Double Cropping Corn and Soybean: Risk or Reward?

Michael Plumblee, Ph.D., CCA

Indiana CCA Conference

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Background

- Corn and Soybean are the top two row-crop commodities in terms of acres and value in South Carolina
  - Corn value in 2023 – $286,125,000
  - Soybean value in 2023 - $208,709,000
- Over time input prices (fertilizer, pesticides, fuel, equipment costs, land rent, etc) have increased
  - Many inputs have drastically increased since COVID-19
- Corn and Soybean are often grown in rotation; shared equipment; disease and weed benefits

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Background – South Carolina

- Planting Dates
  - Corn - March 15 to April 30 (normal window)
  - Soybean Full Season – March 25 to June 15
    - Ultra Late – July 25 to August 20
- Harvest Dates
  - Corn – July 25 to Oct 1 (normal window)
  - Soybean – Early (Sept 5 to Oct 10) Normal (Oct 20 to Dec 10)
- Corn Hybrids – 112 to 120 RM
- Soybean Varieties – MG 4 to 8

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Improving Total Farm Profit

- Increase Yield
  - Irrigation?
  - Hope and Pray for a "Good" Year
- Increase Price
- Reduce inputs or input costs
  - Increase efficiency
  - Are we trading yield or quality for this?
- Increase Production per Acre
  - Double Cropping
  - Intercropping

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Double Cropping Corn and Soybean

- Double Cropping is not a “new” concept
- Double Cropping Corn and Soybean has been conducted in GA for several years with varying levels of success
- Interest from farmers primarily in Clarendon County, SC where corn and soybean crops dominate production
  - Good, productive soils
  - Irrigation
  - Aggressive farmer mentality
- Estimated 5,000 acres planted to this system in 2020
- Estimated 20,000+ acres planted to this system in 2023

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Double Cropping Corn and Soybean

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Problem/Research Questions

- Can we double-crop corn and soybean in South Carolina? Frost?
- Can we do this profitably?
- What is the last day I can plant soybeans and make a crop?
- Should I be concerned with plant parasitic nematodes?
- What maturity group soybean should I plant? Corn hybrid?
- Will the use of N at-plant increase yield or plant height?
- Other factors?

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Important Factor – Plant Height

- This system needs plant height for harvestability
  - Varietal?
  - Agronomically influenced?
  - Maturity Group?
- How does yield work into this?

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Agronomic Challenges

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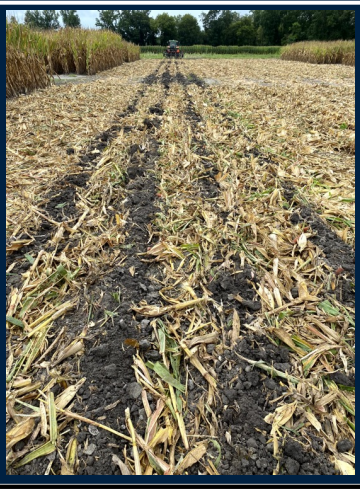
Agronomic Challenges



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Equipment Solutions

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Developing BMP's

- Four Independent Trials:
  - **Trial 1:** Two RM corn hybrids harvested at three different moistures followed by four different MG soybean
  - **Trial 2:** Evaluation of corn and soybean nematicides in double-crop scenarios (Counter 20G & AgLogic15G)
  - **Trial 3:** Evaluation of at-plant nitrogen on ultra-late planted soybean
  - **Trial 4:** Evaluation of row spacing on ultra-late planted soybean (30-inch rows vs. 15-inch rows) & Seeding Rate

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Evaluating Planting Date and Maturity Group – Trial 1

Soybean Planting Date/MG

- Two corn hybrids
  - 113 and 120 RM
- Two corn planting dates
  - March 15 and April 15
- Harvest at 3 moisture contents
  - 25, 20, and 15.5%
- Followed by 4 soybean maturity groups
  - 4, 5, 6, and 7 MG
- Treatments were arranged in a split-plot design with corn planting date as the main effect with 4 replications

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Evaluating Planting Date and Maturity Group

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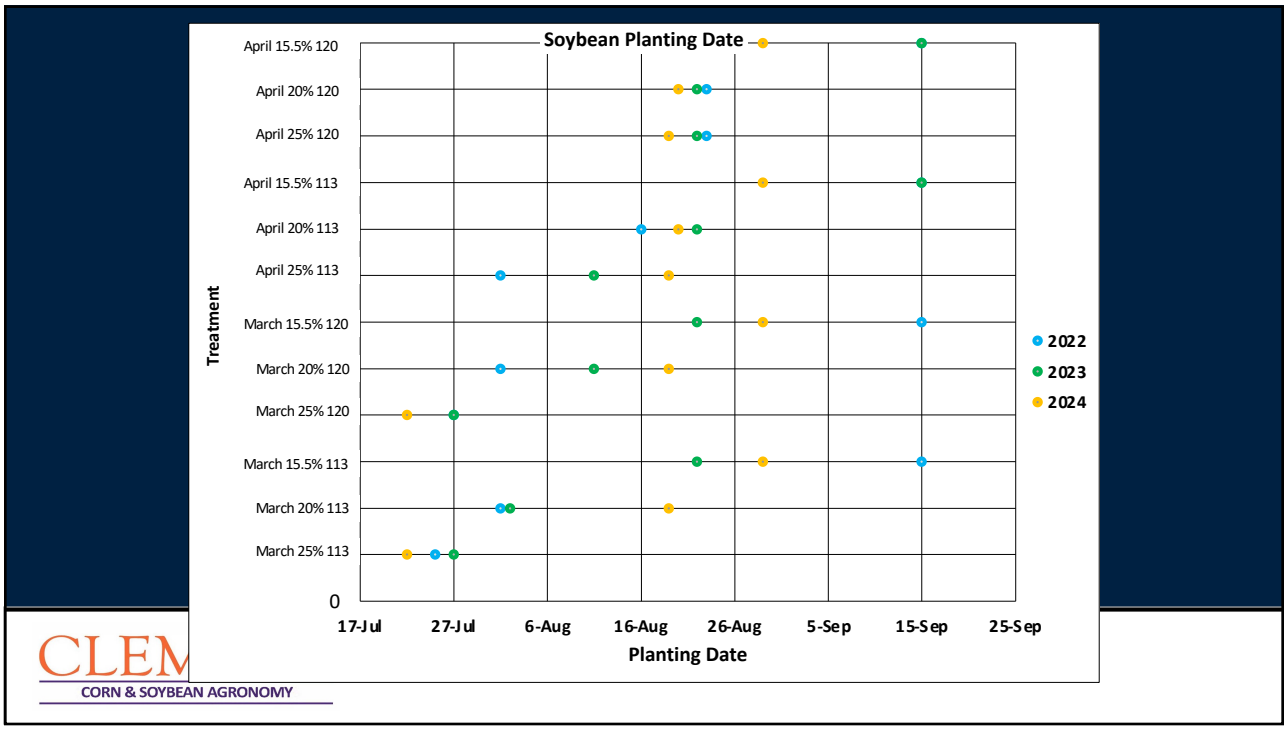
Soybean Planting Date
April 15.5% 120
April 20% 120
April 25% 120
April 15.5% 113
April 20% 113
April 25% 113
March 15.5% 120
March 20% 120
March 25% 120
March 15.5% 113
March 20% 113
March 25% 113
0
Treatment
17-Jul
27-Jul
6-Aug
16-Aug
26-Aug
5-Sep
15-Sep
25-Sep
Planting Date
2022
2023
2024
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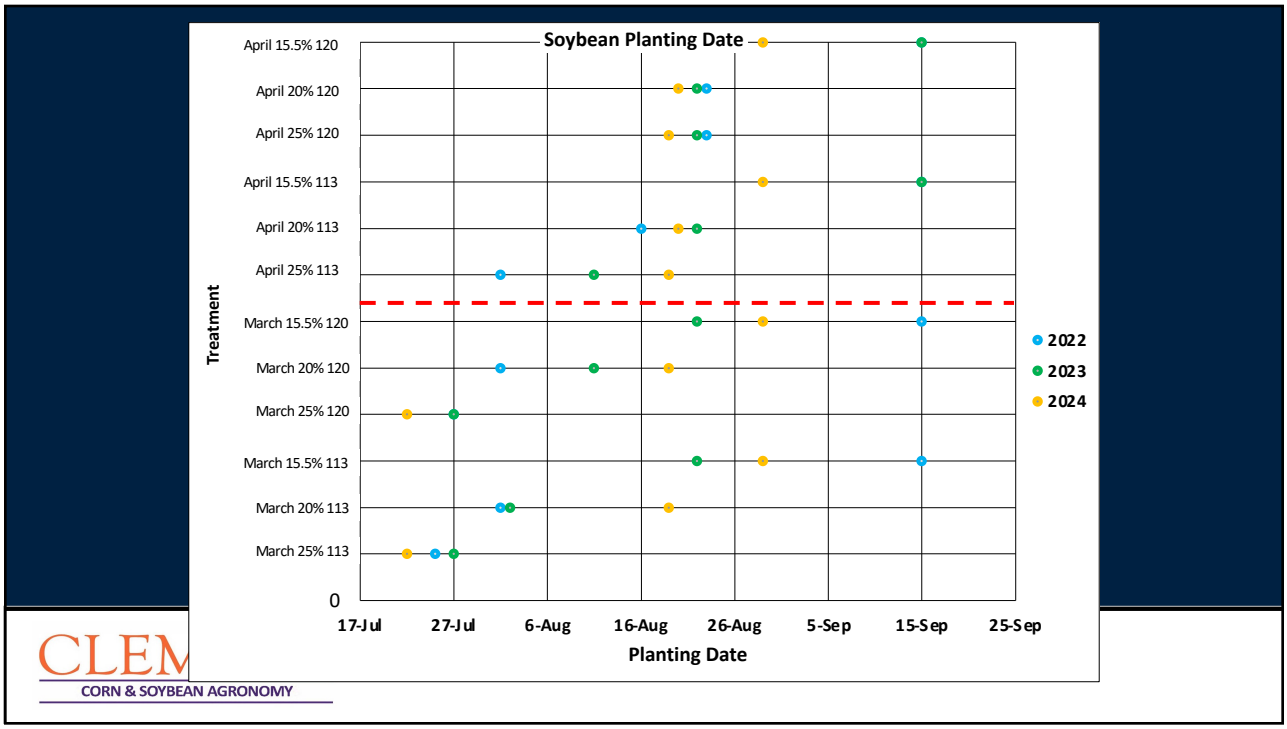
Soybean Planting Date
April 15.5% 120
April 20% 120
April 25% 120
April 15.5% 113
April 20% 113
April 25% 113
March 15.5% 120
March 20% 120
March 25% 120
March 15.5% 113
March 20% 113
March 25% 113
0
Treatment
17-Jul
27-Jul
6-Aug
16-Aug
26-Aug
5-Sep
15-Sep
25-Sep
Planting Date
2022
2023
2024
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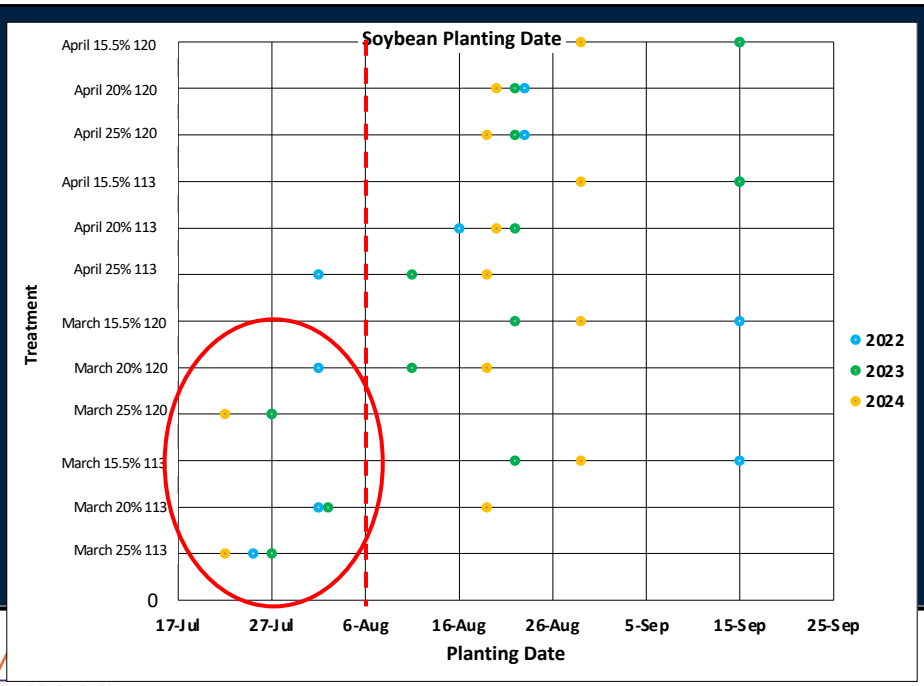

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How to Achieve Appropriate Soybean PD?

- Corn must have a March planting date
  - Heat-driven crop – get in early, expect to harvest earlier
- Understand that corn needs to be harvested at high moisture
  - Grain dryer is a must
  - Drying costs need to be realized upfront
    - Commodity price or drying fuel considerations?
  - Our data suggest that corn harvested at 20% moisture or higher
- Hybrid selection in terms of maturity is flexible
  - Plant full season first or select early hybrid for this system
  - Corn yield is the first and foremost decision!

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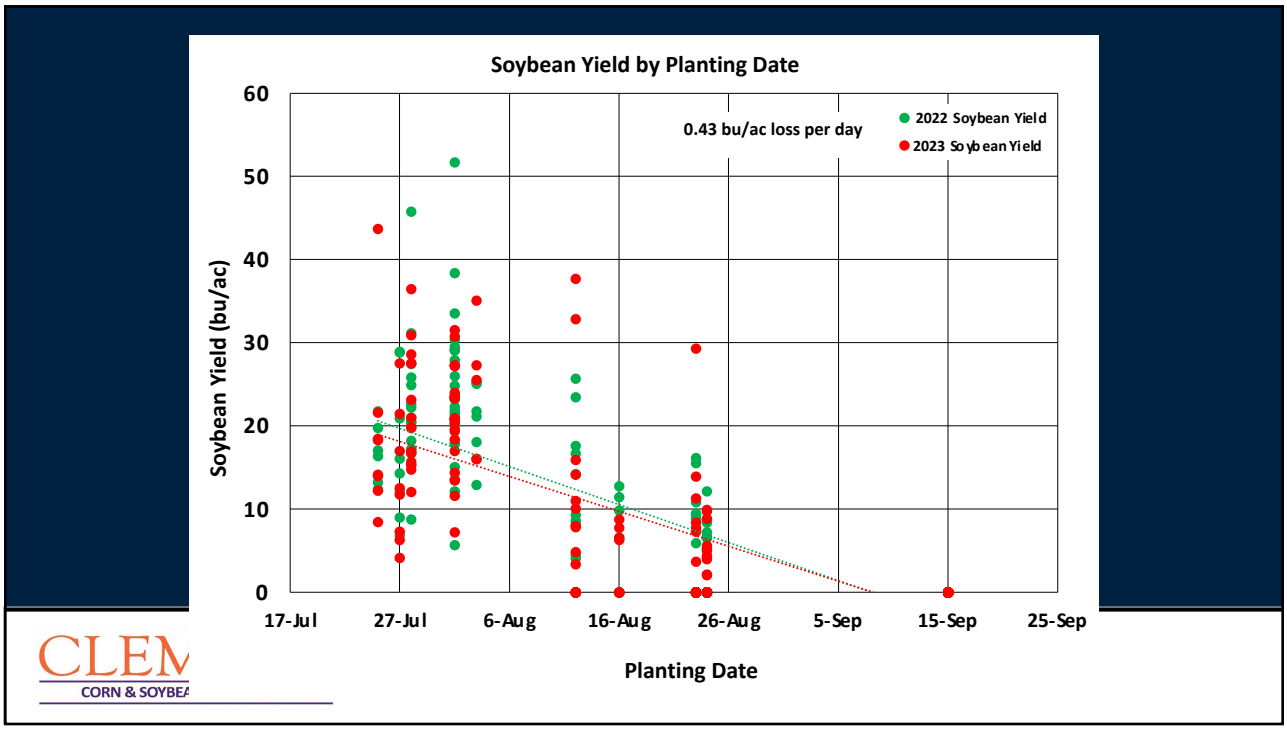
Soybean Yield by Planting Date
0.43 bu/ac loss per day
2022 Soybean Yield
2023 Soybean Yield
Soybean Yield (bu/ac)
60
50
40
30
20
10
0
17-Jul
27-Jul
6-Aug
16-Aug
26-Aug
5-Sep
15-Sep
25-Sep
Planting Date
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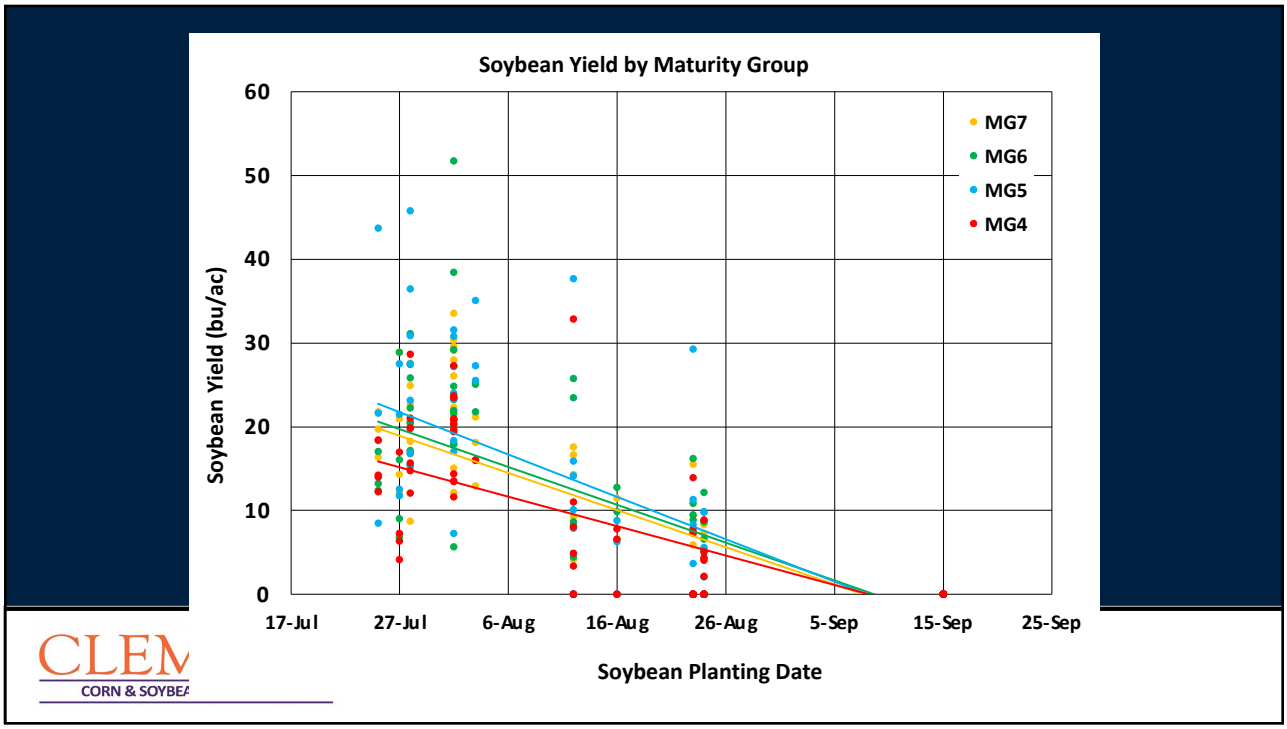
Soybean Yield by Maturity Group
MG7
MG6
MG5
MG4
Soybean Yield (bu/ac)
60
50
40
30
20
10
0
17-Jul
27-Jul
6-Aug
16-Aug
26-Aug
5-Sep
15-Sep
25-Sep
Soybean Planting Date
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Evaluating Planting Date and Maturity Group - Conclusion

- Soybean planting date is highly dependent on corn planting date and harvest moisture
- Flexibility in hybrid selection across years
- Soybean maturity group did influence grain yield at certain planting dates, where the MG 4 underperformed. Varietal?
- Understanding yield potential and yield loss per day will help gauge when to stop planting ~ August 7-10th
- What about plant height??

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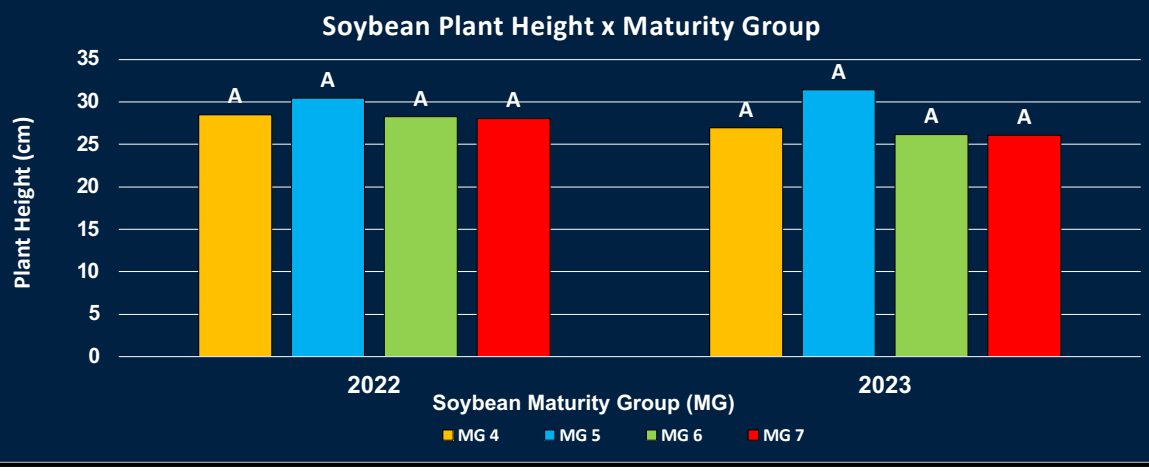
Maturity Group Effects on Plant Height



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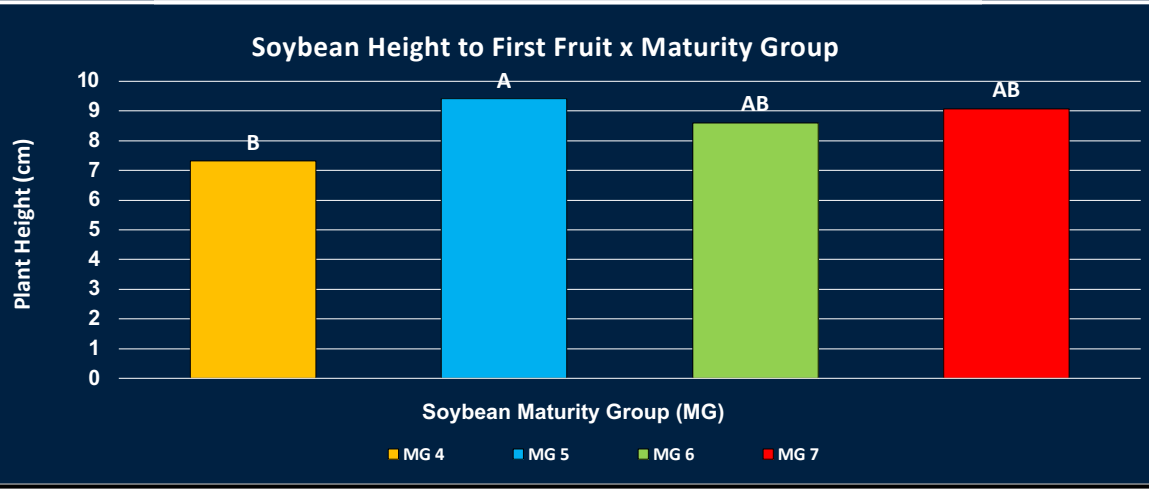
Maturity Group Effects



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Should we be concerned with Nematodes?

Species	Corn	Cotton	Soybean	Peanut
Southern Root-knot	300	100	100	Nonhost
Peanut Root-knot	300	Nonhost	100	50+
Soybean cyst	Nonhost	Nonhost	50	Nonhost
Columbia lance	100	75	50	Nonhost
Lesion	500	100+	150	25+
Stubby root	40+	??	50	50+
Ring	200+	400	200	50+
Sting	4	8	4	8+
Reniform	Nonhost	250	100	Nonhost
Spiral	500	800+	600	200

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Nematode – Trial 2

- SRK Nematode is the primary target in this research, however, all species were identified with sampling
- Corn with and without Counter 20G
  - Nematode sampling at plant, V4, and harvest
  - Root sampling at V4
- SRK resistant and susceptible with and without AgLogic 15G
  - Nematode sampling at plant, V4, and harvest
  - Root sampling at V4

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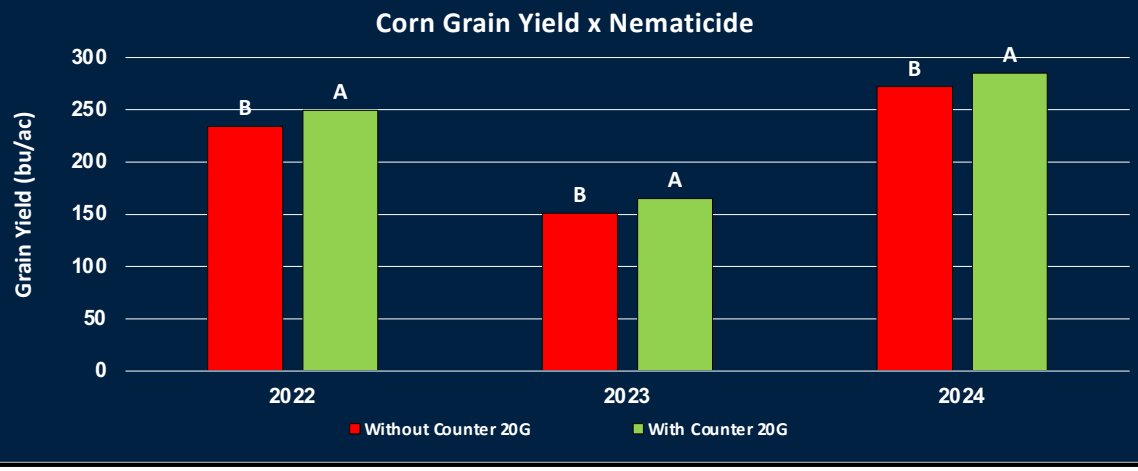
Nematode - Results



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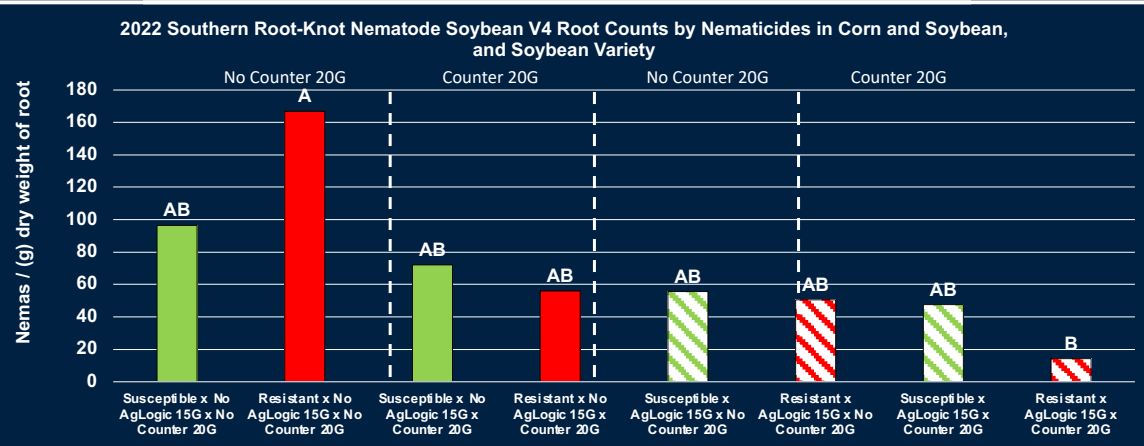
Nematode - Results



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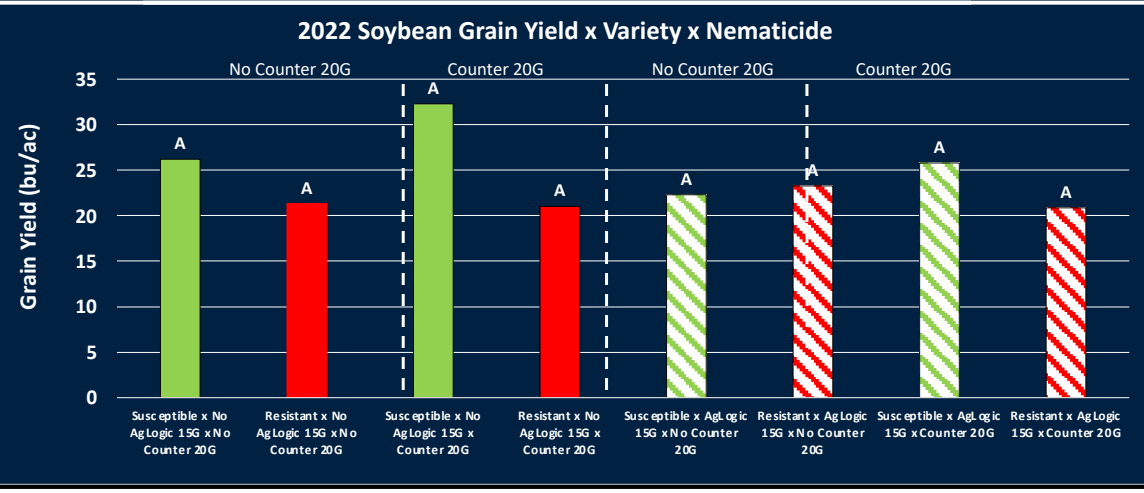
Nematode - Results



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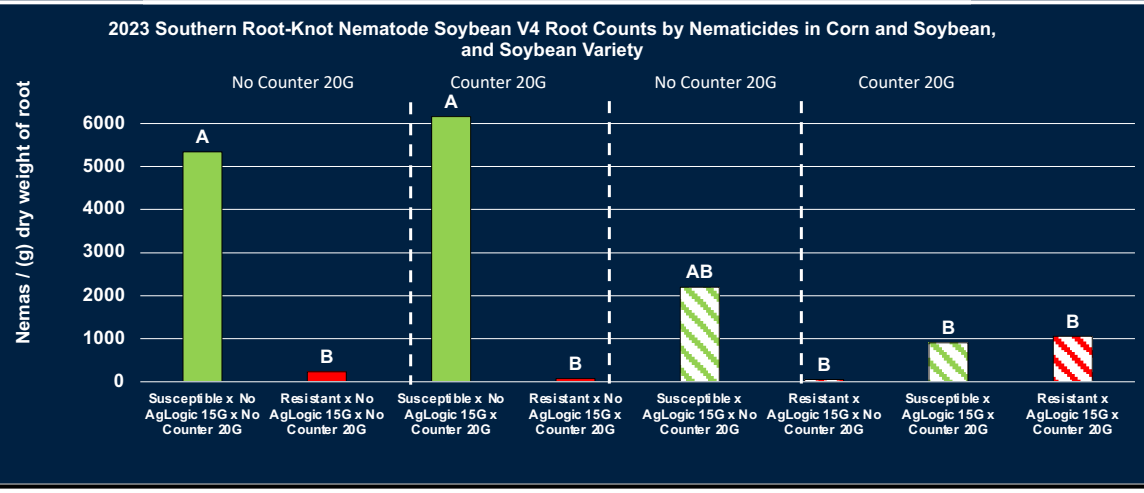
Nematode - Results



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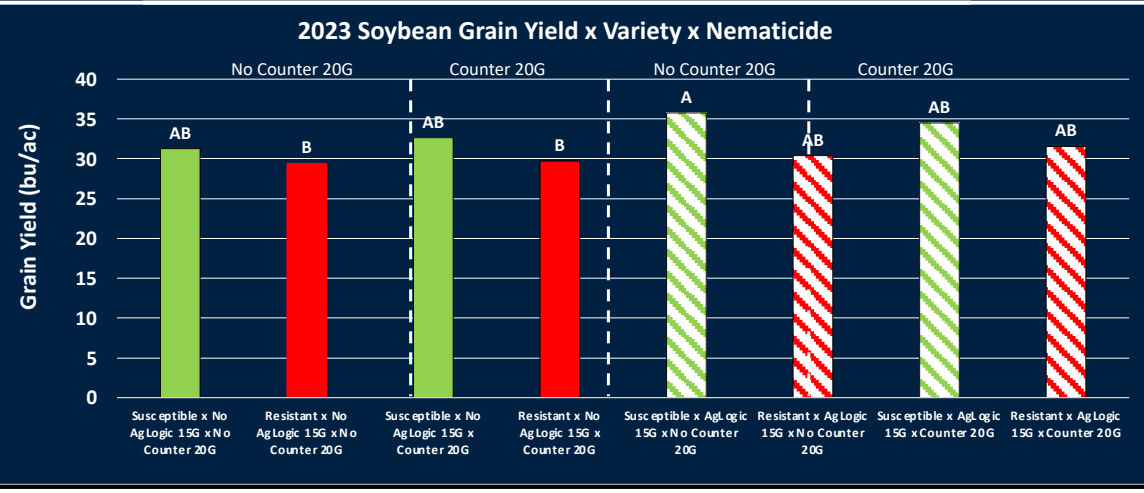
Nematode - Results



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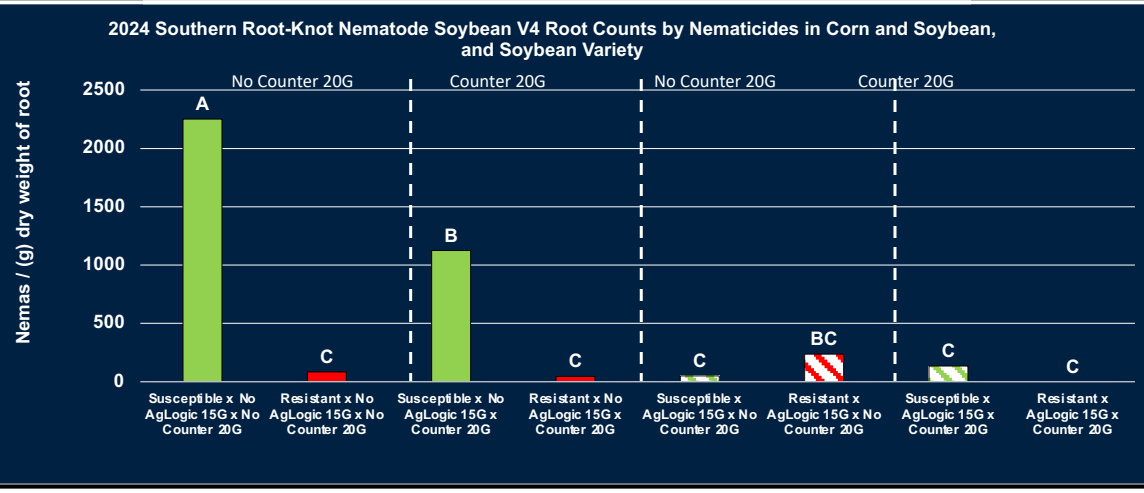
Nematode - Results



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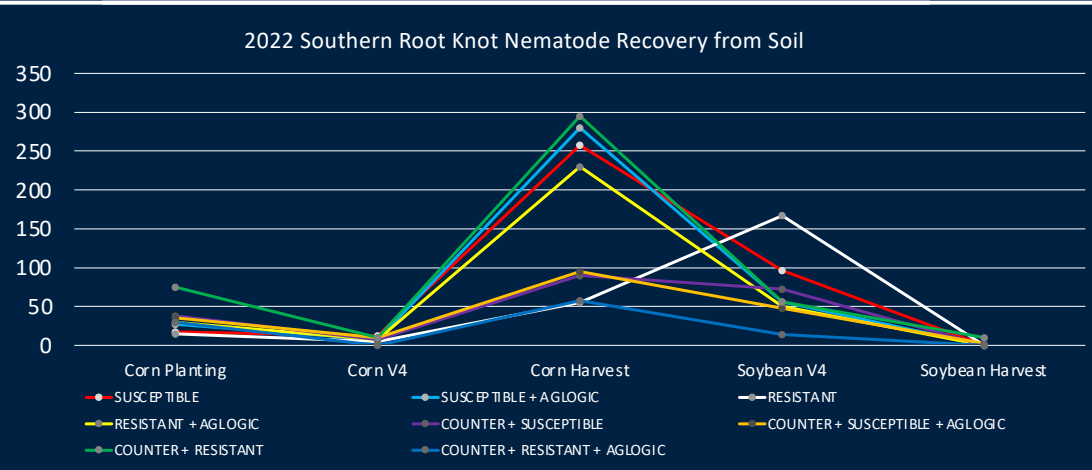
Nematode - Results



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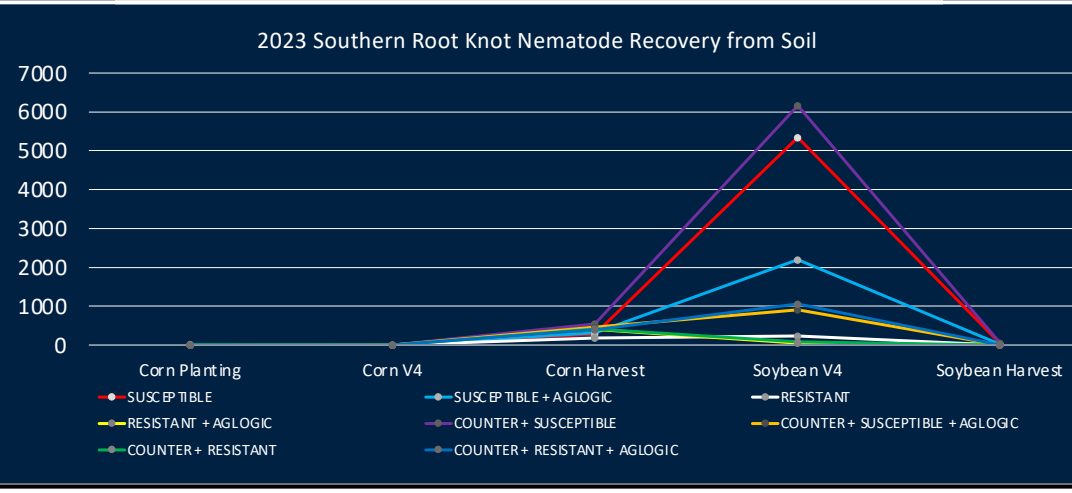
Nematode - Results



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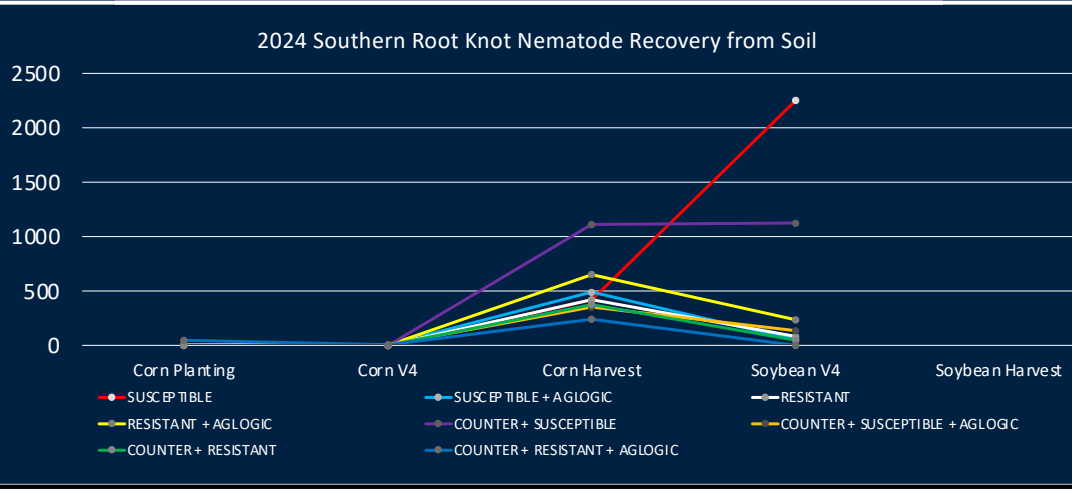
Nematode - Results



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Nematode - Conclusion

- Counter 20G did impact corn grain yield every year with an on-average increase of 14 bu/ac when Counter 20G was used.
- Counter 20G x AgLogic 15G x SRK resistant soybean variety significantly impacted recovery of SRK nematode from soybean roots
- Combination of nematicide and soybean variety did not impact soybean grain yield
  - Variety alone seemed to have biggest impact

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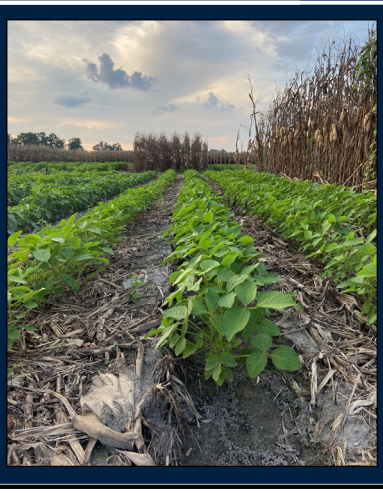
At Plant N – Trial 3

- Soybean was planted in August following corn
- Ammonium nitrate was spread following planting at rates of 15, 30, 60, and 90 lbs of N
- 0 lbs of N was included as a check
- Will we influence plant height?



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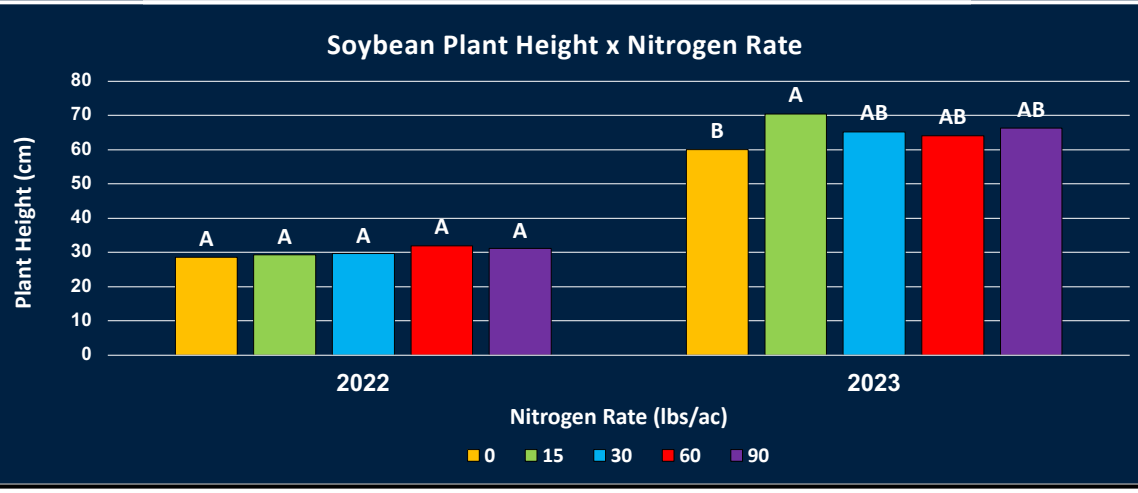
At Plant N - Results



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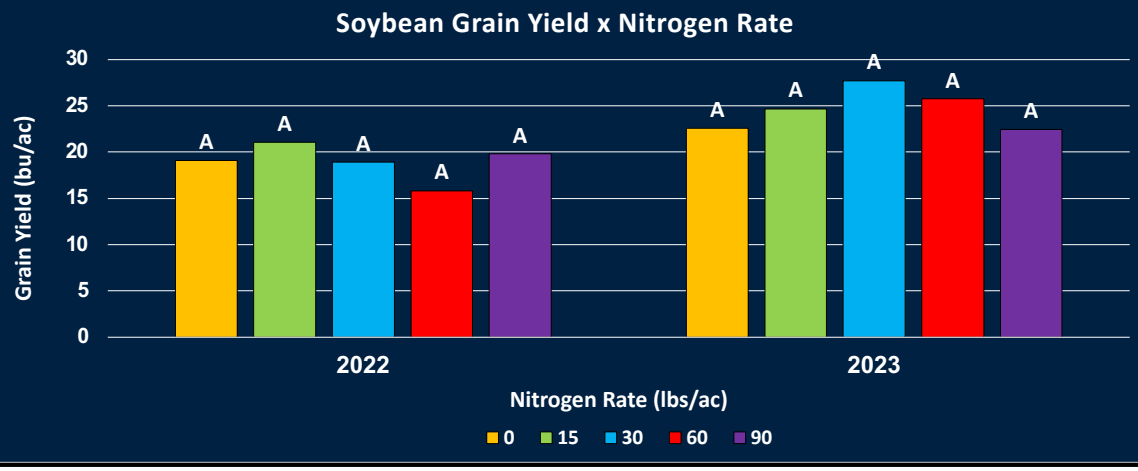
At Plant N - Results



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At Plant N - Conclusion

- Previous research has shown that minor yield increases can be seen in soybeans with additions of N applied
- NO yield advantage in soybeans with the use of supplemental N rarely will show an economic advantage
- Based on our results we only improved plant height in 2023 with additional N supplied to soybean; we did not see the same in 2022.

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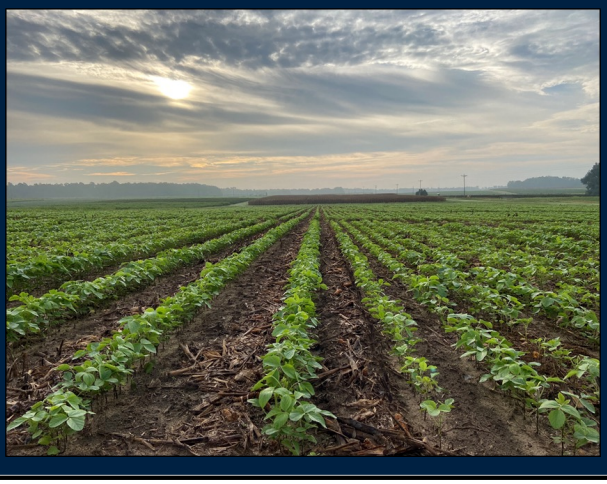
Row Spacing and Seeding Rate – Trial 4

- Soybean was planted in early August following corn
- Evaluated soybean seed rates: 120k, 150k, 180k, 210k, 240k
- Evaluated soybean row spacing: 15in vs 30in
- Strip-tillage used for both row spacings



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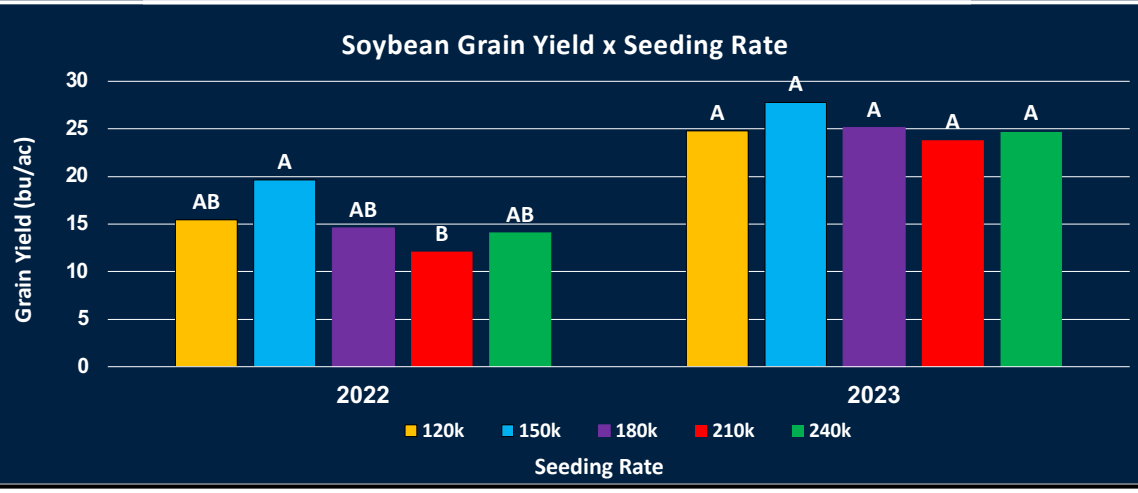
Seeding Rate - Results



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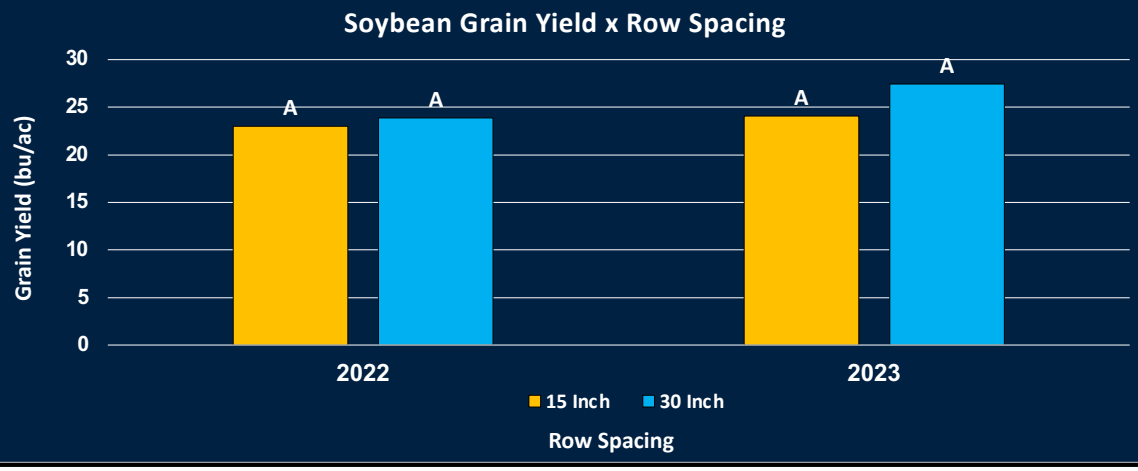
Row Spacing - Results



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Seed Rate/Row Spacing - Conclusion

- In 2022 – 150k seed/ac significantly impacted grain yield and numerically in 2023, are we seeing a trend?
- In 2022 & 2023 – row spacing did not significantly impact grain yield.
  - Strip-till effect?
- How does the seed rate need to be adjusted as the planting window progresses?
- Are we currently planting too high of a seeding rate?

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Double Cropping Economics - 2023

Revenue		Corn - Irrigated	Soybean - Irrigated	DC Corn - Irrigated	DC Soybean - Irrigated
	Projected Yield (bu/ac)	210	65	210	30
	Futures Price	$6.00	$12.62	$6.00	$12.62
	Expected Crop Revenue	$1,260.00	$820.30	$1,260.00	$378.60
Direct Expense					
	Seed	$104.00	$55.00	$104.00	$55.00
	Fertilizer	$393.52	$134.02	$393.52	$0.00
	Crop Protection	$95.52	$128.22	$95.52	$50.00
	Crop Insurance	$8.63	$6.76	$8.63	$0.00
	Drying Cost	$44.73	$2.77	$63.00	$0.00
	Irrigation Energy	$54.00	$27.00	$54.00	$27.00
	Labor	$6.08	$7.15	$6.08	$7.15
	Machinery	$39.45	$43.43	$39.45	$43.43
	Total Direct Expenses	$745.93	$408.99	$764.20	$187.22
	Total Profit / Acre	$514.07	$411.31	$495.80	$191.38
				Total DC Profit / Acre	$687.18

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Double Cropping Economics - 2024

		Corn - Irrigated	Soybean - Irrigated	DC Corn - Irrigated	DC Soybean - Irrigated
Revenue					
	Projected Yield (bu/ac)	210	65	210	30
	Futures Price	$4.80	$9.70	$6.00	$9.70
	Expected Crop Revenue	$1,008.00	$630.50	$1,008.00	$291.00
Direct Expense					
	Seed	$104.00	$55.00	$104.00	$55.00
	Fertilizer	$393.52	$134.02	$393.52	$0.00
	Crop Protection	$95.52	$128.22	$95.52	$50.00
	Crop Insurance	$8.63	$6.76	$8.63	$0.00
	Drying Cost	$44.73	$2.77	$63.00	$0.00
	Irrigation Energy	$54.00	$27.00	$54.00	$27.00
	Labor	$6.08	$7.15	$6.08	$7.15
	Machinery	$39.45	$43.43	$39.45	$43.43
	Total Direct Expenses	$745.93	$408.99	$764.20	$187.22
	Total Profit / Acre	$262.07	$221.51	$243.80	$103.78
				Total DC Profit / Acre	$347.58

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Economics

Example:

- Average farmer plants 250 acres of double-crop soybean
- $9.70 / bushel soybean
- 30-bushel yield

$46,805 Profit?

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BMP's

Understandings:

- Time is critical
- Irrigation is recommended
- Residue management can be a challenge
- Corn must be dried




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BMP's

Lessons Learned:

- Corn needs to be planted in March
- Some flexibility with RM of corn hybrid
- Corn harvest likely needs to occur between 28-20% MC
- Economic benefit from using Counter 20G??

- Pick the best soybean variety for yield and plant height regardless of MG – no benefit in MG 4
- Plant as early as possible until around August 7-10th
- ~150k seed/ac on 30-inch rows can achieve max yield

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BMP's

Lessons Learned:

- What happens if early frost?
  - 2022 we had early frost on Oct 16th
  - Estimated yield loss 10-15% but not total failure
- What happens if we have an active hurricane season?
  - Less irrigation cost
  - In 2023, we had some issues with excessive water
  - In 2024, planting was impacted by Tropical Storm Debbie

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Future Work

Several aspects still to learn:

- Herbicide programs
- Continued varietal screening and evaluation
- Further economic analysis

- Publications in academic journals
- New chapters in production guides
- YouTube videos

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Acknowledgements

Bennett Harrelson

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Edisto REC Nematode Lab

Industry Partners

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South Carolina SOYBEAN BOARD

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Questions?

Michael Plumblee
64 Research Road
Blackville, SC 29803
mplumbl@clemson.edu
803-269-8922

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