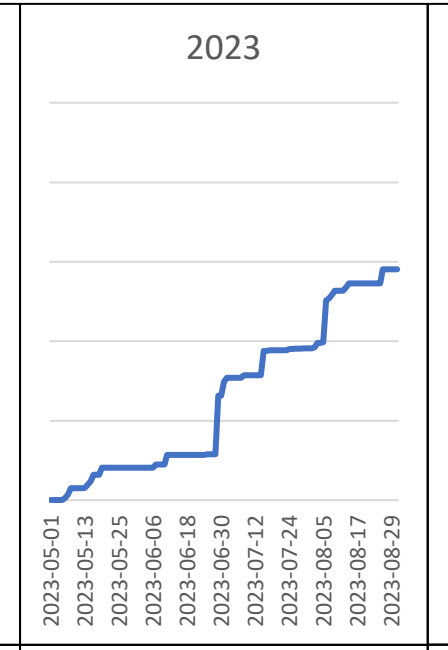
Accumulated and Daily Precipitation (in)

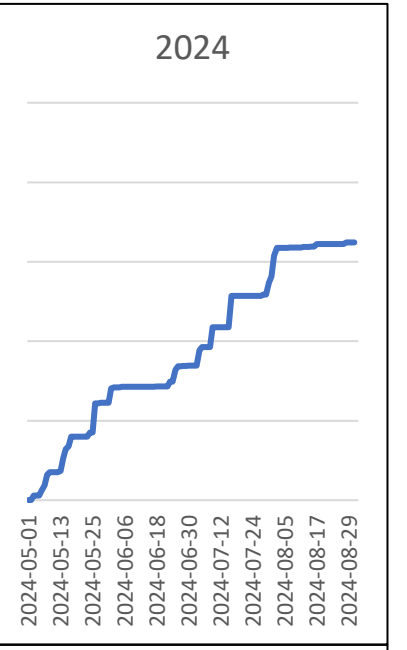


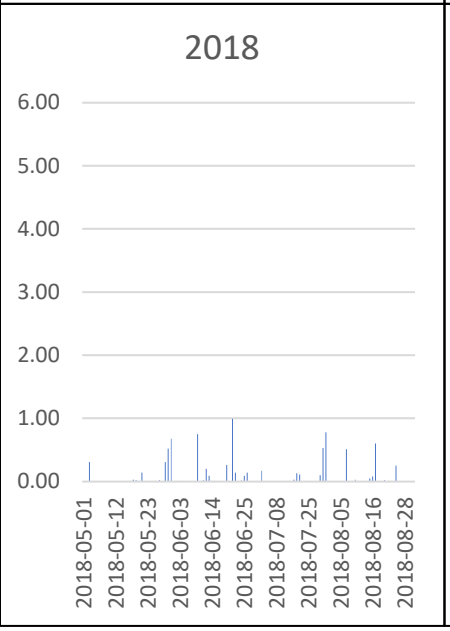


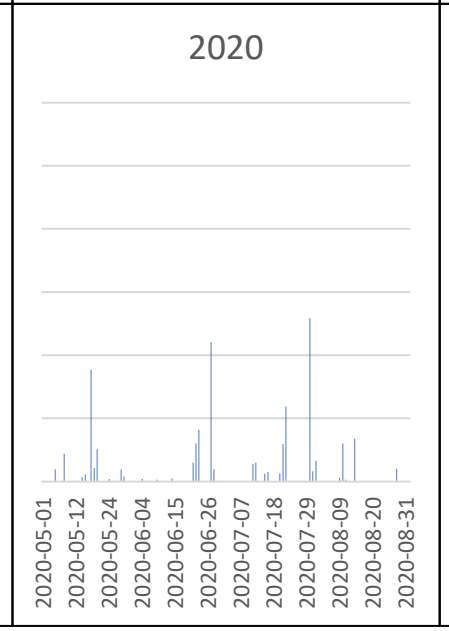


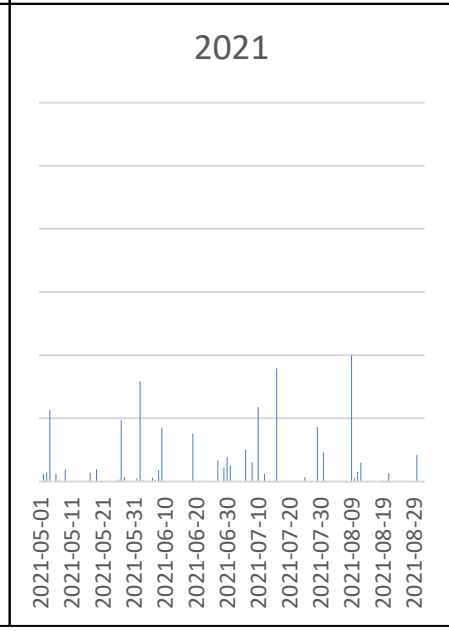


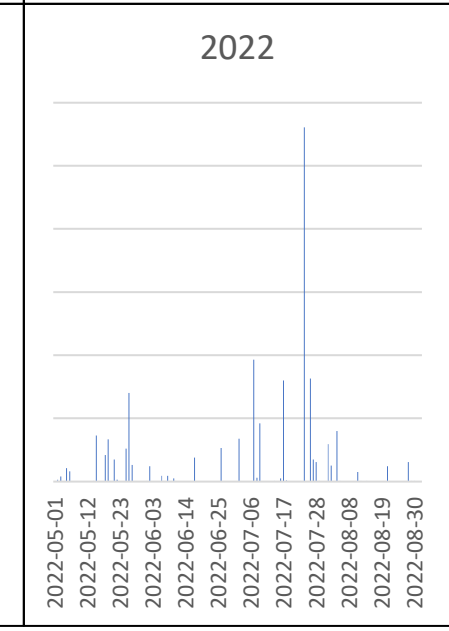


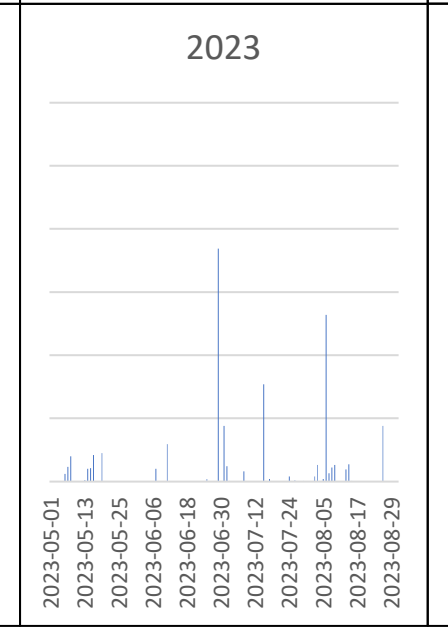


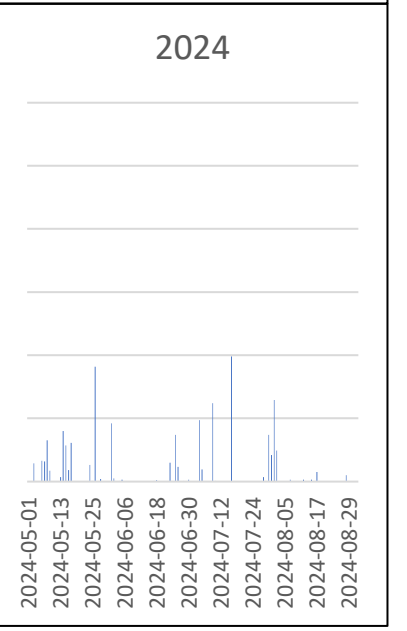












Root Development of Vegetable Crops

John Weaver and William Bruner. 1927

Squash/watermelon/muskmelon

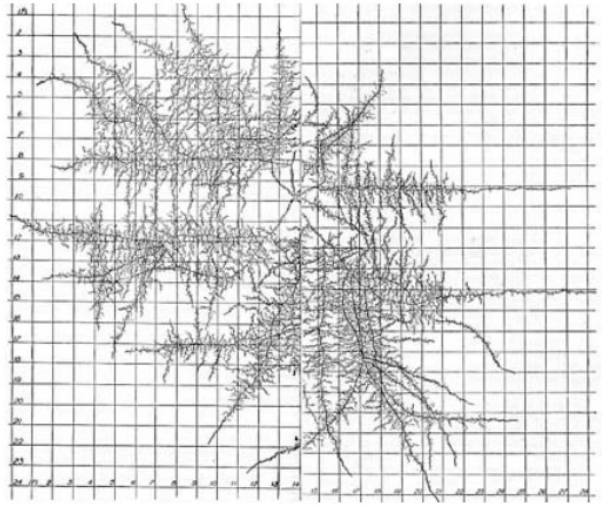
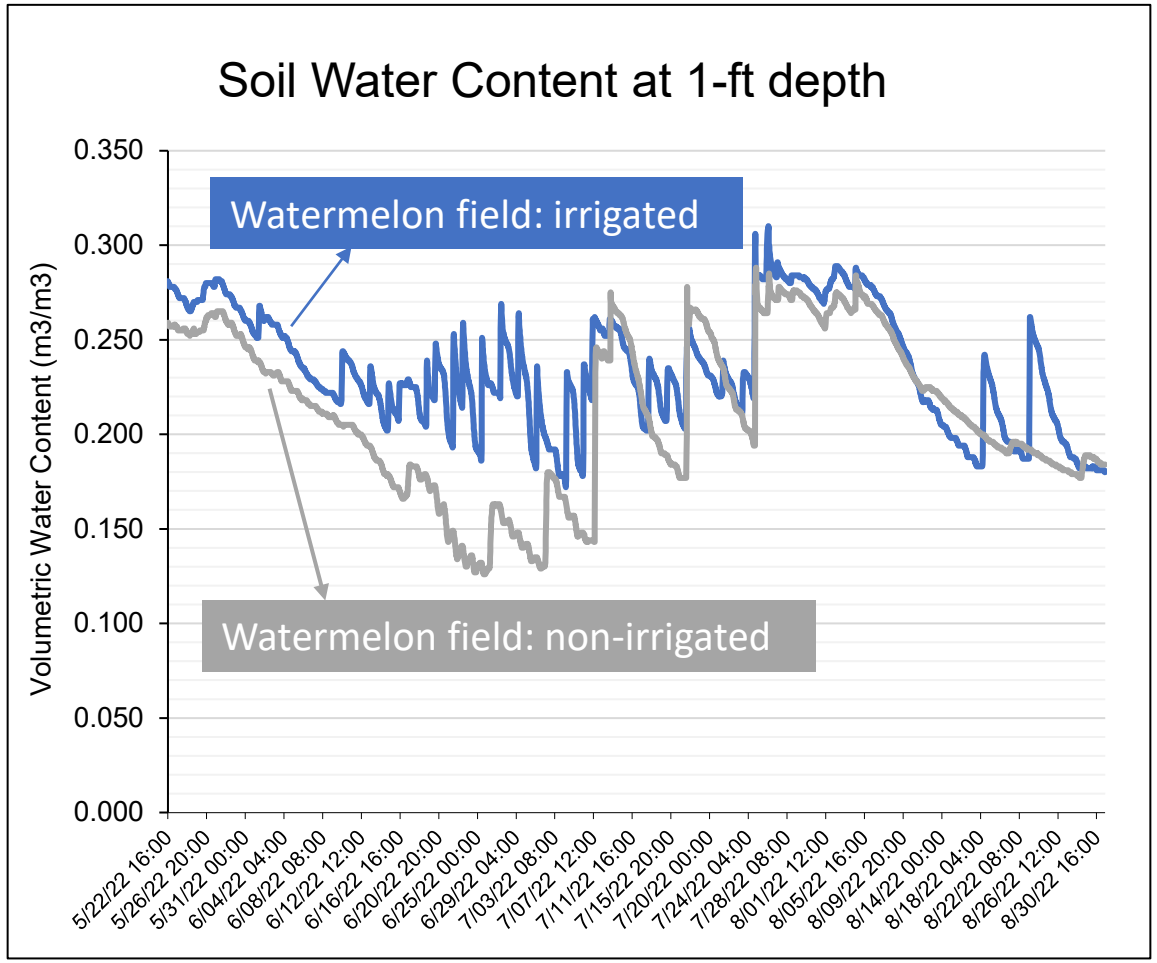


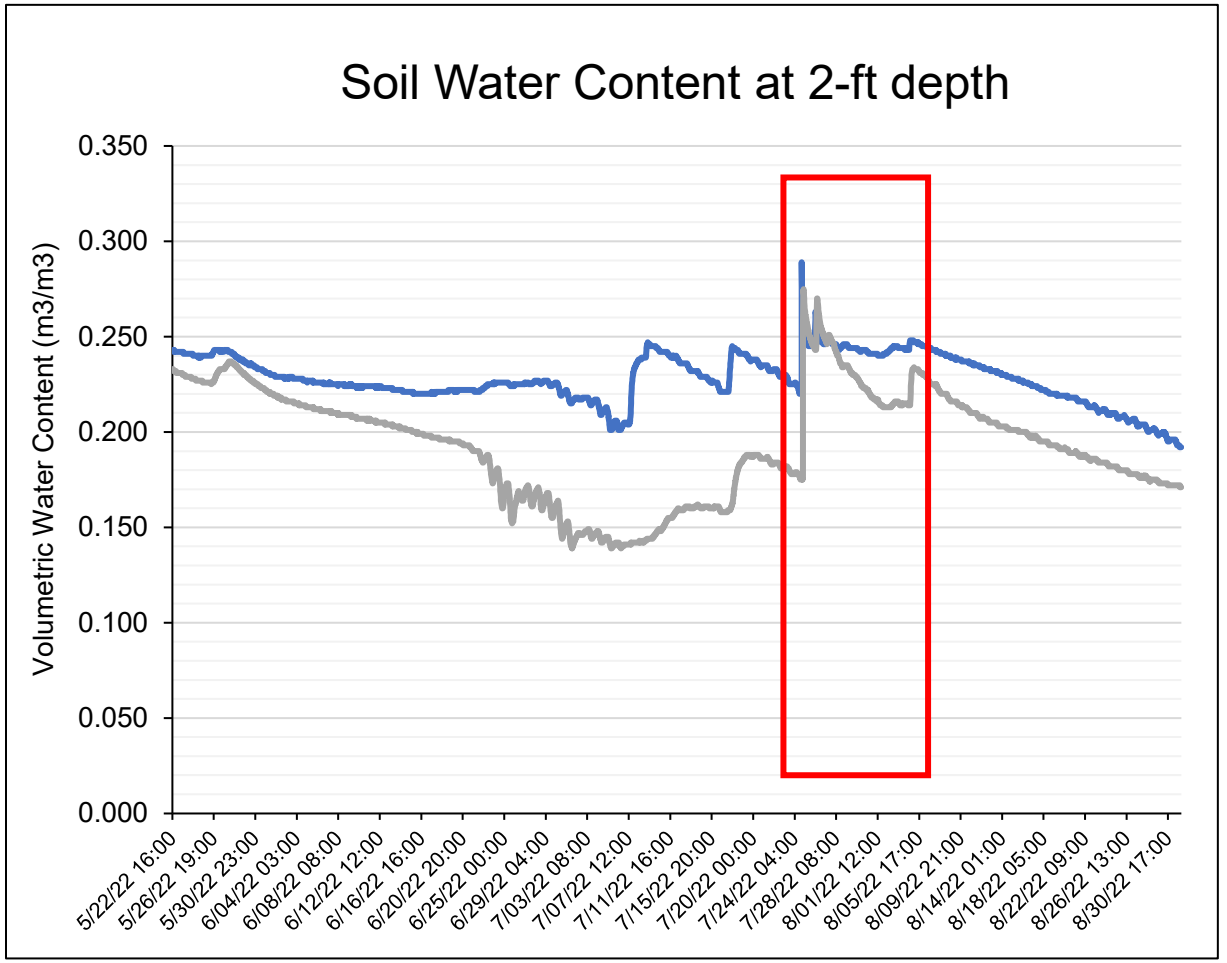
Fig. 88.--View of the root system of squash after the removal of the surface 12 inches of excavated on Aug. 21 when the plant was about 11 weeks old and the main roots were stil of nearly 2.5 inches per day.

Mature Watermelon Plants --- The surface-absorbing system had made a truly remarkable growth. It was, in general, similar to that of the muskmelon but very much greater in extent. It consisted of 24 main roots and their very extensive branches. The four largest of these had diameters of 1 centimeter at their origin and tapered to about 4 millimeters at a distance of **15 feet from the plant**. A diameter of 2 millimeters was maintained to their tips. They ran 18 to 21 feet from the base of the plant. Thus the root extent exceeded that of the vines. The remaining roots were 1 to 5 millimeters thick and varied from 3 to 16 feet in length. No small absorbing laterals were found on the taproot nor on the branches near it. In fact the larger branches were devoid of rootlets throughout the first 12 to 24 inches of their course except for the 8 to 16 rather strong branches which here originated. Large secondary branches 3 to 5 millimeters thick were likewise bare for short distances. Otherwise a wonderfully well-developed network of rootlets filled the surface foot of soil, many laterals extending far into the second and sometimes entering the third foot.

2022: Bloomfield sandy loam soil

Sensors were installed at 1-ft and 2-ft depth in the bed, under plastic





Assumption 1: Watermelon roots are more likely to extend into deeper soil layers later in the growing season compared to earlier stages of growth.

Assumption 2: Watermelon roots tend to grow toward areas with higher moisture availability. The combination of plasticulture and prolonged drip irrigation limit horizontally root expansion.

Assumption 3: Deep soil saturation is more likely to become problematic in soils where the topsoil has a lower water-holding capacity compared to soils with a higher water-holding capacity.

Suggestions to Reduce the Risk:

1. Overhead irrigation poses a lower risk compared to drip irrigation, as it provides more uniform moisture distribution. But it promotes foliar diseases.
2. Practice deficit irrigation, using irrigation water as a supplemental measure rather than meeting all the plant's water needs.
3. Opt for shorter irrigation durations to prevent water enter the deeper soil profile.
4. Do not irrigate when heavy rainfall is anticipated.

Plants are generally easier to recover from drought stress than waterlogging stress.

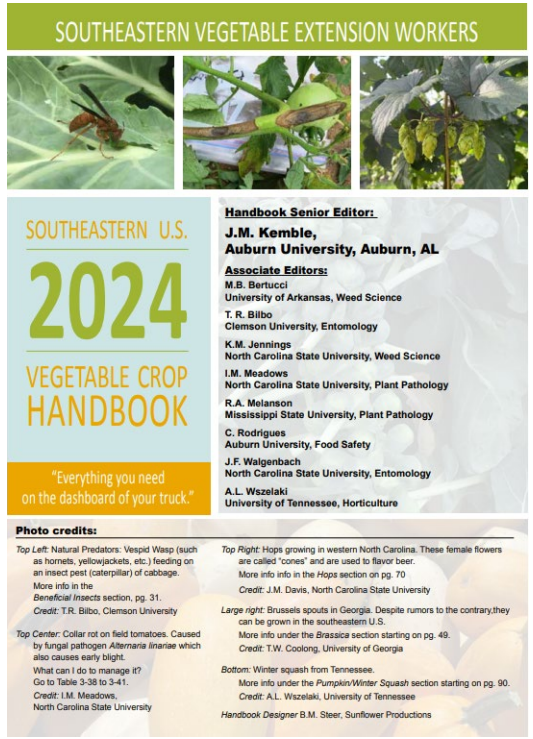
Recommendation from Southeastern U.S. 2024 Vegetable Crop Handbook

SUGGESTED FERTIGATION SCHEDULE FOR WATERMELONS*

Growth Stage [1]	Days after planting	Daily nitrogen (lb/A)	Daily potash (lb/A)	Cumulative nitrogen (lb/A)	Cumulative potash (lb/A)
Preplant				35.0	35.0
Planting to Vining	0 - 14	0.5	0.5	42.0	42.0
Vining to Flowering	15 - 28	1.0	1.0	56.0	56.0
Flowering to Fruit Set	29 - 49	1.5	1.5	86.0	86.0
Fruit Set to Initial Ripening	50 - 77	2.0	2.0	140.0	140.0
Harvest	78 - 91	1.0	1.0	153.0	153.0

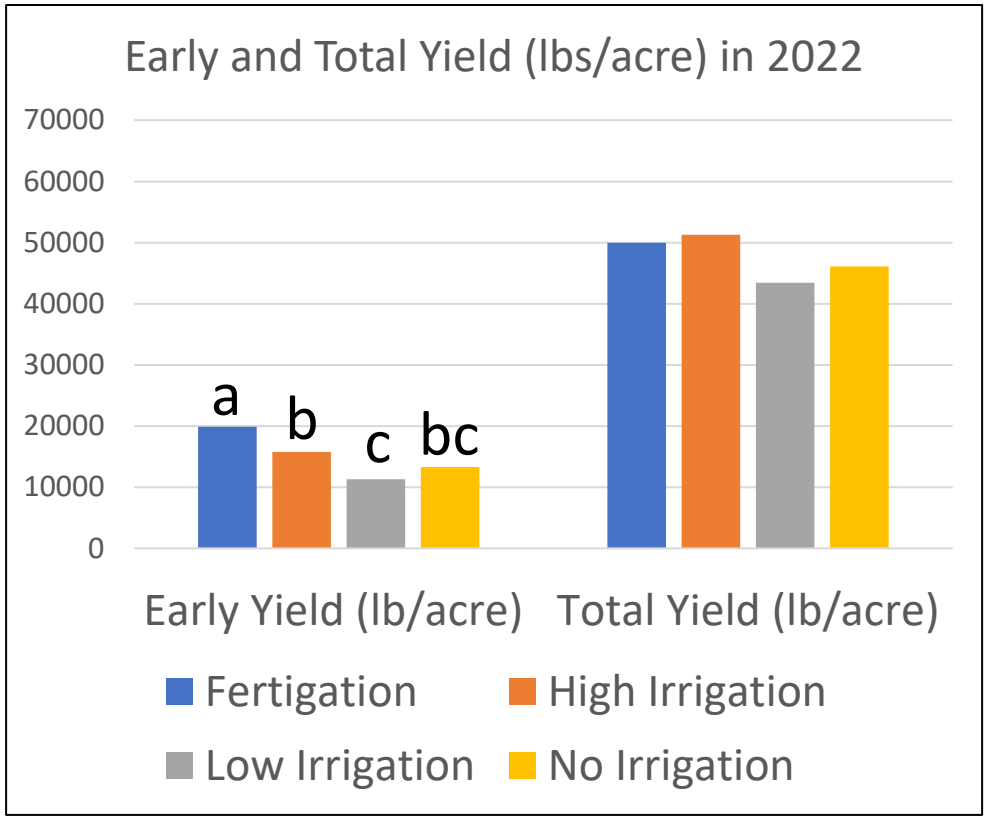
* Adjust based on tissue analysis.

[1] Growth Stage can vary from season to season. For optimal results, fertigate watermelons based on their growth stage as opposed to days after planting.

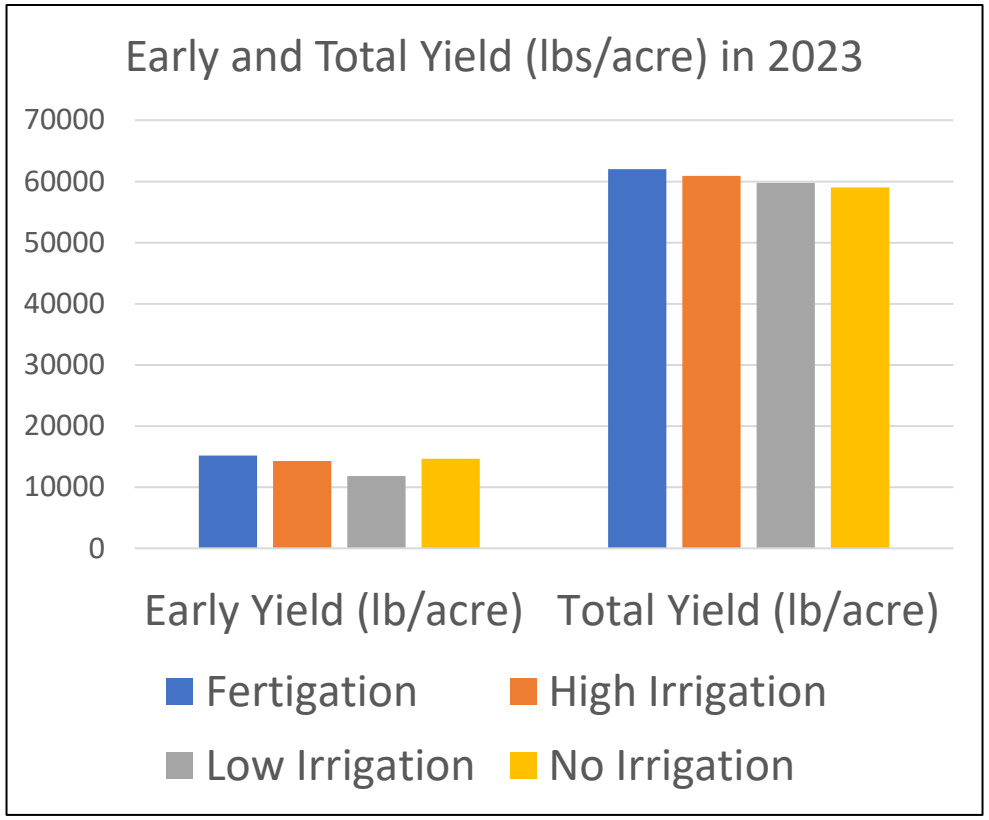


Watermelon Irrigation and Fertilization Experiment in 2022 and 2023 at SWPAC

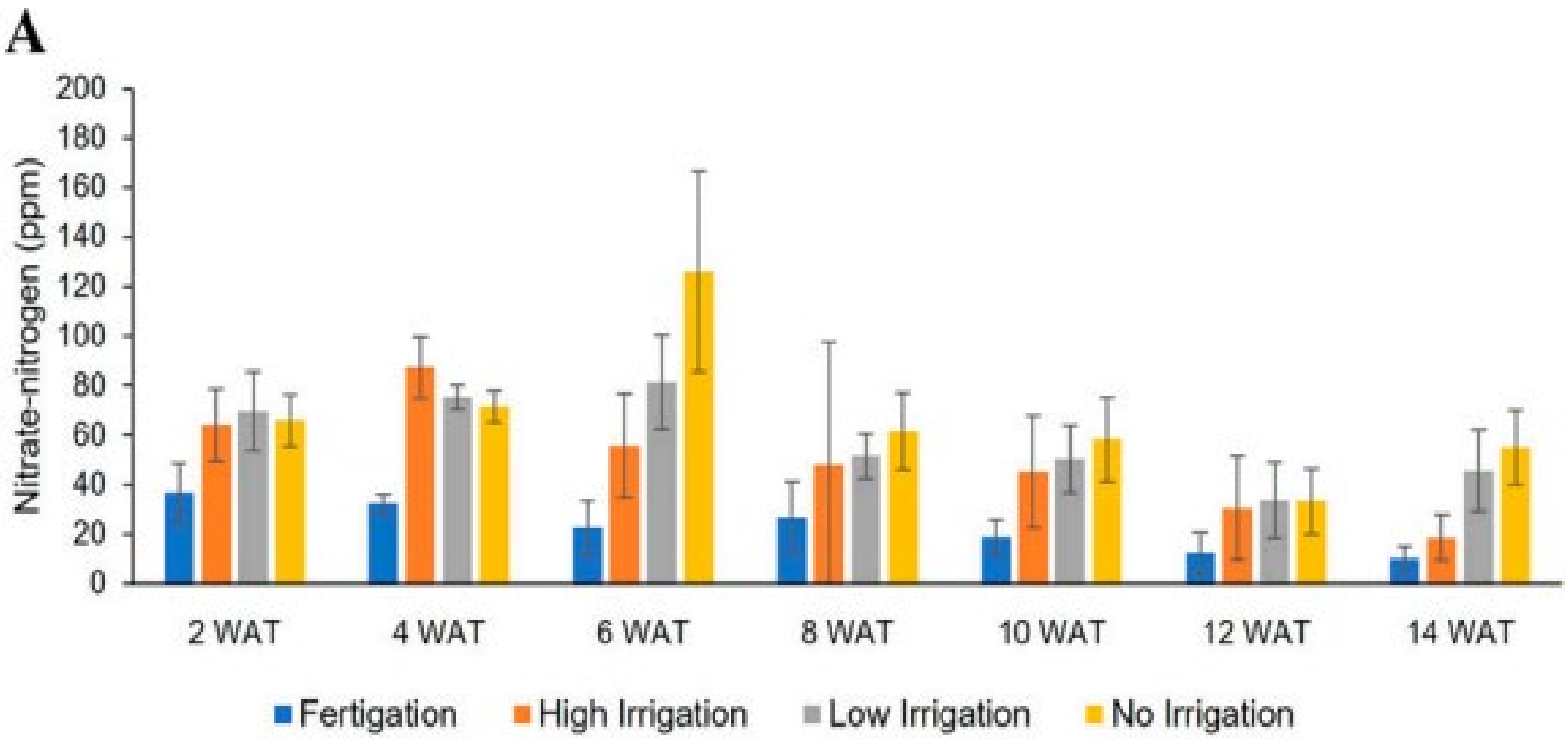
Treatments	Irrigation Threshold	Fertilization
Trt 1. Fertigation	15% water depletion at 1-ft depth 2022: 21 events 2023: 28 events	30 lb/acre N preplant, and fertigation at 10 lb/acre N per event 2022: 6 times (90 lb/acre N total) 2023: 9 times (120 lb/acre N total)
Trt 2. High irrigation	15% water depletion at 1-ft depth 2022: 21 events 2023: 28 events	Preplant: 150 lb/acre N
Trt 3. Low irrigation	2022: 15% water depletion at 2-ft depth. (1 event) 2023: 40% water depletion at 1-ft depth (8 events)	Preplant: 150 lb/acre N
Trt 4. No irrigation		Preplant: 150 lb/acre N



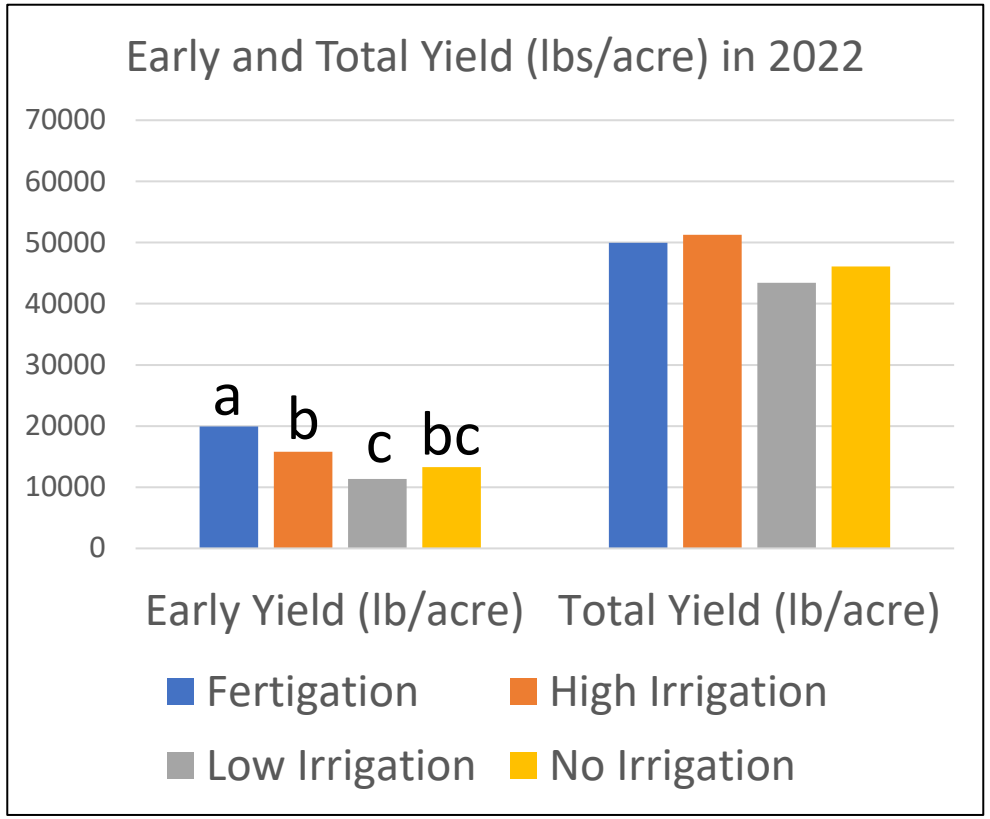
2022: Bloomfield sandy loam soil

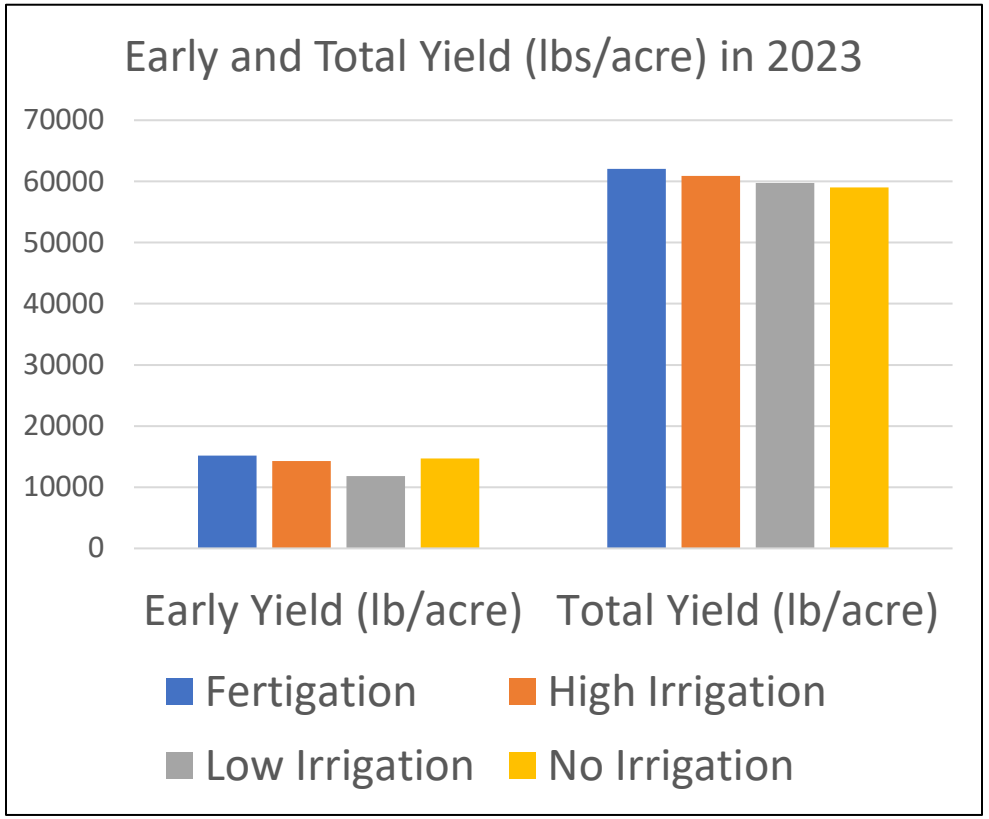


2023: Petrolia silty clay loam soil



- Exclusively preplant N application resulted in excessive N around root zone early in the season that delay plant growth and consequently, delay harvest.

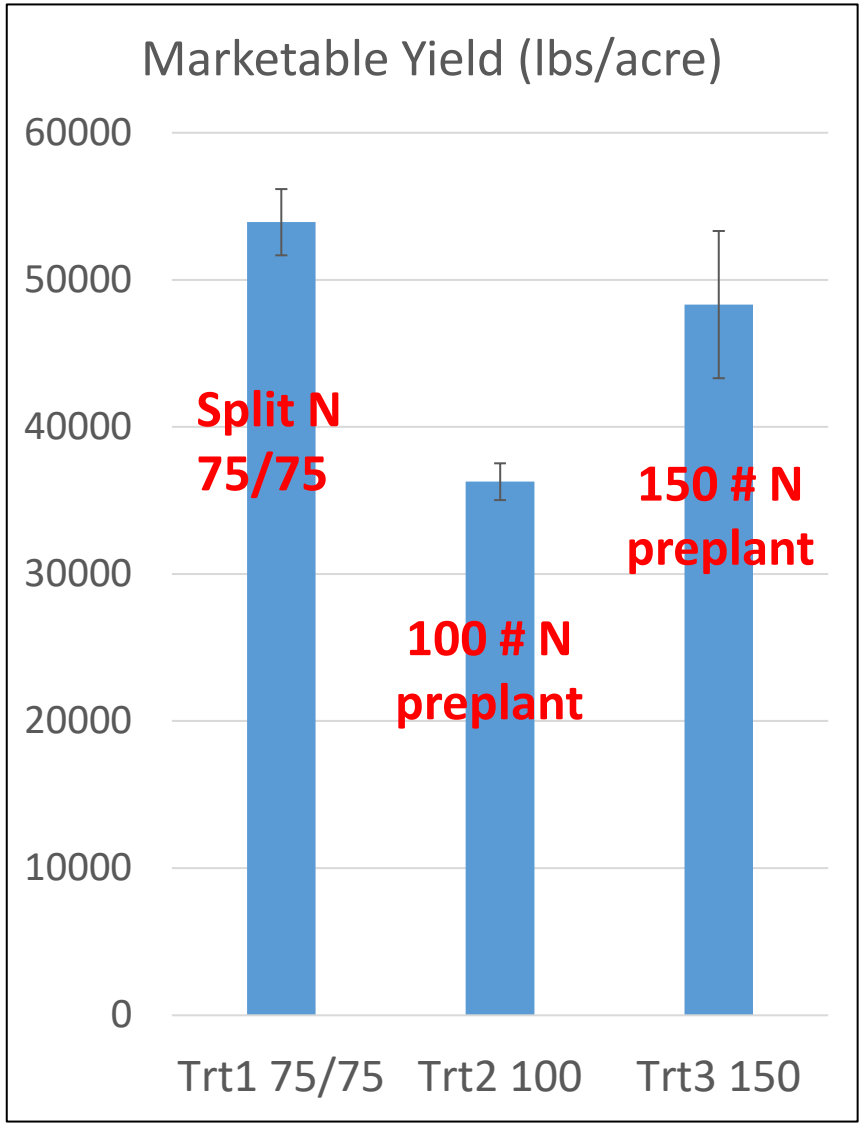


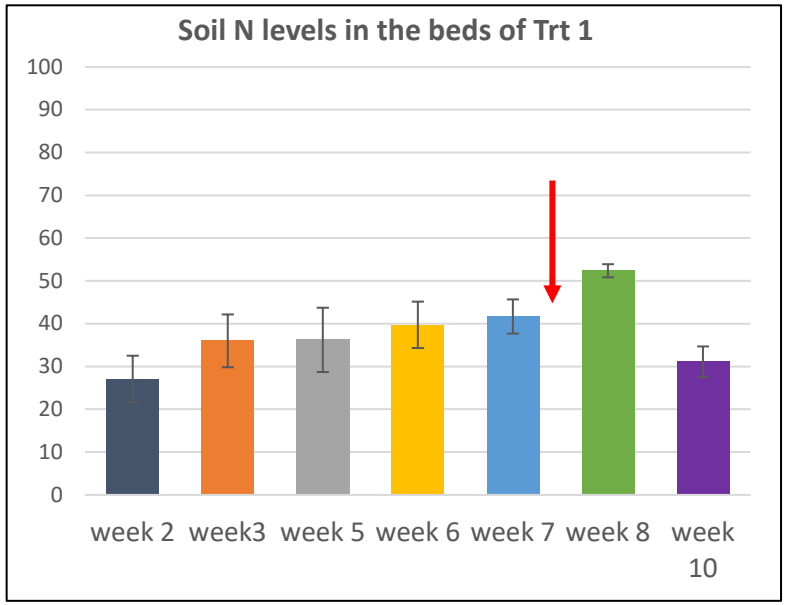


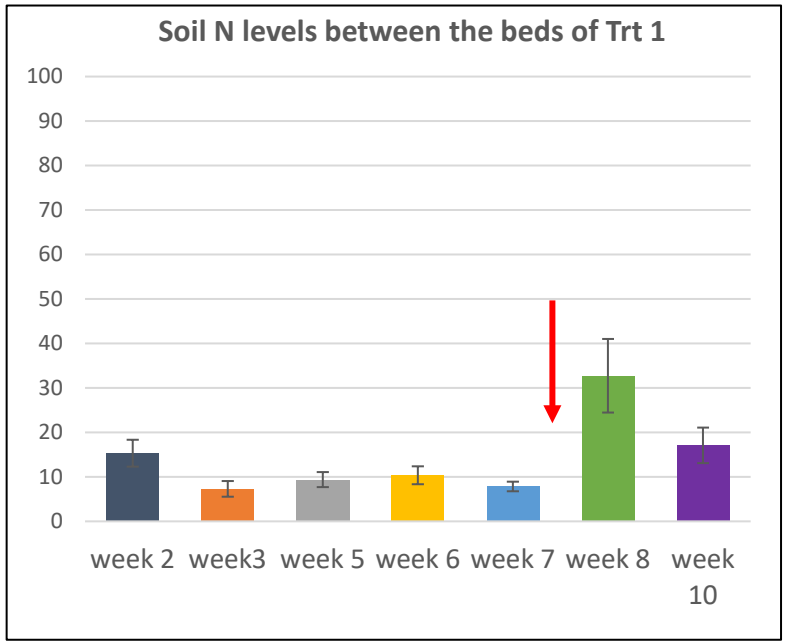
- Fertigation did not significantly increase total yield.
- Fertigation treatment has the highest N use efficiency
- The lowest yield for the Low Irrigation treatment might relate to water application

Watermelon Irrigation and Fertilization Experiment in 2021 at SWPAC

Treatment	Preplant N (lb/acre)	In-season broadcast nitrogen (lb/acre)
Trt1	150	
Trt2	75	75
Trt3	75	75

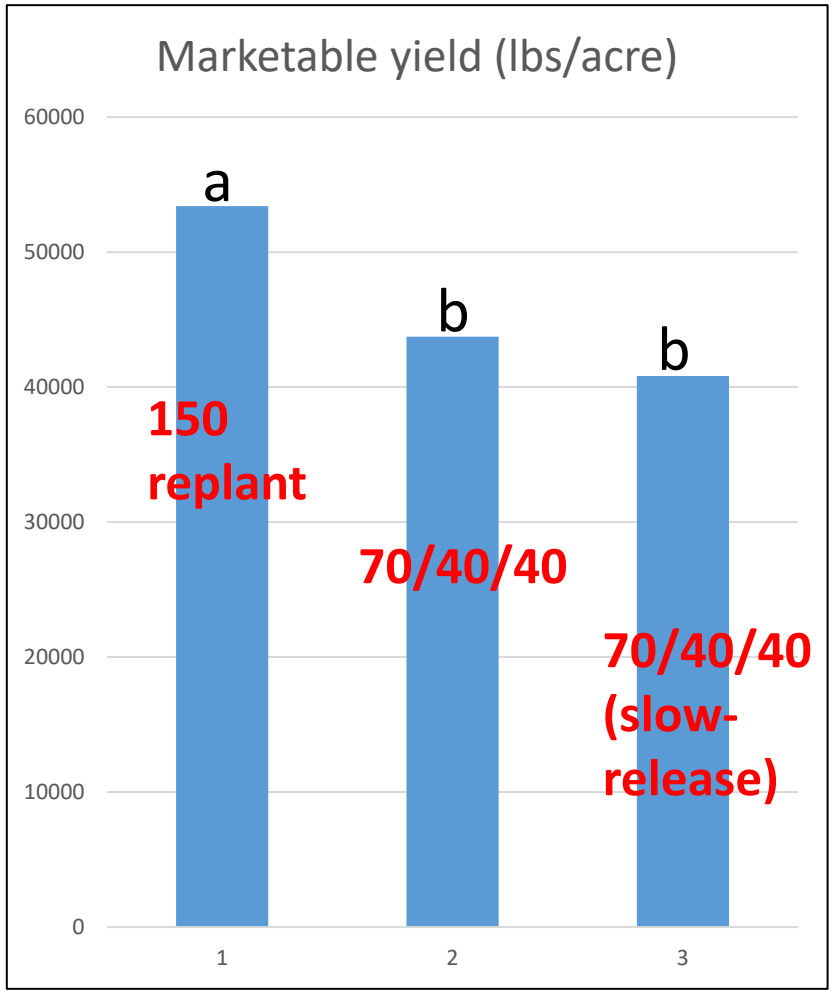


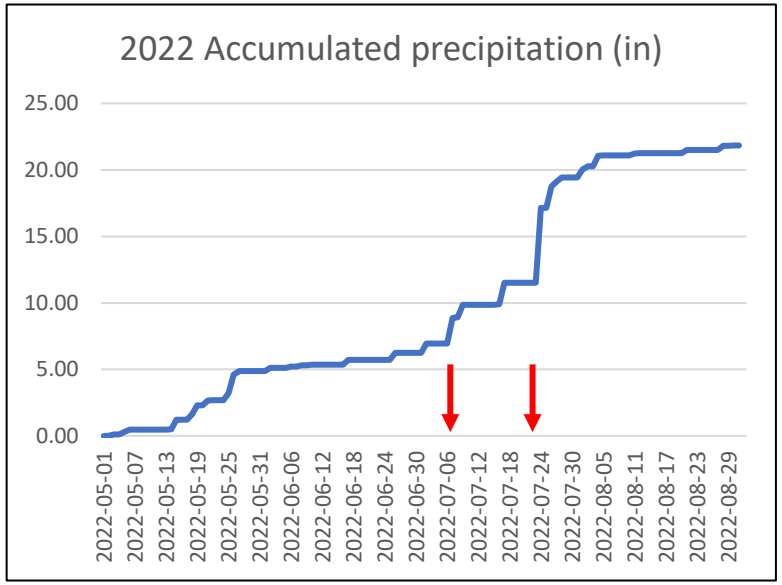


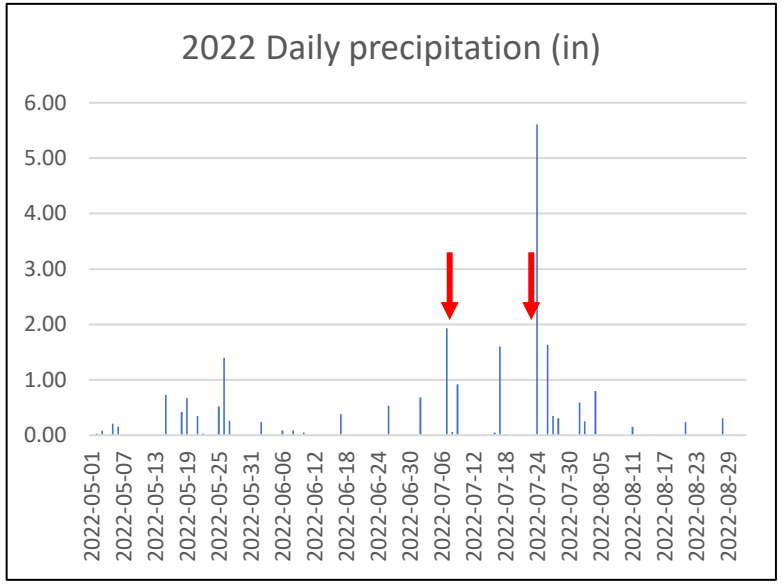


Watermelon Irrigation and Fertilization Experiment in 2022 at SWPAC

Treatment	Preplant N (lb/acre)	In-season N application
Trt1	150	
Trt2	70	Broad coast two times, each applied 40# regular urea
Trt3	70	Broad coast two times, each applied 40# slow release urea







Take-home message

- Split apply fertilizers, and watch for the rainfall
- A universal recommendation is unlikely to suit the diverse watermelon production scenarios, soils, and erratic rainfalls.

Improve soil health is better than any of the fertilizer and irrigation programs, the key for a resilient system

Acknowledgement

We appreciate funding from NWA and IWA to support our work to explore Mature Watermelon Vine Decline; and funding from ISDA Specialty Crop Block Grant for project aims to improve irrigation management in Indiana vegetable production

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