SOYBEAN FARMING SYSTEMS
RESEARCH AND EXTENSION

Variety Testing Program
University of Missouri

How to Adjust Soybean Cultivar-Management Strategies for Different Yield Environments in Missouri

2025 Missouri Crop Management Conference

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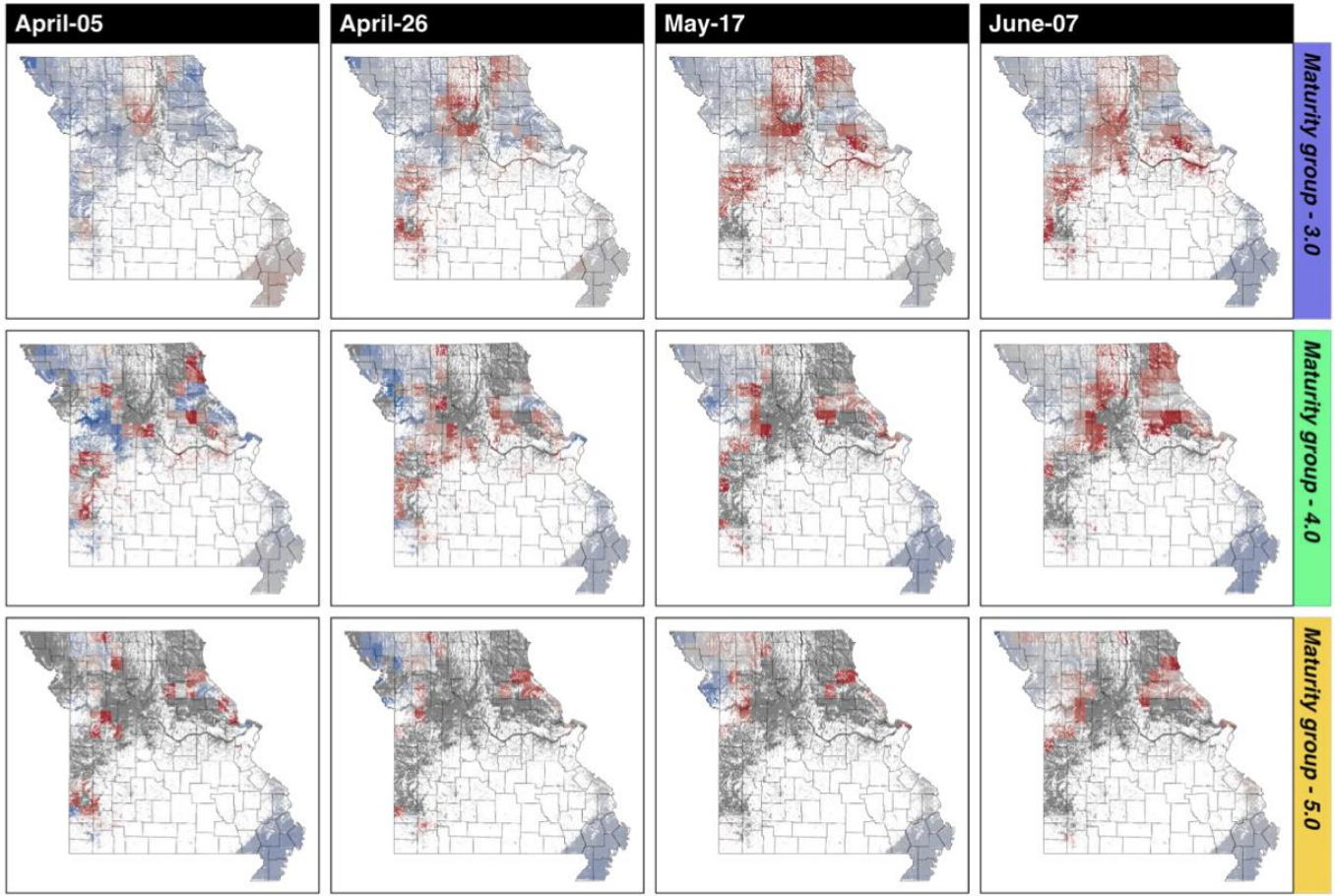
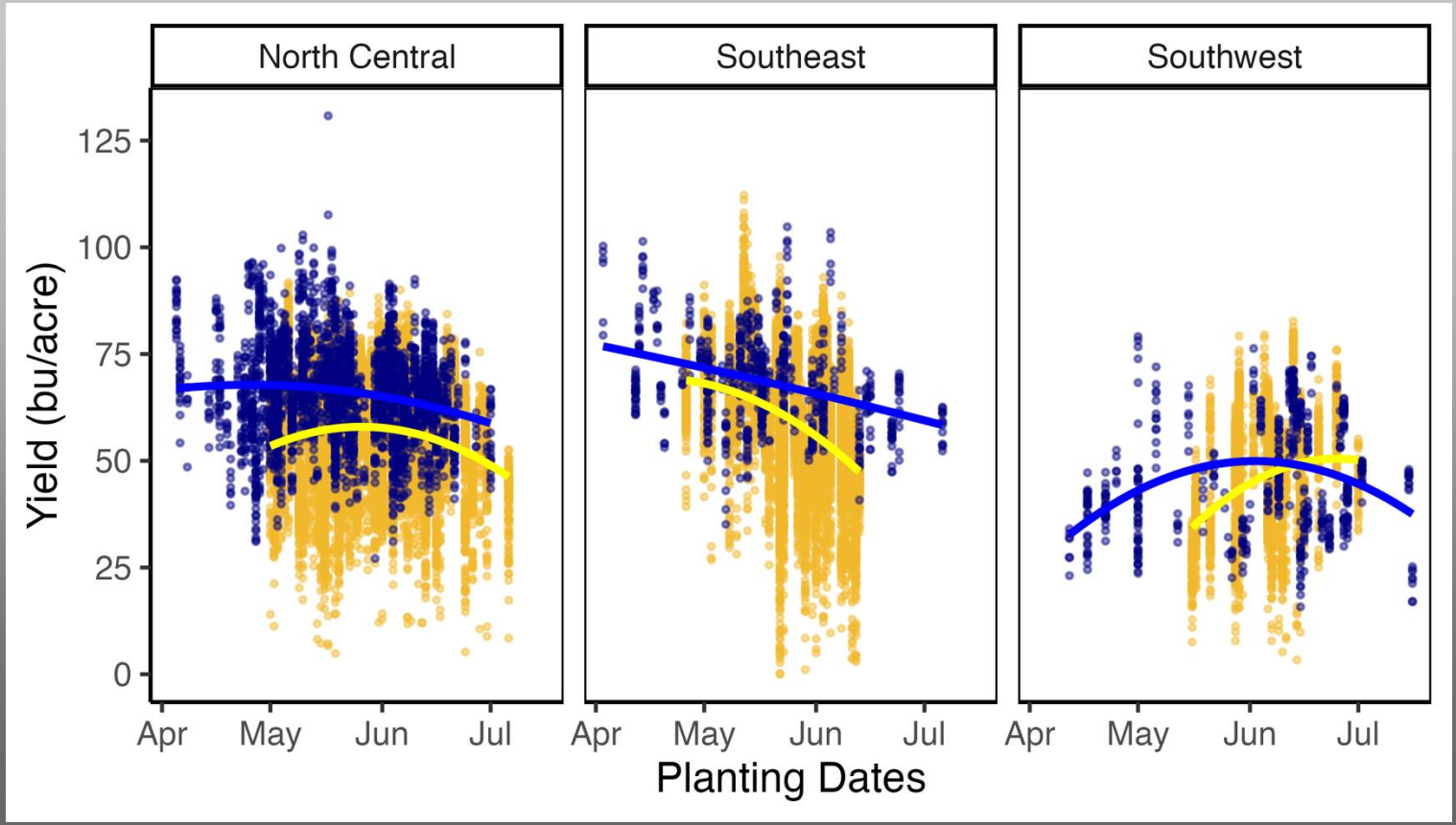
MISSOURI SOYBEANS

Prediction of Yield as of Sep-19-2025

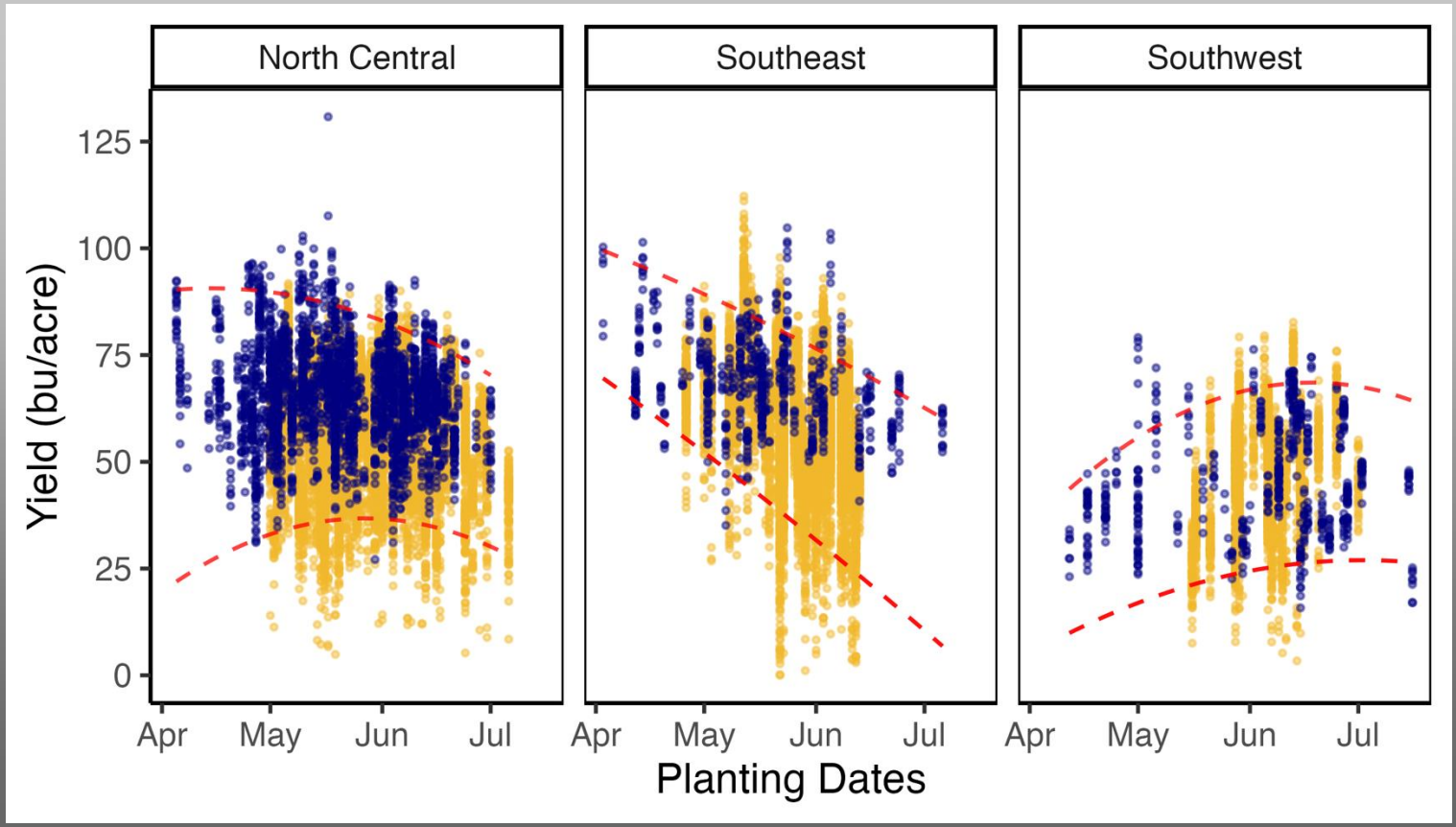
Planting dates:



Best soybean variety and/or maturity group?



Best soybean variety and/or maturity group?



Experimental design

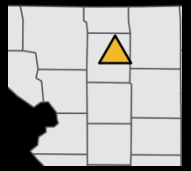
Site x years = **23** (**Albany, Columbia, Vandalia, Henrietta, Charleston, Novelty, Mount Vernon 4x, Sikeston, Portageville, Arcola, Martinsburg, Garden City, Rockport**)

MG	Albany	Columbia	Vandalia	Henrietta	Garden City	Martinsburg	Sikeston	Portageville	Charleston	Novelty	Rock Port	Arcola	Mount Vernon
2.8	P28A65E	-	P28A65E	-	-	-	-	-	-	P28A65E	P28A65E	-	-
3.0	P30A75E	P30A75E	P30A75E	P30A75E	P30A75E	P30A75E	GH3023XF	GH3023XF	GH3023XF	P30A75E	P30A75E	P30A75E	-
3.4	P34A98E	P34A98E	P34A98E	P34A98E	P34A98E	P34A98E	GH3442XF	GH3442XF	GH3442XF	P34A98E	P34A98E	P34A98E	P34A98E
3.7	P37A18E	P37A18E	P37A18E	P37A18E	P37A18E	P37A18E	-	-	-	P37A18E	P37A18E	P37A18E	-
4.0	P40A23E	P40A23E	P40A23E	P40A23E	P40A23E	P40A23E	-	-	-	P40A23E	P40A23E	P40A23E	P40A23E
4.4	-	P44A91E	-	P44A91E	P44A91E	P44A91E	GH4452XF	GH4452XF	GH4452XF	-	-	P44A91E	-
3.9	-	-	-	-	-	-	GH3913XF	GH3913XF	GH3913XF	-	-	-	-
4.9	-	-	-	-	-	-	GH4944XF	GH4944XF	GH4944XF	-	-	-	-
4.8	-	-	-	-	-	-	-	-	-	-	-	-	P48A14E

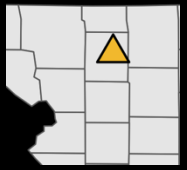
Planting dates: 2,3, or 5
Row spacing: 15 or 30in
Target population: 90k, 140k, 190k/acre
Rep: 3

More than 5,200 plots

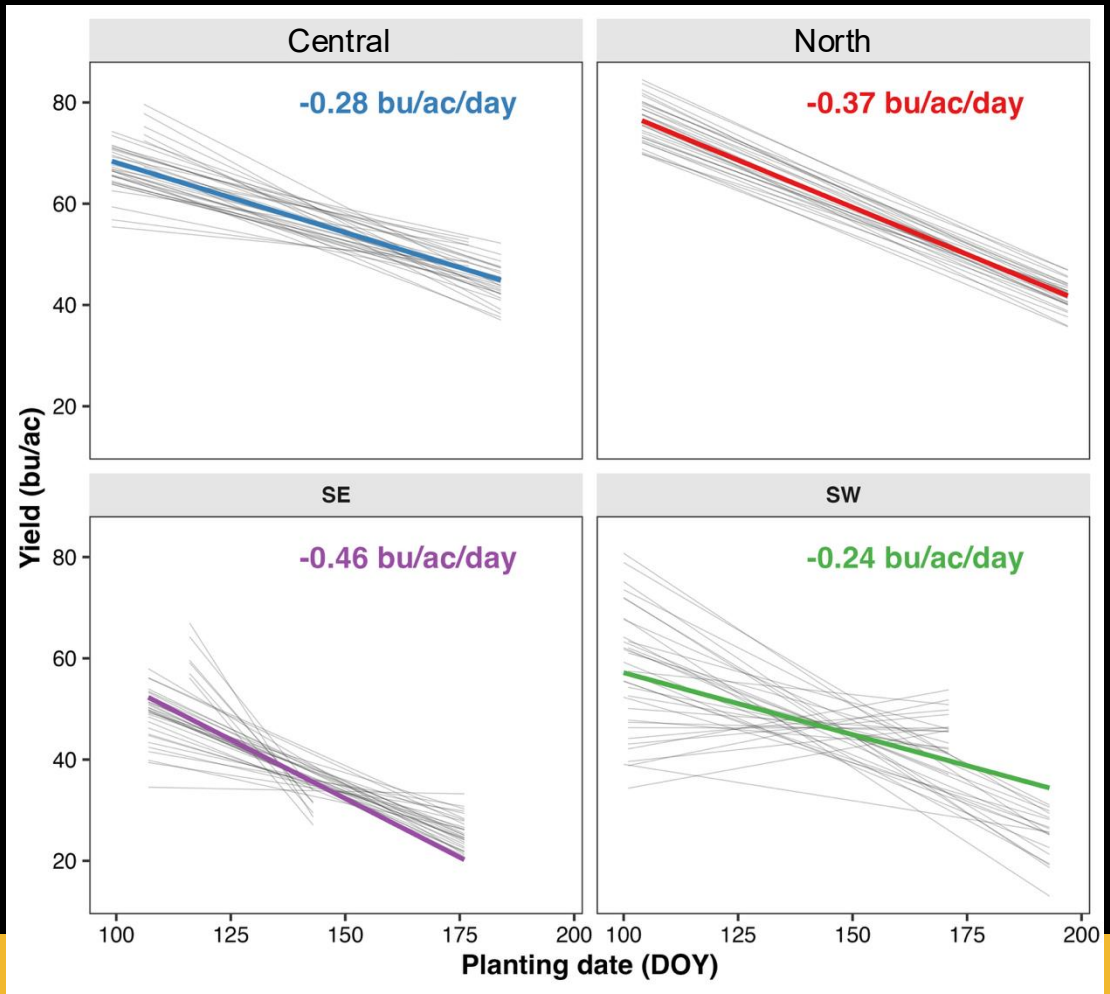
Albany 2024



Albany 2024

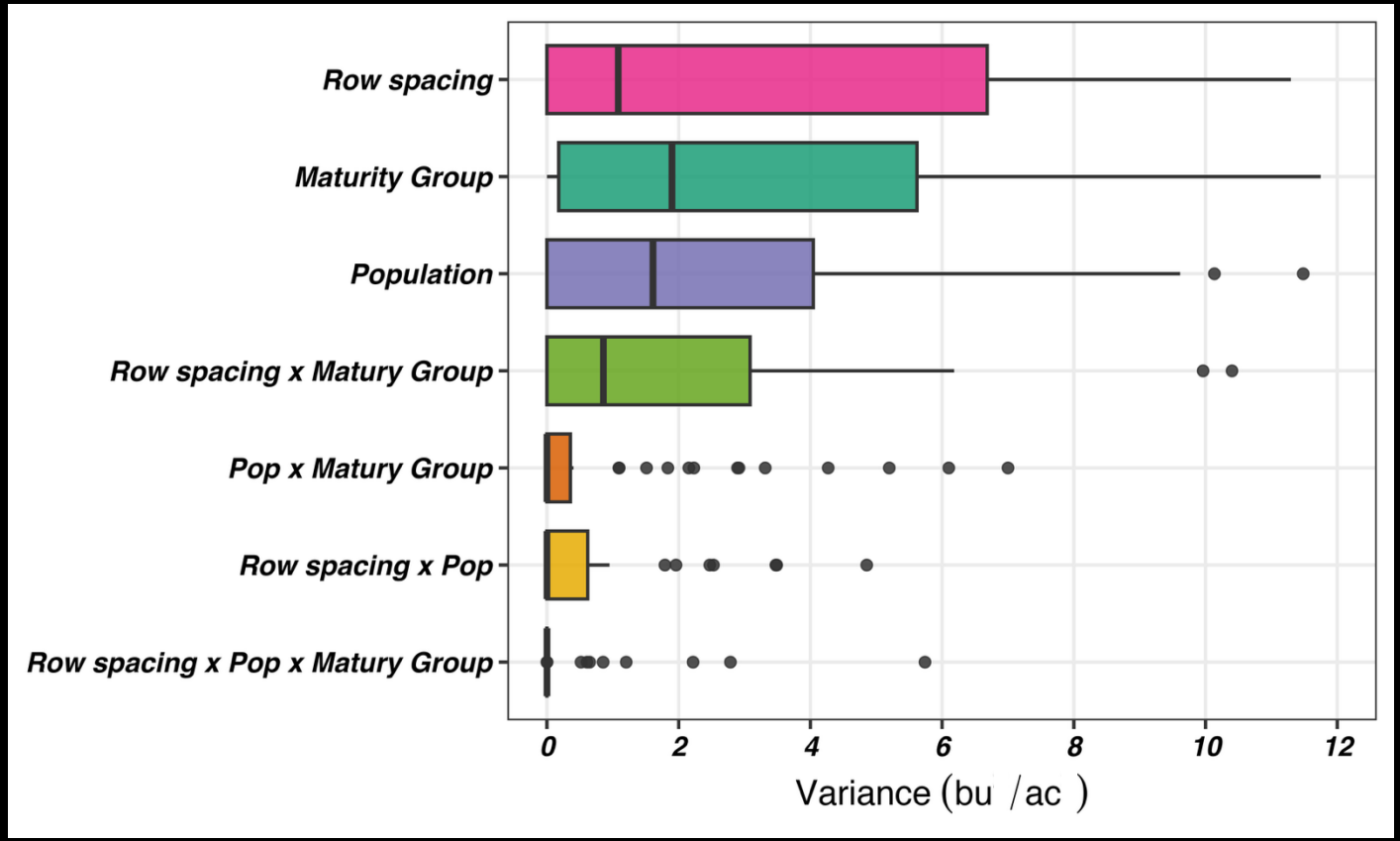


Effect of planting date delay on soybeans yield per MO regions

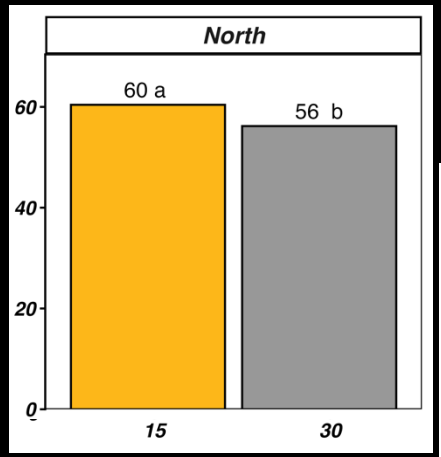


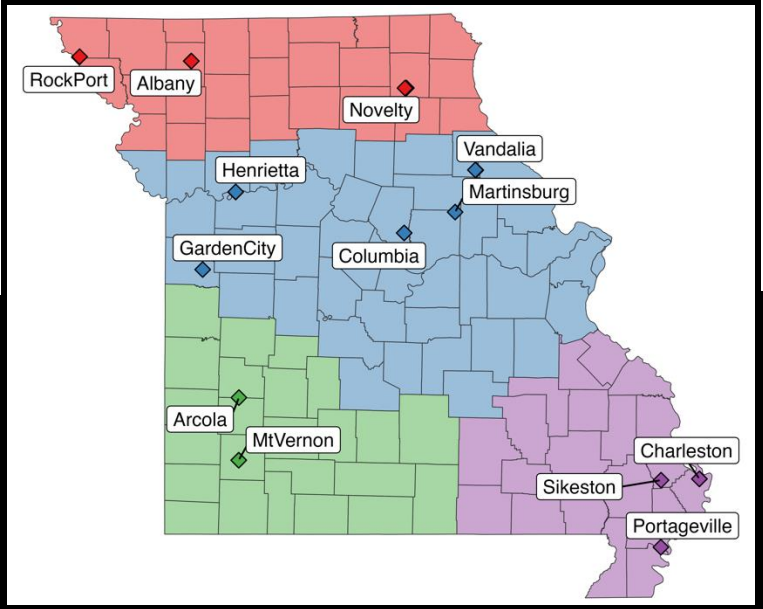
Planting dates
Row spacing
Target population
Maturity group

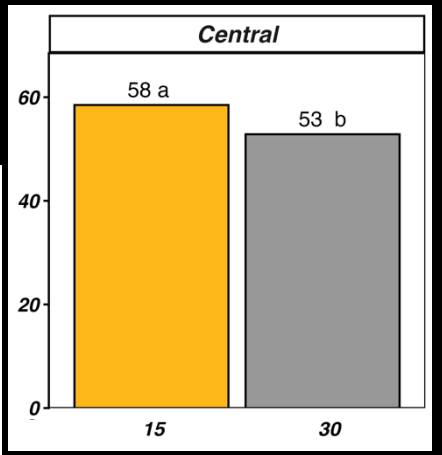
Ranked importance of management factors impacting yield

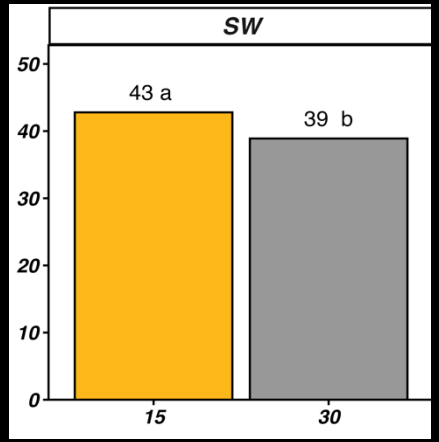


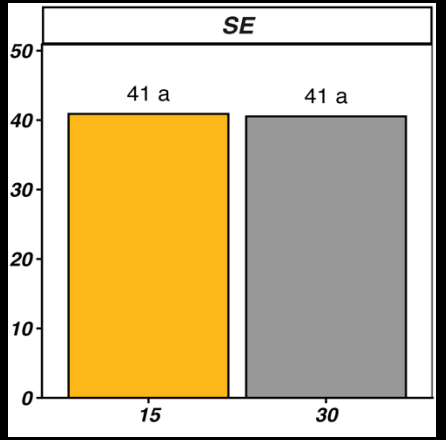
Row spacing and yield



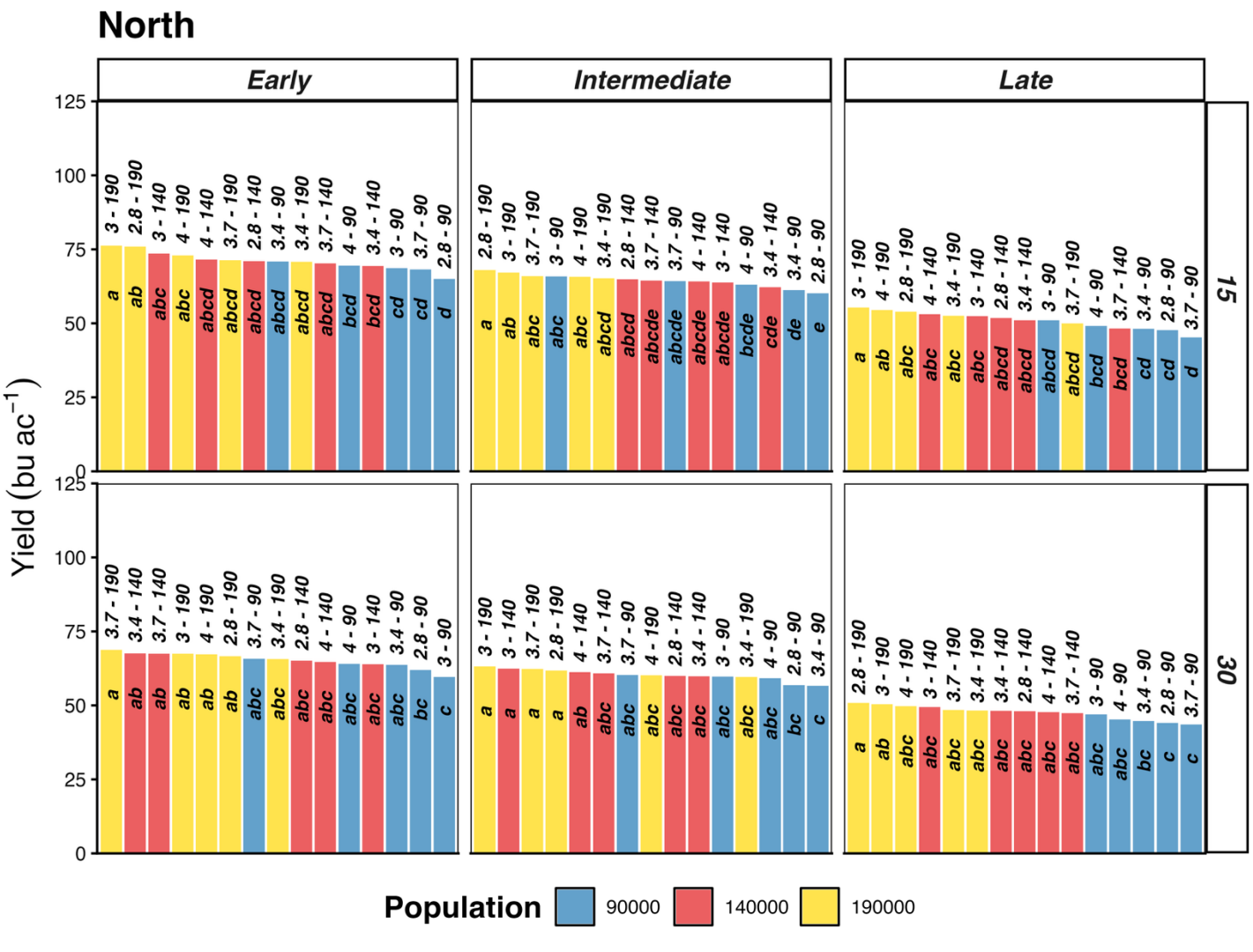






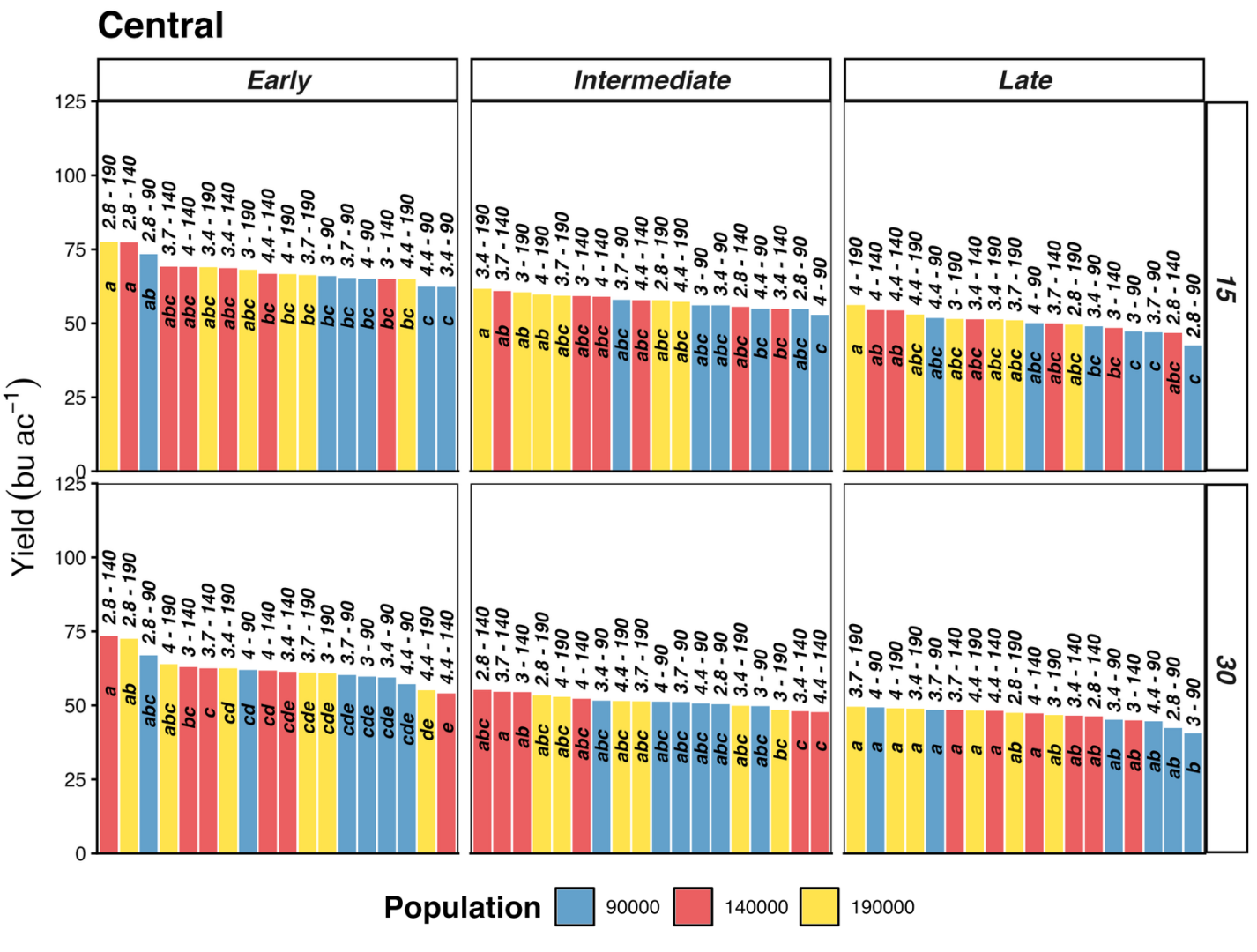


Planting dates
Row spacing
Target population
Maturity group



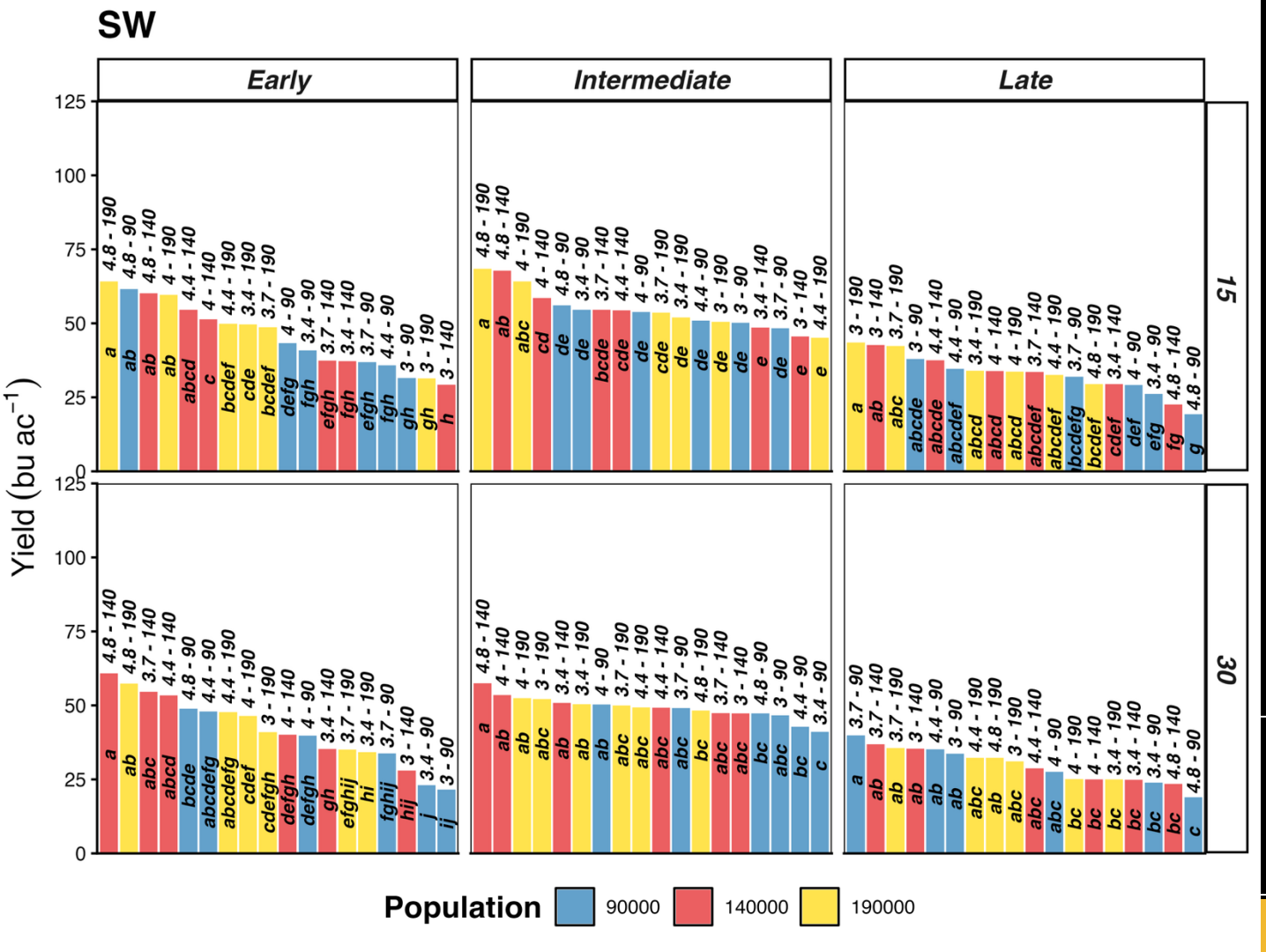
Yield response to management: Variety MG and population - North

Planting dates
Row spacing
Target population
Maturity group



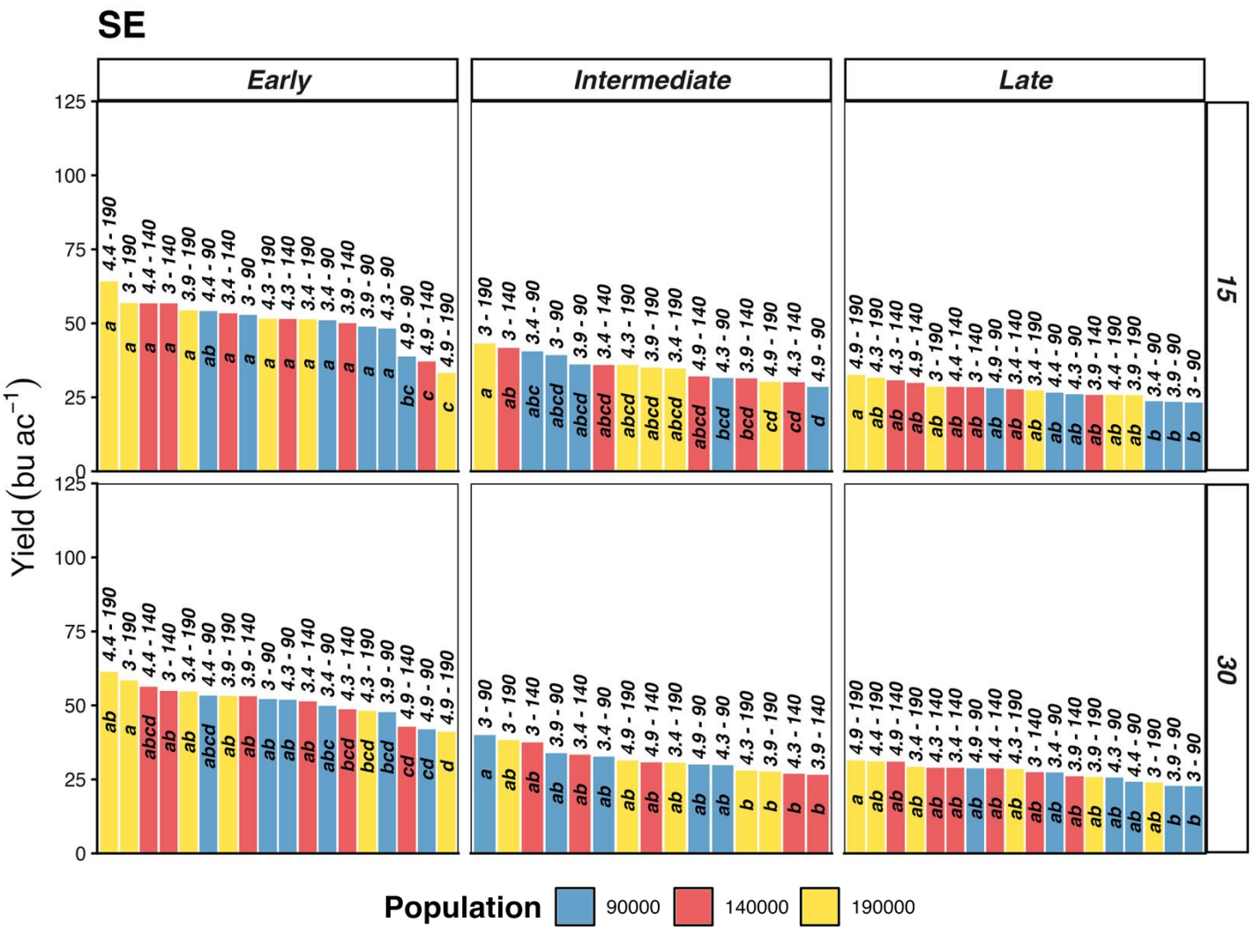
Yield response to management: Variety MG and population - Central

Planting dates
Row spacing
Target population
Maturity group



Yield response to management: Variety MG and population - SW

Planting dates
Row spacing
Target population
Maturity group



Yield response to management: Variety MG and population - Bootheel

Planting dates
Row spacing
Target population
Maturity group

Summary of all 2025 locations – Best vs. Worst Management

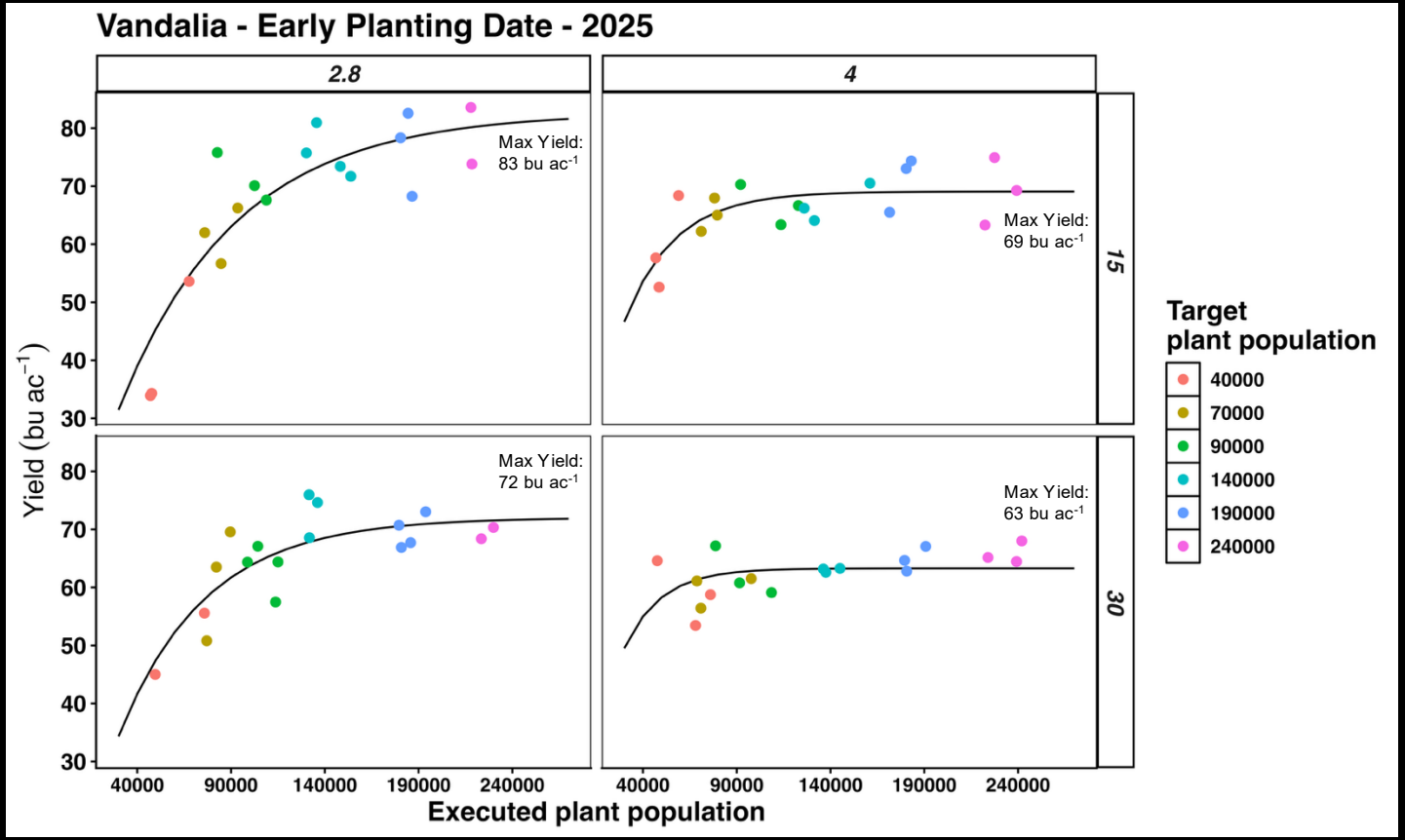
Planting dates
Row spacing
Target population
Maturity group

Environment	Environmental yield (bu/ac)	Env best yield (bu/ac)	Best mgmt	Env worst yield (bu/ac)	Worst mgmt	Yield diff (%)	Best - worst (bu/ac)	p(best > worst)
Albany / 2025 / 2025-04-15	59	69	15 I 190000 I 2.8	47	30 I 90000 I 3	32	22	0.006
Albany / 2025 / 2025-05-15	54	65	15 I 190000 I 2.8	40	30 I 90000 I 3.4	39	25	0.004
Albany / 2025 / 2025-06-12	48	57	15 I 190000 I 3	36	30 I 90000 I 4	36	21	<0.001
Arcola / 2025 / 2025-04-11	36	52	30 I 140000 I 3.7	8	15 I 140000 I 3.4	85	44	0.005
Arcola / 2025 / 2025-05-14	46	52	15 I 140000 I 3.7	40	30 I 90000 I 4.4	23	12	0.536
Arcola / 2025 / 2025-06-20	33	43	15 I 140000 I 4	26	30 I 140000 I 4.4	40	17	0.451
Charleston / 2025 / 2025-04-18	50	58	30 I 140000 I 3.9	35	15 I 140000 I 4.9	40	23	0.009
Charleston / 2025 / 2025-05-23	40	53	15 I 190000 I 3	30	30 I 140000 I 3.9	44	23	0.262
Charleston / 2025 / 2025-06-25	36	44	15 I 190000 I 4.9	28	15 I 90000 I 3.4	36	16	0.117
Garden City / 2025 / 2025-04-10	43	50	30 I 140000 I 3.7	36	30 I 90000 I 3	28	14	0.407
Garden City / 2025 / 2025-05-14	46	62	15 I 90000 I 3	33	30 I 90000 I 3.4	47	29	<0.001
Garden City / 2025 / 2025-06-16	50	56	15 I 140000 I 3	41	30 I 190000 I 4.4	26	14	0.002
Henrietta / 2025 / 2025-04-09	74	88	15 I 190000 I 3.4	65	30 I 140000 I 4.4	27	23	<0.001
Henrietta / 2025 / 2025-05-07	67	77	15 I 140000 I 3.7	59	30 I 140000 I 4.4	23	18	0.154
Henrietta / 2025 / 2025-06-11	63	73	15 I 190000 I 4	52	30 I 90000 I 3	29	21	0.012
Martinsburg / 2025 / 2025-04-16	65	78	15 I 140000 I 3	48	30 I 190000 I 4.4	38	30	<0.001
Martinsburg / 2025 / 2025-05-16	54	67	15 I 190000 I 3.4	42	30 I 140000 I 4.4	37	25	<0.001
Martinsburg / 2025 / 2025-06-24	47	61	15 I 190000 I 4	40	30 I 90000 I 3	35	21	0.087
MtVernon / 2025 / 2025-04-10	54	70	15 I 140000 I 4.8	22	30 I 90000 I 3.4	69	48	0.004
MtVernon / 2025 / 2025-05-13	68	83	15 I 190000 I 4	59	30 I 190000 I 4.8	29	24	0.007
MtVernon / 2025 / 2025-06-20	22	31	30 I 190000 I 4.8	15	15 I 90000 I 3.4	52	16	0.465
Novelty / 2025 / 2025-04-15	73	83	15 I 140000 I 2.8	66	30 I 190000 I 3.4	21	17	0.049
Novelty / 2025 / 2025-05-15	66	77	15 I 140000 I 3	58	30 I 190000 I 3	24	18	0.002
Novelty / 2025 / 2025-06-12	61	71	15 I 140000 I 3	52	30 I 90000 I 3.4	26	19	<0.001
Portageville / 2025 / 2025-04-19	37	44	30 I 190000 I 3	26	15 I 190000 I 4.9	41	18	0.161
Portageville / 2025 / 2025-06-25	18	29	30 I 140000 I 4.9	9	30 I 90000 I 3.9	71	21	0.004
RockPort / 2025 / 2025-04-14	72	83	15 I 190000 I 2.8	64	30 I 140000 I 3.4	22	19	0.527
RockPort / 2025 / 2025-05-14	79	87	15 I 140000 I 3.4	72	30 I 90000 I 4	18	16	<0.001
RockPort / 2025 / 2025-06-11	70	78	15 I 190000 I 2.8	62	30 I 90000 I 3.4	20	16	0.002
Sikeston / 2025 / 2025-04-17	48	69	15 I 140000 I 3	17	15 I 190000 I 4.9	76	52	<0.001
Sikeston / 2025 / 2025-05-23	25	41	30 I 140000 I 3	16	30 I 90000 I 4.3	60	25	<0.001
Sikeston / 2025 / 2025-06-25	13	30	15 I 190000 I 4.3	3	15 I 90000 I 3	90	27	0.027
Vandalia / 2025 / 2025-04-16	67	78	15 I 190000 I 3	59	30 I 90000 I 3.7	24	19	0.007
Vandalia / 2025 / 2025-05-16	46	53	15 I 190000 I 3.7	38	30 I 140000 I 3.4	27	14	0.049
Vandalia / 2025 / 2025-06-24	41	48	15 I 140000 I 4	32	30 I 90000 I 3	33	16	<0.001

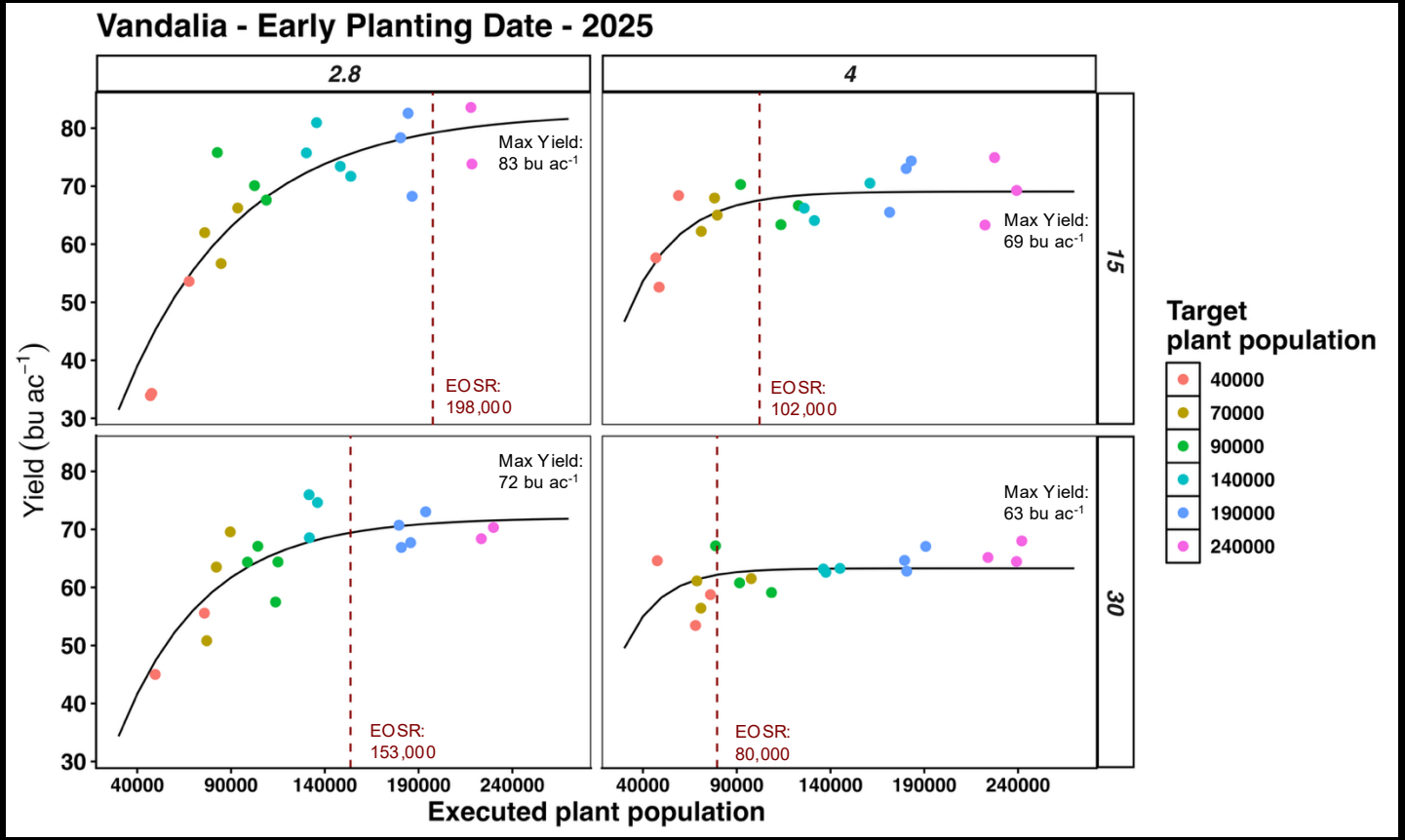
Summary of all 2024 locations – Best vs. Worst Management

Planting dates
Row spacing
Target population
Maturity group

Environment	Environmental yield (bu/ac)	Env best yield (bu/ac)	Best mgmt	Env worst yield (bu/ac)	Worst mgmt	Yield diff (%)	Best - worst (bu/ac)	p(best > worst)
Albany / 2024 / 2024-05-18	62	73	15 | 90000 | 3.4	55	30 | 140000 | 4	25	18	0.298
Albany / 2024 / 2024-05-30	61	71	15 | 190000 | 4	53	30 | 140000 | 3.4	25	18	0.109
Albany / 2024 / 2024-06-11	66	79	15 | 190000 | 3	53	15 | 90000 | 2.8	33	26	0.002
Albany / 2024 / 2024-06-25	49	55	15 | 190000 | 2.8	41	30 | 90000 | 3.4	26	14	0.022
Albany / 2024 / 2024-07-10	31	42	15 | 190000 | 3.4	18	30 | 90000 | 3.7	57	24	<0.001
Charleston / 2024 / 2024-04-25	73	88	15 | 190000 | 4.4	61	15 | 90000 | 3.4	31	27	<0.001
Charleston / 2024 / 2024-05-22	53	62	15 | 140000 | 3	48	30 | 90000 | 4.4	23	14	0.184
Columbia / 2024 / 2024-04-22	74	97	15 | 190000 | 3.4	46	30 | 90000 | 3.4	53	51	0.158
Columbia / 2024 / 2024-05-13	65	85	15 | 190000 | 3.4	52	30 | 190000 | 3	39	34	0.134
Columbia / 2024 / 2024-05-31	45	67	15 | 190000 | 4.4	29	30 | 140000 | 3.4	57	38	0.008
Columbia / 2024 / 2024-06-13	53	70	15 | 190000 | 4	42	30 | 90000 | 3	40	28	<0.001
Columbia / 2024 / 2024-06-24	43	52	15 | 140000 | 4.4	30	30 | 90000 | 3	43	22	0.004
Henrietta / 2024 / 2024-05-21	75	81	15 | 190000 | 3.7	67	15 | 140000 | 3	17	14	0.015
Henrietta / 2024 / 2024-06-25	63	67	15 | 190000 | 4.4	55	15 | 90000 | 3.4	17	11	0.135
MtVernon / 2024 / 2024-05-24	69	78	15 | 190000 | 4	57	15 | 90000 | 3.4	27	21	0.203
MtVernon / 2024 / 2024-06-20	52	70	15 | 140000 | 4.8	39	30 | 90000 | 3.4	45	31	0.299
MtVernon / 2024 / 2024-07-11	46	53	15 | 190000 | 3.4	36	15 | 90000 | 4.8	33	17	0.004
MtVernonCC / 2024 / 2024-05-24	43	51	15 | 140000 | 4.8	27	15 | 90000 | 3.4	48	25	0.389
MtVernonCC / 2024 / 2024-06-26	23	43	15 | 190000 | 4.8	10	30 | 90000 | 3.4	76	33	0.177
MtVernonCC / 2024 / 2024-07-11	16	23	15 | 190000 | 4	10	15 | 90000 | 3.4	55	13	0.095
Novelty / 2024 / 2024-05-16	63	73	15 | 190000 | 2.8	56	30 | 90000 | 3	23	17	0.131
Novelty / 2024 / 2024-05-29	63	71	15 | 140000 | 2.8	55	30 | 190000 | 4	22	16	0.001
Novelty / 2024 / 2024-06-11	40	45	15 | 190000 | 4	36	30 | 90000 | 2.8	20	9	0.629
Novelty / 2024 / 2024-07-02	28	36	15 | 190000 | 4	18	30 | 90000 | 2.8	50	18	0.004
Novelty / 2024 / 2024-07-15	35	40	15 | 190000 | 4	30	30 | 90000 | 2.8	25	10	0.088
RockPort / 2024 / 2024-05-19	73	95	15 | 140000 | 3.7	50	30 | 90000 | 3	48	45	0.002
RockPort / 2024 / 2024-06-12	64	79	15 | 140000 | 4	47	30 | 90000 | 2.8	40	31	0.032
Vandalia / 2024 / 2024-05-23	60	73	15 | 190000 | 3	55	30 | 90000 | 3.4	25	18	<0.001
Vandalia / 2024 / 2024-07-02	41	49	15 | 90000 | 3.7	34	30 | 90000 | 2.8	30	15	0.002



Planting dates
Row spacing
Target population
Maturity group

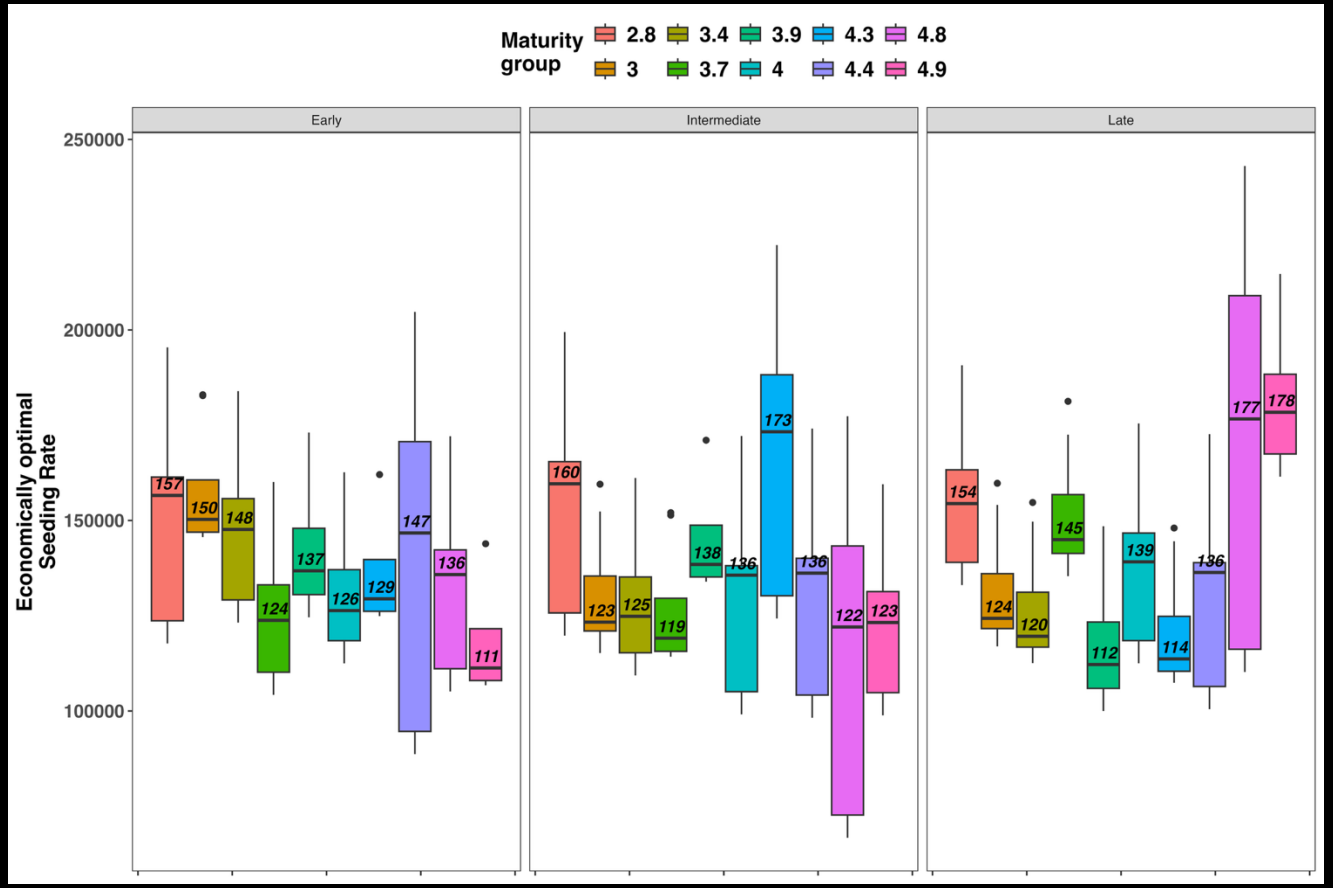


Economically Optimum seed rate - EOSR

Propositions:

Soybean bushel: $9.5
Seed bag price: $75.00

Planting dates
Row spacing
Target population
Maturity group

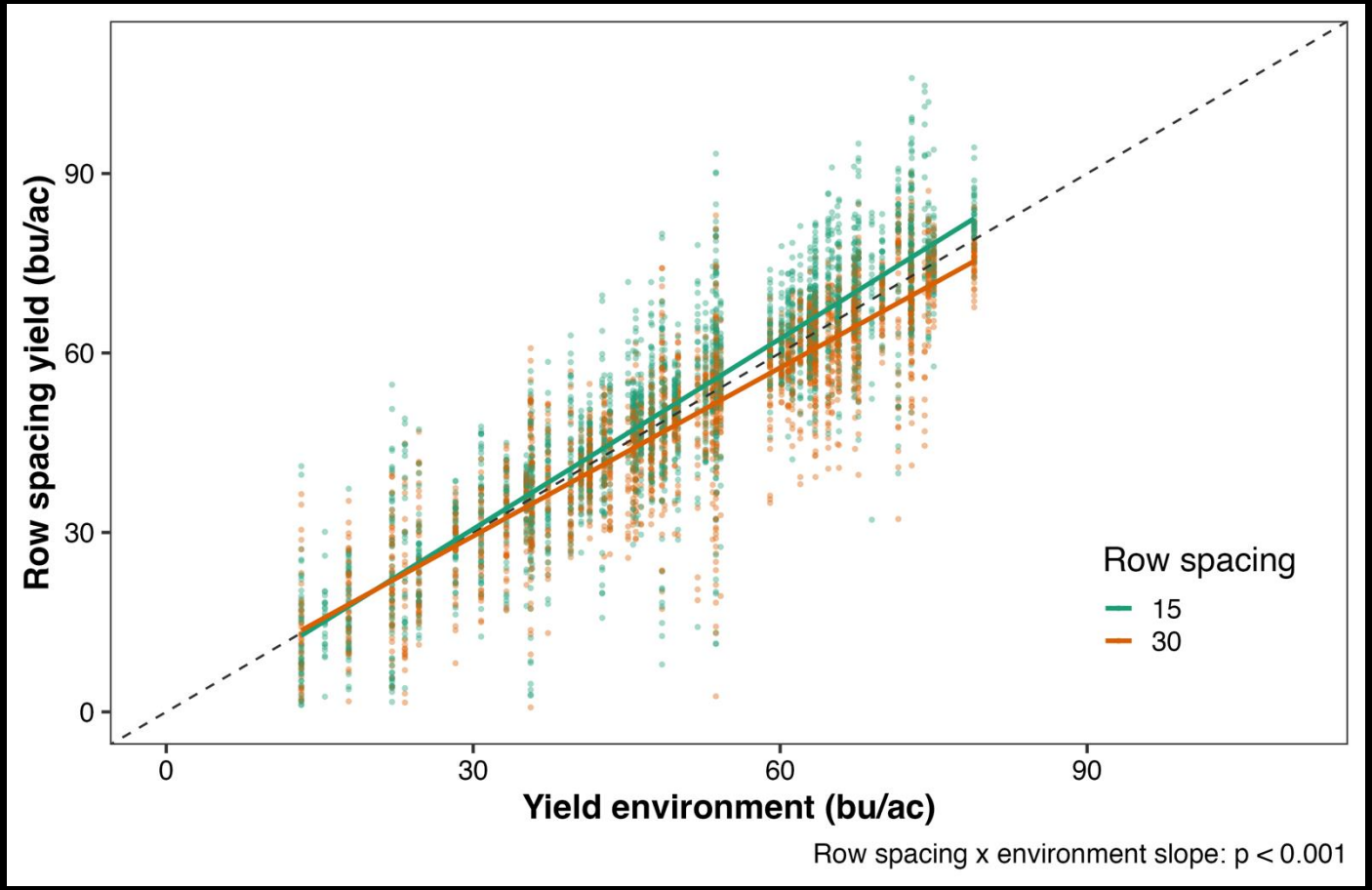


Economically Optimum Seed Rate (EOSR) -

Relationship between MG and planting date

Planting dates
Row spacing
Target population
Maturity group

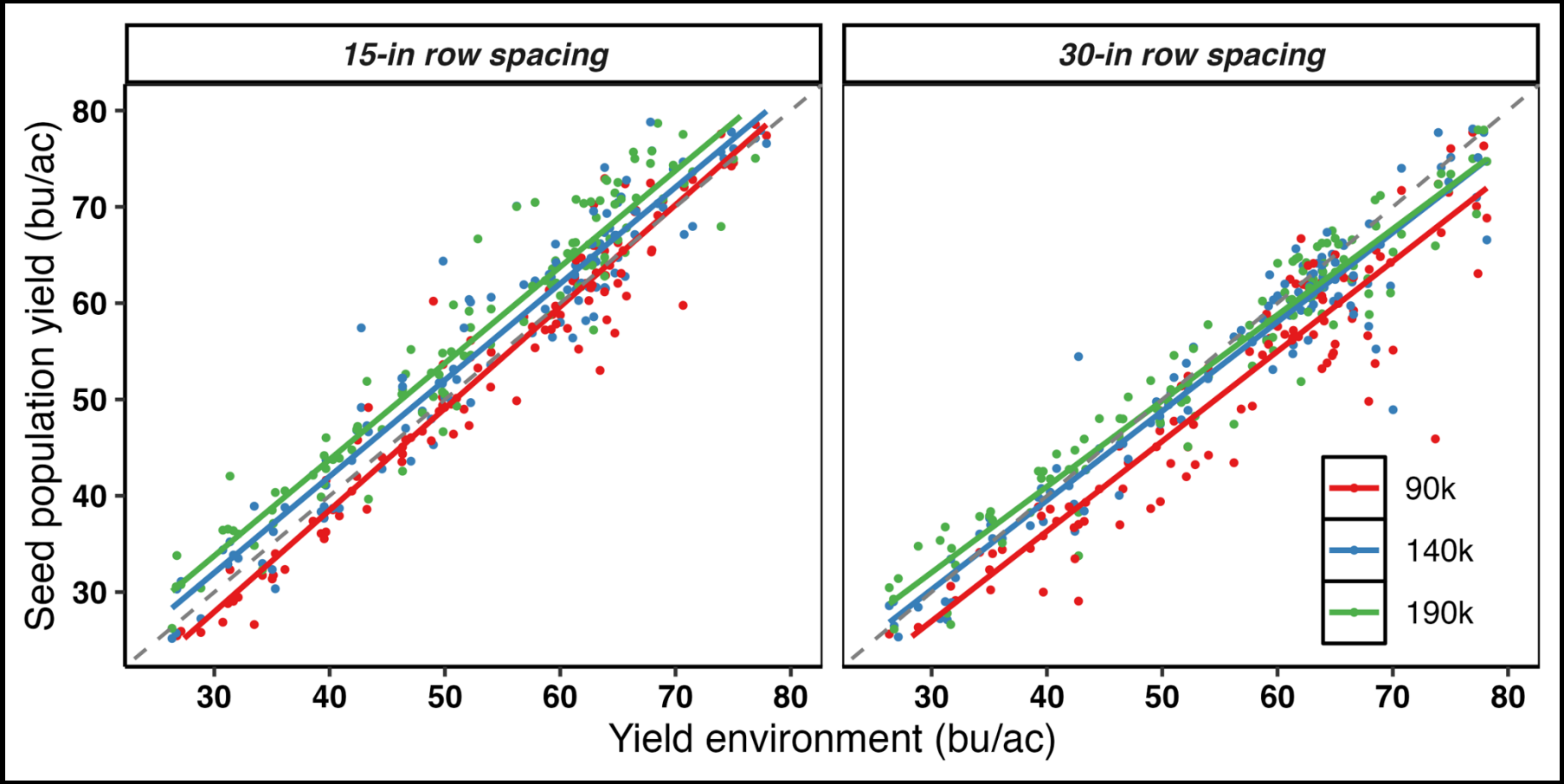
Is there a general model for row spacing?



Economically Optimum Seed Rate (EOSR) -

Relationship between MG and planting date

Is there a general model for seeding rate?



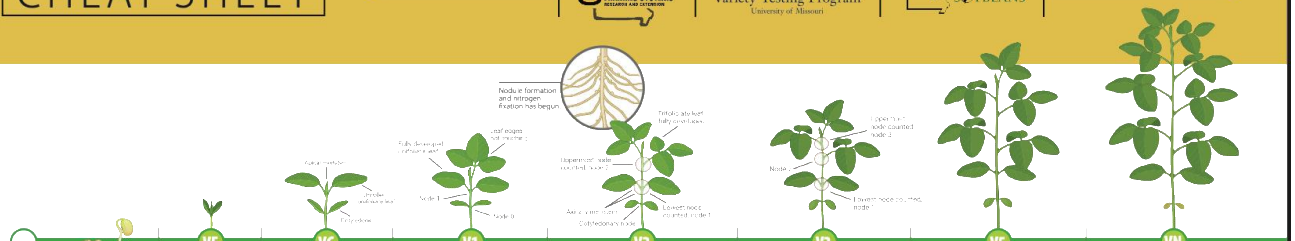
SOYBEAN CHEAT SHEET

Soybean Farming Systems Research and Extension | Variety Testing Program, University of Missouri | Missouri Soybeans

VEGETATIVE DEVELOPMENT

Count the number of nodes on the main stem, starting with the unifoliolate node (instead the cotyledonary node), and include all subsequent nodes that have fully developed leaves. A leaf is considered fully developed when the leaf at the node immediately above has expanded sufficiently so that its leaflets no longer touch. The vegetative stage corresponds to this node count. A plant with three nodes is classified as being in the V3 stage.

Fehr et al., 1971; Fehr & Caviness, 1977



VE — **GERMINATION**

VE — **EMERGENCE**
Cotyledons above soil surface

VC — **COTYLEDON**
Unifoliolate leaves edges not touching

V1 — **FIRST NODE**
Fully developed leaves at unifoliolate nodes

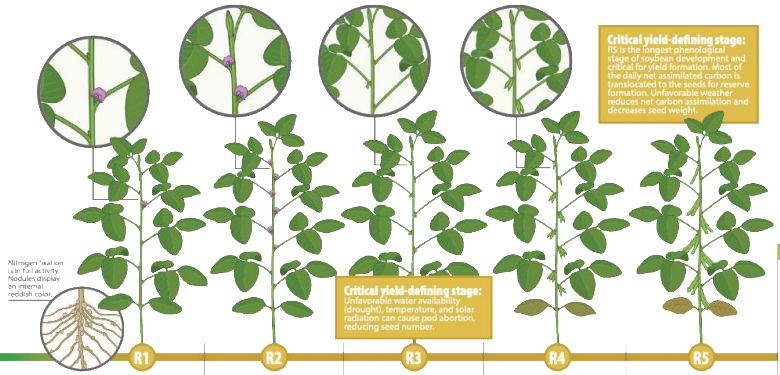
V2 — **SECOND NODE**
Fully developed trifoliolate leaf at node above the unifoliolate node

V3 — **THIRD NODE**
Three nodes on the main stem with fully developed leaves

V5 — **FIFTH NODE**
Five nodes on the main stem with fully developed leaves

VN — **NTH NODE**
N nodes on the main stem with fully developed leaves

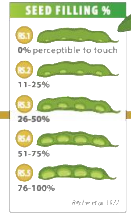
STAND ESTABLISHMENT
DISEASE & PEST MANAGEMENT
CRITICAL ROOT DEVELOPMENT
CRITICAL WEED COMPETITION

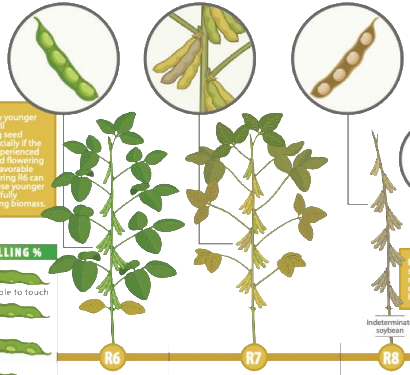


Critical yield-defining stage: Unfavorable water availability (drought), temperature, and solar radiation can cause pod abortion, reducing seed number.

Critical yield-defining stage: R5 is the longest phenological stage of soybean development and critical for yield formation. Most of the daily net assimilated carbon is translocated to the seeds for reserve formation. Unfavorable weather reduces net carbon assimilation and decreases seed weight.

At R6, many younger pods are still undergoing seed filling, especially if the crop has experienced an extended flowering period. Unfavorable weather during R6 can prevent these younger seeds from fully accumulating biomass.





Indeterminate varieties have a stem segment or a leaf in the apical meristem at maturity, whereas determinate varieties have, or have had, a reproductive structure.

R1 — **BEGINNING BLOOM**
One open flower at any node on the main stem

R2 — **FULL BLOOM**
An open flower at the node immediately below the uppermost node with a completely unrolled leaf

R3 — **BEGINNING POD**
A pod with 3/16 inch (0.5 cm) long at one of the four uppermost nodes on the main stem with a fully developed leaf

R4 — **FULL POD**
Pod 3/4 inch (2 cm) long at one of the four uppermost nodes on the main stem with a fully developed leaf

R5 — **BEGINNING SEED**
Seeds inside the pods can be felt when gently squeezed at one of the four uppermost nodes on the main stem with a fully developed leaf

R6 — **FULL SEED**
Seeds completely filling the pod cavity at one of the four uppermost nodes on the main stem

R7 — **BEGINNING MATURITY**
One pod on the main stem that has reached its mature pod color, usually accompanied by the presence of yellow pods throughout the plant (Physiological maturity)

R8 — **FULL MATURITY**
Ninety-five percent of the pods have reached their mature pod color

Harvest maturity: Dry weather is required after the R8 stage to allow soybeans to reach a moisture content suitable for pod threshing and seed separation.

DISEASE & PEST MANAGEMENT
CRITICAL WEED COMPETITION
DROUGHT & HEAT STRESS
CRITICAL ROOT DEVELOPMENT
DROUGHT & HEAT STRESS

Physiological maturity denotes the complete separation of the mature seed from the pod, ending seed biomass accumulation. This change is not visible to the naked eye, so we look for visual cues such as pod color. By the time pods change color, the seed has already reached physiological maturity. If the seed has separated from the pod but the pod wall is still green, this stage is also called R6.5.

REPRODUCTIVE DEVELOPMENT

R1 & R2 based on flowering,
R3 & R4 based on pod development,
R5 & R6 based on seed development,
R7 & R8 based on pod color (as indicator of maturity)

Reproductive stages based on the development at the upper portion of the main stem only (use uppermost FOUR nodes from R3 to R6).

Fehr et al., 1971; Fehr & Caviness, 1977

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