QUICK REFERENCE
CORN

JACOBSEN

SPACING BETWEEN KERNELS (IN)

Planting Rate	20" Row	30" Row	38" Row
26,000	12.0	8.0	6.4
28,000	11.2	7.5	5.9
30,000	10.4	7.0	5.5
32,000	9.8	6.5	5.2
34,000	9.2	6.1	4.9
36,000	8.7	5.8	4.6
38,000	8.2	5.5	4.4

RELATIVE YIELD POTENTIAL OF CORN BY PLANTING DATE AND POPULATION

Seeding Rate	23,000	28,000	31,000	35,000	39,000
Final Stand	20,000	24,000	27,000	31,000	34,000
Planting Data	Perecent Maximum Yield				
15- April	85%	94%	99%	100%	98%
25-April	83%	92%	98%	99%	97%
5-May	81%	90%	96%	99%	98%
15-May	77%	85%	92%	95%	95%
25-May	69%	77%	83%	87%	88%
1-June	61%	68%	72%	76%	78%
15-June	41%	45%	48%	51%	52%
25-June	25%	28%	29%	30%	30%

ISU Guide to Iowa Corn Planting, CROPR 3161, 2019

FROST DAMAGE TO CORN YIELDS

Corn Kernel Stage	Percent Silage Yield Loss	Percent Grain Yield Loss	Test Weight
R4 (Dough)	30%	66%	--
R5 (Dent)	21%	55%	47
R5.25 (75%milk)	15%	35%	50
R5.5 (50% milk)	5%	10%	53
R5.75 (25% milk)	1%	3%	54-55
R6 (Mature)	0%	0%	56

https://extension.umn.edu/growing-corn/early-fall-freeze-injury-corn

ESTIMATING CORN YIELD

Yield (bushels per acre) =
(number of ears/1000th acre) x (rows of kernels) x (kernels per row) / kernel size factor
Example: 32 x 18 x 33 / 75 = 253 bu/ac

Growing Condition (kernel size)	Kernel Size factor
Excellent (large)	65
Average	75
Poor (small)	85
Very Poor	95

https://www.agry.purdue.edu/ext/corn/news/timeless/YldEstMethod.html

CORN DRYDOWN RATE

Corn Drydown Rate = (Average Daily Temperature X 0.0202) – 0.7133.*

Week Of	Weekly Avg Temp (Lake View, IA) ºF	Avg Drydown % per day
1-Sep	67	0.64
8-Sep	65	0.60
15-Sep	65	0.60
22-Sep	60	0.50
1-Oct	56	0.42
8-Oct	53	0.36
15-Oct	50	0.30
22-Oct	46	0.22
1-Nov	41	0.11

* https://www.canr.msu.edu/st_joseph/uploads/files/SW-MI-FieldCrops%20Update-December2020.pdf

MEASURING HARVEST LOSS

Length to Measure 1/100th of an acre (ft)

Row Width	Number of Rows Harvested			
	4	6	8	12
20	65.5	53.6	32.7	21.8
30	43.6	29.0	21.8	14.5
36	36.2	24.2	18.1	12.1

Directions: Measure the distance above and count how many full ears have been lost. Two ear per 1/100th of an acre equals 1 bu/ac.
Kernel Loss: Two kernels per square foot equals 1 bu/ac
www.extension.iastate.edu/nwcrops/reducing-harvest-losses

CORN GROWTH STAGES

VE	Emergence. Corn emergence begins after the seed contains at least 30% moisture.
V(n)	(n) is the total number of nodes within the plant. This is done by counting leaf collars or cutting into the stalk to count nodes.
V1	The first collar is visible. The first leaf is oval shaped
V5	Nodal roots become, and will continue to be, the major source of nutrients. A microscopic tassel is beginning to develop at the growing point . Ear shoots at each node develop as well as number of kernel rows.
V6	Growing point is at or above the soil surface.
V10-V17	Potential kernels are being set on the ear shoots
VT	Last branch of the tassel is visible but silks are not visible.
R1	**Silking.** Silks can be seen and pollination occurs. Stress at silking can cause a large reduction in yield.
R2	**Blister.** Roughly 12 days after silking. Kernels are white and contain a clear liquid.
R3	**Milk.** Roughly 20 days after silking. Kernels begin to darken but contain a milky fluid.
R4	**Dough.** Roughly 26 days after silking. Kernels have accumulated 50% of their dry weight and are a pasty consistency.
R5	**Dent.** Roughly 36 days after silking. Grain begins to dry down, forming a dent in the top of the kernel.
R6	**Physiological Maturity.** Roughly 55 days after silking. Maximum dry weight accumulation has occured and a black layer forms at the base of the kernel.

https://www.ag.ndsu.edu/publications/crops/corn-growth-and-management-quick-guide

QUICK REFERENCE
SOYBEANS

JACOBSEN

SOYBEAN PLANT STANDS

	Desired Seeds / Acre x 1,000				
	100	125	150	165	185
Row Width	Seeds per Foot of Row				
7.5	1.4	1.7	2	2	2.5
15	2.9	3.6	4.3	4.7	5.6
20	3.8	4.8	5.7	6.3	7.1
30	5.7	7.2	8.6	9.5	11.2

ESTIMATING SOYBEAN PLANT STANDS

Plants/Acre			
	Row Width		
Plants/ft of Row	30	20	15
1	17,400	26,100	34,800
2	34,800	52,300	69,700
3	52,300	78,400	104,500
4	69,700	104,500	139,400
5	87,100	130,700	174,200
6	104,500	156,800	209,100
7	122,000	183,000	
8	139,400	209,100	
9	156800		
10	174,200		
11	191,700		
12	209,100		

SOYBEAN STAND COUNT - HOOP METHOD

Begin by tossing the hoop in 5-10 random spots within the field. Count the number of plants within the hoop and take the average of all tosses.
Plant Stand = Average # of Soybeans within hoop x Multiplication Factor

Hoop Diameter	18"	24"	30"	32"	34"	36"
Multiplication Factor	24,662	13,872	8,878	7,808	6,912	6,165

ESTIMATED SOYBEAN YIELD (% OF NORMAL) FOR REDUCED STANDS

	Row Width (in)	
Population	30	7.5
120,000	100%	100%
110,000	99%	98%
100,000	98%	96%
90,000	97%	94%
80,000	95%	92%
70,000	92%	89%
60,000	87%	85%
50,000	81%	79%
40,000	73%	71%
30,000	60%	58%

https://extension.missouri.edu/publications/g4091

SOYBEAN PLANTING DATE & YIELD POTENTIAL

Date	Yield % of Normal
25-April	100%
5-May	99%
15-May	97%
20-May	94%
25-May	91%
30-May	87%
5-June	82%
10-June	76%
15-June	70%
30-June	57%

https://extension.umn.edu/soybean-planting/when-and-how-plant-soybean

SOYBEAN - POUNDS OF SEED PER ACRE

Seeds/lb	Seeds/ac x 1000				
	100	125	150	165	185
2000	50	63	75	83	93
2200	45	57	68	75	89
2400	42	52	63	69	81
2600	38	48	58	63	75
2800	36	45	54	59	70
3000	33	42	50	55	65
3200	31	39	47	52	61
3400	29	37	44	49	57
3600	28	35	42	46	54
3800	26	33	39	43	51

Ideal soybean planting depth is 1.25-1.75 in. Do no plant shallower than 1 inch or deeper than 2.25. Field soil temperature should be at 50°F or greater and is predicted to remain so during the next 24 or 48 hours.

https://cropwatch.unl.edu/2019/soybean-germination-tracking

SOYBEAN GROWTH STAGE

VE	**Emergence.** Cotyledons are above soil surface
VC	Unifoliate leaves are fully developed
V(n)	Number of nodes on the main stem with fully developed trifoliate leaves
V1	First fully developed trifoliate. Comes from unifoliate node.
R1	**Beginning Bloom.** Open flower at any node on the main stem
R2	**Full Bloom.** Open flower at one of the two uppermost nodes on the main stem.
R3	**Beginning Pod.** 3/16" long pod at one of the four uppermost nodes on the main stem that has a fully developed trifoliate.
R4	**Full Pod.** 3/4" long pod at one of the four uppermost nodes on the main stem that has a fully developed trifoliate.
R5	**Beginning Seed.** 1/8" seed in a pod at one of the four uppermost nodes on the main stem that has a fully developed trifoliate.
R6	**Full Seed.** Pod containing a green seed that fills the pod cavity at one of the four uppermost nodes on the main stem that has a fully developed trifoliate.
R7	**Beginning Maturity.** One normal pod on the main stem that has reached its mature pod color
R8	**Full Maturity.** 95% of the pods have reached their mature pod color. roughly 10 days of drying weather to reach 15% moisture.

https://extension.umn.edu/growing-soybean/soybean-growth-stages

QUICK REFERENCE SOYBEANS

EXPECTED YIELD LOSS (%) AS AFFECTED BY DEGREE OF DEFOLIATION

	Defoliation %					
Growth Stage	10	20	40	60	80	100
V9-12	0	0	0	5	8	10
R1-R2	0	0	6	13	20	40
R3	0	0	7	12	25	50
R4	0	5	9	12	30	76
R5	3	5	11	15	35	84
R6	2	4	8	11	25	62

Yield loss from defoliation in early vegetative stages is generally small
https://extensionpublications.unl.edu/assets/pdf/ec128.pdf

EXPECTED YIELD LOSS (%) AS AFFECTED BY DEGREE OF NODE LOSS

	Percent Node Loss (% nodes cut off compared to total number of nodes)				
Growth Stage	5	15	25	45	65
V1-V(n)	0	1	3	7	18
R1-R2	1	4	7	12	23
R2.5	2	6	10	18	32
R3	3	9	14	25	41
R3.5	4	12	19	35	53

https://extensionpublications.unl.edu/assets/pdf/ec128.pdf

SOYBEAN HARVEST ESTIMATES

Yield (bu/ac) = plants/ac x pods/plant x seeds/pod* / seeds/lb** / 60lb/bu
* 2.5 seeds per pod is a good estimate to start
** Varieties vary in seed size but 2,500 is a good place to start

4 soybeans per square foot equals 1 bu/ac loss

QUICK REFERENCE ALFALFA

ALFALFA STEM COUNT EVALUATION

Stems/Sq ft	% Maximum Yield
>55	100%
40-55	75-92%
<39	Stand too weak to keep

Stem density and yield potential have a strong relationship, regardless of stand age.
Count stems that over 2in tall.
When conducting stem counts in older stands, check crowns for discoloration. Stands with >30% discolored crowns are likely yield limited and could struggle with winter survival.
https://fyi.extension.wisc.edu/forage/alfalfa-stand-assessment-is-this-stand-good-enough-to-keep/

ALFALFA AUTOTOXICITY - MINIMUM WAIT PERIODS

2+ year old, productive stand	Rotate out of alfalfa for one growing season
2+ year old stand, winterkill	Destory stand and crop residue, wait 2-4 weeks before reseeding
Failed seedings/ <1 year old winterkill	Can be seeded back with no waiting

Never interseed alfalfa to thicken a stand that is 2 years or older.
https://fyi.extension.wisc.edu/forage/seeding-alfalfa-fields-back-into-alfalfa/

CUTTING INTERVAL - ESTIMATED DAYS AFTER MAY 25TH

Management Goal	1st Cut	2nd Cut	3rd Cut	4th Cut
Persistence	15	35-40	35-40	-
Quality	0	28-33	30-35	30-35
Yield and Quality	0	28-33	38-55	By 20-Oct

QUICK REFERENCE
GENERAL

JACOBSEN

STAND COUNTS

# of plants in 1/1000th of an acre x 1,000

Row Width (in)	Row Length for 1/1000th acre
7.5	69' 8"
15	34' 10"
20	26' 1"
22	23' 9"
30	17' 5"
36	14' 6"
38	13' 10"

COMMON PRODUCTS & NUTRIENT CONTENT

Lbs of Nutrient per unit

Product	Unit	Weight (lbs)	N	P	K	S
32% (32-0-0)	1 gal	11.06	3.5	0	0	0
28% (28-0-0)	1 gal	10.66	2.98	0	0	0
10-34-0	1 gal	11.65	1.16	3.96	0	0
Thiosulfate (21-0-0-24)	1 gal	11.10	1.32	0	0	2.87
9-18-9	1 gal	11.11	0.99	1.99	0.99	0
NH3 (82-0-0)	1 gal	5.15	4.22	0	0	0
AMS	1 ton	2000	21	0	0	24
Ammonium Nitrate	1 ton	2000	34	0	0	0
Urea	1 ton	2000	46	0	0	0
DAP	1 ton	2000	18	14	0	0
MAP	1 ton	2000	11	52	0	0
MESZ	1 ton	2000	12	40	0	10
Potash	1 ton	2000	0	0	60	0

NUTRIENT REMOVAL ESTIMATES BY SELECTED CROP

Removal, lb/unit

Crop	Harvest Unit	P2O5	K2O	S
Alfalfa	ton	12	49	5.4
Corn, Grain	bu	0.35	0.25	0.08
Corn, Silage (67% water)	ton	3.1	7.3	1.1
Corn, Stover	ton	5.8	40	2.6
Soybean, grain	bu	0.73	1.2	0.18
Soybean, Stover	ton	8.8	37	6.2
Bromegrass (DM)	ton	10	46	5
Fescue (DM)	ton	12	54	5.7
Oat grain	bu	0.28	0.19	0.07
Oat straw	ton	6.3	37	4.5
Orchardgrass	ton	13	54	5.8
Red Clover (DM)	ton	12	42	3
Rye grain	bu	0.46	0.31	0.1
Rye straw	ton	3	22	2
Sorghum grain	bu	0.16	0.83	0.12
Sorghum-Sudan (DM)	ton	9.5	34	5.8
Timothy (DM)	ton	11	42	2

P, K and S numbers from International Plant Nutrition Institute (IPNI)

WEIGHTS PER BUSHEL

Corn	56
Grain Sorghum	56
Oats	32
Rye	56
Soybeans	60
Wheat	60

CONVERSION CHART

8 oz	1 cup
16oz	1 pint / 2 cups
32 oz	1 quart / 2 pints / 4 cups
128 oz	1 gallon / 4 quarts / 8 pints / 16 cups

GDU CALCULATION

(Daily Maximum Air Temp °F* + Daily Minimum Air Temp °F) / 2 - base = GDU**
*** Use the upper limit number if max air temp is above that limit per pest**
**** Use the base number if minimum air temp is below base per pest**

Crop/Pest	Base (°F)	Upper Limit (°F)	Comment
Corn	50	86	The first leaf needs roughly 100-125GDUs to break through the soil surface. 80-85 GDUs for each new leaf from VE-V10. 50 GDUs for V11 and up.
Soybean	50	86	Roughly 130 GDU's needed for emergence
Alfalfa	41-42	110	
Black Cutworm	50	86	300 DD from a significant moth catch (pheromone trap) to begin scouting larval feeding in corn.
Corn Rootworm	52		Egg hatch starts at 500 soil DD from Jan. 1 (average June 6 in Iowa), and about 50% egg hatch at 684 to 767 soil DD from Jan. 1.
European Corn Borer	50	86	1 st generation egg hatch ~200 DD after a significant moth catch. Scout for shot-holes ~300 DD. For 2nd generation scout for egg masses ~1,400 DD.
Western Bean Cutworm	50		1,319 DD from May 1 to 25% egg hatch and 1,422 DD to 50% egg hatch
Alfalfa Weevil	48	86	Begin scouting for larval feeding 250 DD from Jan. 1 in northern Iowa, and 200 DD from Jan. 1 in southern Iowa.

https://www.extension.iastate.edu/winneshiek/sites/www.extension.iastate.edu/files/winneshiek/CropNotes/8.5%20x%2014%20insect%20pest%20scout%20calendar%20and%20DD%20info.pdf