95 YEARS

AMERICAN

SINCE 1926

2022 Pioneer® brand products proposal specifically designed for

2021 YIELD RESULTS

Red River Marketing Co

RED RIVER MARKETING

CORTEVA™ agriscience

Our Services to YOU!

RED RIVER MARKETING

- **Agronomy Services**
  - Plots – *the most local research you can trust!*
  - Agronomic trials
  - SxS Comparisons
- **Small Grain Sales**
  - Certified Wheat, Oats, Rye, Covercrops
  - CRP Mix, Pollinator Mix
  - Seed Cleaning
- **Granular – Digital Services**
  - Spring planting maps
  - Field by field planning
  - Yield monitor calibration
  - Soil mapping
  - Directed Scouting
- **LumiGEN™ Seed treatment**
- **Corteva Crop Protection bundling**
  - Corteva Cash
  - Seed savings with CP pre-pay
  - Enlist Ahead
- **Financing**
- **Delivery to your farm or field**
- **Year-round, 24/7 staffing**

2021 NEW PIONEER® BRAND CORN PRODUCTS

PIONEER.

P8859AM™ — CRM: 88

- Excellent yield potential coupled with solid agronomics
- Moderate plant height with higher ear placement
- Improved roots & brittle over P8736AM & P8989AM
- Acceptable disease package

P9193AM™ | P9193Q™ — CRM: 91

- Attractive stature & ear height
- Strong drought tolerance
- TW similar to P9608 & P9301 families
- Long slender ear with limited rows
- P9188AM replacement in time

P9489AM™ | P9489Q™ — CRM: 94

- New yield leader for zone
- Solid stress emergence
- Good ear flex with average test weight
- Excellent Goss's Wilt tolerance
- Stalks slightly better than P9772AM

P9540AM™ — CRM: 95

- Leader type hybrid with high yields & solid agronomics
- Above average drought tolerance
- Brings exceptional late season stalks
- Very good root strength (early & late)
- Average brittle tolerance
- Consistent yields across environments

P9823Q™ — CRM: 98

- Excellent yield for maturity
- Strong disease package for Goss's Wilt & NCLB
- Performance was better in zone & on higher producing soils
- Replaces P9880AMXT in time & takes volume from P9998Q

P0075 — CRM: 100

- Conventional option of P0075AM
- Outstanding yield potential paired with solid agronomic package
- Strong stress emergence
- Fantastic Goss's Wilt tolerance

P0404AM™| P0404Q™ — CRM: 104

- Strong drought tolerance provides consistent performance
- Solid Goss's Wilt & NCLB package
- Below average staygreen
- Above average brittle & root strength
- Qrome has significant advantage over P0421Q

P0487Q™ — CRM: 104

- AQUAmax hybrid coupled with strong disease package
  - Goss-7 & NCLB-6
- Above average brittle tolerance & late season stalks
- Average stress emergence
- Shown potential for dual purpose option of silage

PIONEER.COM/YIELD

Pioneer® Hybrid/ Brand	Comp Brand	Comp Hybrid/ Brand	# Cmp	Prim Yield (bu/a)	Yld Adv (bu/a)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim Tst Wt (lb/bu)	Tst Wt Adv	AGI Adv
P8588AM	DeKalb	DKC36-48RIB	5	154.5	3.2	60%	16.0	0.5	57.9	1.4	$19
	DeKalb	DKC37-50RIB	5	182.9	-4.2	60%	16.9	0.4	57.7	1.0	($17)
	Pioneer	P8352AM	18	133.6	2.0	67%	17.6	-0.2	56.5	0.2	$8
	Pioneer	P8431AM	26	146.5	9.3	81%	17.0	-0.9	57.0	-0.1	$43
	Pioneer	P8736AM	28	155.3	-11.6	18%	16.7	0.7	57.6	1.0	($53)
	Pioneer	P8989AM	18	152.2	-8.9	28%	16.7	1.3	57.4	0.9	($37)
P8736AM	DeKalb	DKC36-48RIB	6	169.0	6.4	83%	17.0	-0.6	56.3	-0.6	$30
	DeKalb	DKC36-86RIB	5	176.2	5.5	80%	16.8	0.5	56.8	-0.3	$32
	DeKalb	DKC37-50RIB	5	200.2	13.1	80%	17.4	-0.1	56.8	0.1	$63
	Pioneer	P8352AM	14	130.2	3.1	71%	18.2	-1.6	56.4	-0.8	$9
	Pioneer	P8431AM	22	155.0	16.3	86%	17.8	-1.7	56.5	-1.5	$74
	Pioneer	P8588AM	28	166.8	11.6	82%	17.4	-0.7	56.5	-1.0	$53
	Pioneer	P8989AM	23	159.3	-1.6	48%	17.3	0.4	56.3	-0.3	($5)
	Pioneer	P9188AM	24	182.1	0.6	58%	17.0	0.5	56.8	-0.3	$7
	Pioneer	P9193AM	25	180.9	-3.9	36%	17.1	0.9	56.7	-0.9	($13)
	Pioneer	P9211AM	18	172.0	-3.2	39%	16.9	1.3	56.7	1.1	($6)
P8989AM	Pioneer	P8431AM	16	160.1	13.7	88%	18.0	-2.1	56.5	-1.4	$57
	Pioneer	P8588AM	18	161.1	8.9	72%	18.0	-1.3	56.5	-0.9	$37
	Pioneer	P8736AM	23	160.9	1.6	52%	17.6	-0.4	56.7	0.3	$5
	Pioneer	P9188AM	20	173.0	-0.4	60%	17.5	0.1	57.2	0.1	($1)
	Pioneer	P9193AM	25	167.2	-5.7	28%	17.0	0.5	57.3	-0.5	($25)
	Pioneer	P9211AM	25	164.6	-4.5	28%	16.9	0.7	57.4	1.3	($17)
	Pioneer	P9301AM	19	175.2	-5.9	26%	17.1	0.5	57.3	-1.0	($25)
	Pioneer	P9492AM	20	161.1	-14.4	15%	17.1	1.0	57.1	1.6	($64)

Pioneer® Hybrid/ Brand	Comp Brand	Comp Hybrid/ Brand	# Cmp	Prim Yield (bu/a)	Yld Adv (bu/a)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim Tst Wt (lb/bu)	Tst Wt Adv	AGI Adv
P9188AM	DeKalb	DKC37-50RIB	5	202.5	15.5	100%	17.9	-0.6	57.6	0.9	$71
P9188AM	DeKalb	DKC43-75RIB	7	182.5	-9.8	14%	16.9	0.2	57.5	0.5	($48)
	Pioneer	P8736AM	24	181.5	-0.6	42%	17.5	-0.5	57.0	0.3	($7)
	Pioneer	P8989AM	20	173.4	0.4	40%	17.5	-0.1	57.1	-0.1	$1
	Pioneer	P9193AM	48	177.8	-3.4	38%	17.0	0.3	57.4	-0.6	($15)
	Pioneer	P9211AM	42	173.2	-2.8	38%	16.8	0.7	57.4	1.1	($10)
	Pioneer	P9301AM	35	173.0	-0.7	49%	16.8	0.3	57.4	-1.2	($2)
	Pioneer	P9492AM	38	176.1	-12.9	11%	16.8	0.6	57.3	1.2	($60)
	Pioneer	P9489AM	35	171.7	-13.6	11%	16.6	1.9	57.4	1.5	($55)
P9193AM	DeKalb	DKC36-48RIB	5	178.9	1.9	60%	17.9	-1.1	57.9	0.7	$3
	DeKalb	DKC36-86RIB	5	168.5	-3.5	80%	18.2	-1.0	57.8	0.7	($23)
	DeKalb	DKC37-50RIB	5	202.7	15.6	100%	17.8	-0.5	57.3	0.5	$73
	DeKalb	DKC42-05RIB	10	168.8	5.0	60%	18.0	0.3	57.4	1.8	$26
	DeKalb	DKC43-75RIB	15	190.0	-7.8	13%	16.8	-0.2	58.4	0.5	($41)
	Pioneer	P8736AM	25	184.8	3.9	60%	17.9	-0.9	57.6	0.9	$13
	Pioneer	P8989AM	25	173.0	5.7	72%	17.5	-0.5	57.8	0.5	$25
	Pioneer	P9188AM	48	181.2	3.4	60%	17.3	-0.3	58.0	0.6	$15
	Pioneer	P9211AM	86	177.5	-0.8	55%	17.2	0.2	58.1	1.7	($2)
	Pioneer	P9301AM	67	181.1	5.0	66%	17.3	0.0	58.2	-0.2	$24
	Pioneer	P9492AM	82	179.1	-8.9	21%	17.1	0.4	58.1	2.1	($41)
	Pioneer	P9489AM	79	177.2	-9.7	19%	17.1	1.5	58.2	2.5	($38)
P9193Q	Pioneer	P9211Q	6	167.9	-1.4	17%	15.5	0.8	57.4	0.3	($3)
	Pioneer	P9489Q	7	169.6	-7.4	14%	15.4	1.3	57.4	-0.3	($30)
	Pioneer	P9551Q	7	162.9	-10.6	14%	15.4	2.6	57.4	0.8	($39)

Pioneer® Hybrid/ Brand	Comp Brand	Comp Hybrid/ Brand	# Cmp	Prim Yield (bu/a)	Yld Adv (bu/a)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim Tst Wt (lb/bu)	Tst Wt Adv	AGI Adv
P9211AM	DeKalb	DKC42-05RIB	8	166.1	16.7	75%	17.9	0.5	55.7	0.3	$81
	DeKalb	DKC43-75RIB	14	183.5	-7.6	14%	16.9	-0.2	57.0	-1.1	($40)
	DeKalb	DKC45-95RIB	8	184.8	-11.1	13%	16.4	0.6	57.1	0.4	($51)
	Pioneer	P8736AM	18	175.2	3.2	61%	18.1	-1.3	55.6	-1.1	$6
	Pioneer	P8989AM	25	169.0	4.5	72%	17.6	-0.7	56.0	-1.3	$17
	Pioneer	P9188AM	42	176.1	2.8	62%	17.5	-0.7	56.3	-1.1	$10
	Pioneer	P9193AM	86	178.3	0.8	44%	17.4	-0.2	56.4	-1.7	$2
	Pioneer	P9301AM	68	179.2	4.5	53%	17.5	-0.3	56.5	-2.0	$19
	Pioneer	P9492AM	89	178.9	-8.3	17%	17.3	0.2	56.4	0.3	($40)
	Pioneer	P9489AM	81	175.7	-9.8	21%	17.2	1.4	56.5	0.8	($40)
	Pioneer	P9540AM	81	178.7	-15.7	14%	17.2	1.5	56.5	1.5	($67)
	Pioneer	P9619AM	61	184.8	-4.6	26%	16.8	1.2	56.8	0.9	($15)
P9211Q	Pioneer	P9193Q	6	169.4	1.4	83%	16.3	-0.8	57.1	-0.3	$3
	Pioneer	P9489Q	7	176.5	-4.2	14%	16.7	0.6	57.1	-0.7	($18)
	Pioneer	P9551Q	8	183.5	-5.0	25%	16.9	1.8	57.1	0.2	($14)
P9301AM	DeKalb	DKC42-05RIB	7	176.9	2.2	57%	18.2	-0.4	57.8	2.1	$9
	DeKalb	DKC43-75RIB	11	207.4	-10.9	9%	17.2	-0.1	58.2	0.7	($55)
	DeKalb	DKC45-95RIB	7	190.4	-6.7	43%	16.7	0.5	57.9	1.9	($31)
	Pioneer	P8989AM	19	181.1	5.9	74%	17.6	-0.5	58.2	1.0	$25
	Pioneer	P9188AM	35	173.7	0.7	51%	17.1	-0.3	58.5	1.2	$2
	Pioneer	P9193AM	67	176.1	-5.0	34%	17.3	0.0	58.5	0.2	($24)
	Pioneer	P9211AM	68	174.7	-4.5	47%	17.2	0.3	58.5	2.0	($19)
	Pioneer	P9492AM	66	174.6	-12.9	15%	17.2	0.5	58.4	2.3	($59)
	Pioneer	P9489AM	66	174.6	-14.5	3%	17.2	1.6	58.4	2.7	($60)

Pioneer® Hybrid/ Brand	Comp Brand	Comp Hybrid/ Brand	# Cmp	Prim Yield (bu/a)	Yld Adv (bu/a)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim Tst Wt (lb/bu)	Tst Wt Adv	AGI Adv
P9489AM	DeKalb	DKC42-05RIB	8	175.5	15.4	88%	19.8	-1.8	54.9	-0.9	$63
	DeKalb	DKC43-75RIB	17	193.0	1.4	71%	17.8	-1.3	55.7	-1.7	($2)
	DeKalb	DKC45-95RIB	12	197.1	-0.2	50%	17.3	-0.7	55.8	-0.7	($6)
	DeKalb	DKC47-54RIB	9	194.6	0.9	44%	16.8	0.8	55.5	-2.4	$11
	Pioneer	P9188AM	35	185.2	13.6	86%	18.5	-1.9	55.9	-1.5	$55
	Pioneer	P9193AM	79	186.9	9.7	80%	18.6	-1.5	55.7	-2.5	$38
	Pioneer	P9211AM	81	185.5	9.8	79%	18.6	-1.4	55.7	-0.8	$40
	Pioneer	P9301AM	66	189.0	14.5	97%	18.8	-1.6	55.8	-2.7	$60
	Pioneer	P9492AM	146	190.4	0.8	58%	17.7	-1.0	55.8	-0.6	($3)
	Pioneer	P9540AM	143	191.6	-6.3	34%	17.6	0.0	55.9	0.7	($30)
	Pioneer	P9619AM	123	193.6	5.9	70%	17.2	-0.2	56.2	0.0	$28
	Pioneer	P9772AM	106	195.7	1.0	52%	17.1	0.3	56.2	0.0	$8
P9489Q	DeKalb	DKC49-44RIB	17	231.6	-3.5	29%	17.4	1.2	57.7	-0.2	($6)
	Pioneer	P9193Q	7	177.1	7.4	86%	16.8	-1.3	57.7	0.3	$30
	Pioneer	P9211Q	7	180.7	4.2	86%	17.3	-0.6	58.0	0.7	$18
	Pioneer	P9551Q	27	215.1	5.8	59%	17.4	0.4	57.6	0.3	$31
	Pioneer	P9880AMXT	21	230.2	-4.0	38%	17.8	1.2	57.5	0.5	($9)
	Pioneer	P9823Q	31	210.4	-10.8	13%	17.2	1.2	57.4	1.2	($43)
	Pioneer	P9998Q	7	188.0	-13.7	%	16.4	2.2	57.9	2.0	($50)

Pioneer® Hybrid/ Brand	Comp Brand	Comp Hybrid/ Brand	# Cmp	Prim Yield (bu/a)	Yld Adv (bu/a)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim Tst Wt (lb/bu)	Tst Wt Adv	AGI Adv
P9492AM	Channel	194-49DGVT2PRIB	5	201.2	2.8	60%	18.1	0.6	57.0	-0.3	$18
	Channel	195-85DGVT2PRIB	5	205.4	-1.7	40%	18.1	0.4	56.7	1.0	($6)
	DeKalb	DKC42-05RIB	9	179.8	15.0	89%	18.7	-0.5	55.3	-0.5	$69
	DeKalb	DKC43-75RIB	24	195.1	4.4	71%	17.0	-0.3	56.6	-0.7	$19
	DeKalb	DKC45-95RIB	15	202.3	3.1	67%	16.2	0.1	57.0	0.2	$16
	DeKalb	DKC47-27RIB	5	193.2	0.0	60%	16.9	0.3	57.6	-0.6	$1
	DeKalb	DKC47-54RIB	8	197.3	3.0	63%	15.8	1.8	56.3	-1.9	$28
	DeKalb	DKC48-95RIB	9	211.3	-1.9	44%	15.3	0.6	56.8	-1.5	($4)
	DeKalb	DKC49-44RIB	25	217.7	-3.5	40%	16.5	1.7	56.9	-0.3	($3)
	DeKalb	DKC49-45RIB	9	199.4	7.1	67%	16.7	2.3	56.2	-0.1	$52
	Pioneer	P8989AM	20	175.5	14.4	85%	18.1	-1.0	55.6	-1.6	$64
	Pioneer	P9188AM	38	189.0	12.9	87%	17.4	-0.6	56.1	-1.2	$60
	Pioneer	P9193AM	82	188.0	8.9	79%	17.6	-0.4	56.1	-2.1	$41
	Pioneer	P9211AM	89	187.3	8.3	83%	17.5	-0.2	56.1	-0.3	$40
	Pioneer	P9301AM	66	187.4	12.9	85%	17.7	-0.5	56.2	-2.3	$59
	Pioneer	P9489AM	146	189.6	-0.8	42%	16.7	1.0	56.4	0.6	$3
	Pioneer	P9489Q	30	216.5	-0.8	47%	17.0	0.6	56.8	-0.3	$1
	Pioneer	P9551Q	116	197.2	4.2	64%	16.7	0.9	56.4	-0.4	$27
	Pioneer	P9540AM	163	193.2	-6.6	21%	16.7	1.0	56.5	1.2	($26)
	Pioneer	P9619AM	134	193.2	5.7	69%	16.5	0.8	56.7	0.6	$33
	Pioneer	P9772AM	114	195.9	0.1	51%	16.3	1.3	56.6	0.4	$10
	Pioneer	P9880AMXT	24	224.8	-6.1	33%	17.0	1.7	56.9	0.1	($15)
	Pioneer	P9823Q	122	199.1	-10.6	20%	16.3	1.6	56.7	0.5	($40)
	Pioneer	P9998AM	25	196.0	-5.1	40%	16.4	2.2	56.9	0.6	($8)

Pioneer® Hybrid/ Brand	Comp Brand	Comp Hybrid/ Brand	# Cmp	Prim Yield (bu/a)	Yld Adv (bu/a)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim Tst Wt (lb/bu)	Tst Wt Adv	AGI Adv
P9540AM	DeKalb	DKC42-05RIB	8	177.0	17.0	88%	19.9	-1.9	53.9	-1.9	$68
	DeKalb	DKC43-75RIB	22	194.2	12.8	82%	18.2	-1.3	55.2	-1.9	$53
	DeKalb	DKC45-95RIB	13	209.9	7.9	62%	17.5	-1.0	56.1	-0.5	$31
	DeKalb	DKC47-54RIB	9	203.7	10.0	67%	16.7	0.9	55.2	-2.7	$56
	DeKalb	DKC48-95RIB	8	200.7	10.7	88%	16.1	-0.2	55.5	-2.6	$52
	DeKalb	DKC49-44RIB	22	220.9	2.1	64%	16.8	1.2	56.3	-1.0	$21
	DeKalb	DKC49-45RIB	8	205.4	11.1	75%	18.4	1.1	54.8	-1.3	$62
	Pioneer	P9188AM	32	192.6	19.0	91%	18.7	-2.1	54.6	-2.7	$80
	Pioneer	P9193AM	77	195.4	15.7	88%	18.8	-1.7	54.9	-3.2	$65
	Pioneer	P9211AM	81	194.4	15.7	85%	18.7	-1.5	54.9	-1.5	$67
	Pioneer	P9301AM	63	194.8	18.8	95%	18.8	-1.7	54.9	-3.5	$80
	Pioneer	P9492AM	163	199.8	6.6	78%	17.7	-1.0	55.3	-1.2	$26
	Pioneer	P9489AM	143	197.8	6.3	66%	17.6	0.0	55.2	-0.7	$30
	Pioneer	P9489Q	24	220.8	5.9	75%	17.5	-0.1	56.3	-0.9	$29
	Pioneer	P9551Q	117	203.1	11.2	85%	17.5	0.0	55.4	-1.3	$55
	Pioneer	P9619AM	133	197.9	12.3	86%	17.2	-0.2	55.4	-0.8	$59
	Pioneer	P9772AM	110	202.4	7.8	68%	17.1	0.4	55.3	-0.8	$41
	Pioneer	P9880AMXT	21	232.3	2.0	57%	17.8	1.0	56.0	-1.0	$20
	Pioneer	P9823Q	118	205.5	-3.6	36%	16.9	0.9	55.6	-0.6	($10)
	Pioneer	P9998Q	14	199.4	-6.0	36%	17.5	0.9	55.3	-0.7	($21)
	Pioneer	P9998AM	23	199.4	1.2	57%	17.3	1.1	54.9	-1.1	$14
	Pioneer	P0046AM	40	185.8	-2.0	45%	17.0	2.1	55.7	-1.1	$5
	Pioneer	P0075Q	81	206.9	-4.5	27%	16.4	1.7	55.9	-0.7	($9)
	Pioneer	P0075AM	6	183.1	-4.0	33%	16.3	1.3	56.6	-0.3	($13)

Pioneer® Hybrid/ Brand	Comp Brand	Comp Hybrid/ Brand	# Cmp	Prim Yield (bu/a)	Yld Adv (bu/a)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim Tst Wt (lb/bu)	Tst Wt Adv	AGI Adv
P9551Q	DeKalb	DKC42-05RIB	7	184.0	9.2	71%	19.4	-1.5	55.2	-0.4	$34
	DeKalb	DKC43-75RIB	14	192.2	3.0	57%	18.3	-1.3	56.3	-0.8	$5
	DeKalb	DKC45-95RIB	5	192.6	-4.9	40%	16.9	-0.6	55.8	-0.6	($29)
	DeKalb	DKC47-54RIB	9	187.6	-7.9	33%	16.8	0.8	57.6	-0.7	($32)
	DeKalb	DKC48-95RIB	7	213.9	-7.9	29%	16.6	-0.4	57.5	-0.4	($42)
	Pioneer	P9188AM	15	180.2	10.4	80%	18.1	-1.9	56.1	-1.1	$40
	Pioneer	P9193AM	47	183.9	6.7	77%	18.5	-1.4	56.2	-1.9	$23
	Pioneer	P9193Q	7	173.5	10.6	86%	18.0	-2.6	56.6	-0.8	$39
	Pioneer	P9211AM	49	181.7	3.6	76%	18.4	-1.3	56.2	-0.1	$9
	Pioneer	P9211Q	8	188.4	5.0	75%	18.7	-1.8	56.8	-0.2	$14
	Pioneer	P9301AM	40	180.9	11.4	85%	18.5	-1.4	56.2	-2.0	$46
	Pioneer	P9301Q	5	182.5	7.1	60%	19.2	-2.7	56.3	-1.3	$17
	Pioneer	P9492AM	116	193.0	-4.2	34%	17.6	-0.9	56.8	0.4	($27)
	Pioneer	P9489AM	93	187.5	-3.8	37%	17.5	0.1	56.7	0.9	($18)
	Pioneer	P9489Q	27	209.3	-5.8	41%	17.8	-0.4	57.2	-0.3	($31)
	Pioneer	P9540AM	117	191.9	-11.2	15%	17.5	0.0	56.8	1.3	($55)
	Pioneer	P9619AM	82	189.4	1.3	55%	17.2	-0.3	56.8	0.7	$4
	Pioneer	P9772AM	72	192.0	-3.5	43%	17.0	0.2	56.8	0.7	($15)
	Pioneer	P9880AMXT	21	218.0	-15.3	14%	18.1	0.9	56.9	0.1	($66)
	Pioneer	P9823Q	91	196.9	-17.0	5%	17.1	0.7	57.0	0.8	($78)
	Pioneer	P9998Q	12	196.8	-17.7	%	17.4	1.6	57.0	1.3	($73)
	Pioneer	P0075Q	76	200.0	-17.6	7%	16.8	1.6	57.2	0.7	($74)

Pioneer® Hybrid/ Brand	Comp Brand	Comp Hybrid/ Brand	# Cmp	Prim Yield (bu/a)	Yld Adv (bu/a)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim Tst Wt (lb/bu)	Tst Wt Adv	AGI Adv
P9619AM	DeKalb	DKC43-75RIB	25	186.5	1.1	48%	18.2	-1.4	55.8	-1.2	($5)
	DeKalb	DKC45-95RIB	15	201.1	-3.6	27%	17.3	-0.9	56.4	-0.8	($25)
	DeKalb	DKC47-54RIB	16	194.0	-7.2	25%	17.9	0.8	55.8	-1.4	($29)
	DeKalb	DKC49-45RIB	10	202.6	-0.2	30%	18.6	1.0	55.6	-0.7	$6
	Pioneer	P9492AM	134	187.6	-5.7	31%	17.3	-0.8	56.1	-0.6	($33)
	Pioneer	P9489AM	123	187.7	-5.9	30%	17.0	0.2	56.2	0.0	($28)
	Pioneer	P9540AM	133	185.6	-12.3	14%	17.1	0.2	56.2	0.8	($59)
	Pioneer	P9772AM	127	189.6	-6.9	24%	17.1	0.4	56.0	-0.1	($31)
	Pioneer	P9880AM	5	210.1	-10.7	20%	16.6	1.4	57.2	-0.9	($42)
	Pioneer	P9823Q	123	190.9	-17.4	6%	17.1	1.0	56.1	0.0	($78)
	Pioneer	P9998AM	25	191.8	-9.3	24%	17.2	1.3	56.1	-0.4	($36)
P9772AM	DeKalb	DKC43-75RIB	17	191.6	4.6	59%	18.3	-1.9	55.6	-1.0	$9
	DeKalb	DKC45-95RIB	9	205.8	0.4	44%	17.8	-1.5	56.3	-0.3	($10)
	DeKalb	DKC47-54RIB	17	206.7	4.1	53%	18.3	0.5	56.4	-0.8	$24
	DeKalb	DKC48-95RIB	8	200.1	-7.7	25%	16.2	0.0	56.4	-1.5	($36)
	DeKalb	DKC49-44RIB	10	195.4	-6.1	40%	16.7	0.9	56.6	0.0	($23)
	DeKalb	DKC49-45RIB	10	210.3	8.5	60%	17.9	0.1	55.6	-0.9	$42
	Pioneer	P9492AM	114	195.8	-0.1	48%	17.6	-1.3	56.2	-0.4	($10)
	Pioneer	P9489AM	106	194.7	-1.0	48%	17.4	-0.3	56.2	0.0	($8)
	Pioneer	P9540AM	110	194.6	-7.8	30%	17.5	-0.4	56.1	0.8	($41)
	Pioneer	P9619AM	127	196.5	6.9	76%	17.6	-0.4	56.1	0.1	$31
	Pioneer	P9823Q	114	198.5	-10.5	22%	17.4	0.5	56.2	0.0	($47)
	Pioneer	P9998AM	24	196.3	-3.0	46%	17.9	0.7	55.7	-0.5	($9)
	Pioneer	P0046AM	38	187.0	-5.1	34%	17.3	1.6	55.9	-0.9	($13)

Pioneer® Hybrid/ Brand	Comp Brand	Comp Hybrid/ Brand	# Cmp	Prim Yield (bu/a)	Yld Adv (bu/a)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim Tst Wt (lb/bu)	Tst Wt Adv	AGI Adv
P9823Q	DeKalb	DKC43-75RIB	15	202.1	13.6	87%	19.8	-2.3	55.4	-0.7	$48
	DeKalb	DKC45-95RIB	7	228.8	8.9	71%	18.0	-1.1	56.7	0.2	$33
	DeKalb	DKC47-54RIB	18	215.3	13.8	83%	18.8	-0.2	55.7	-1.6	$66
	DeKalb	DKC48-95RIB	9	229.5	7.5	56%	17.2	-0.5	56.4	-1.2	$33
	DeKalb	DKC49-44RIB	71	232.3	6.9	77%	17.8	0.5	56.4	-0.8	$38
	DeKalb	DKC49-45RIB	11	223.1	12.5	91%	20.0	-0.2	55.8	-0.7	$58
	DeKalb	DKC51-38RIB	8	202.3	-0.2	63%	16.5	0.8	56.5	-0.4	$5
	DeKalb	DKC51-25RIB	7	198.2	1.3	57%	16.7	0.0	56.9	-0.5	$11
	DeKalb	DKC52-18RIB	17	225.8	10.1	71%	17.2	0.9	56.9	0.1	$58
	Pioneer	P9492AM	122	209.7	10.6	80%	17.9	-1.6	56.3	-0.5	$40
	Pioneer	P9489AM	101	205.0	10.3	79%	17.8	-0.8	56.2	0.0	$44
	Pioneer	P9489Q	31	221.2	10.8	87%	18.4	-1.2	56.2	-1.2	$43
	Pioneer	P9551Q	91	213.9	17.0	95%	17.8	-0.7	56.2	-0.8	$78
	Pioneer	P9540AM	118	209.0	3.6	64%	17.8	-0.9	56.2	0.6	$10
	Pioneer	P9619AM	123	208.3	17.4	93%	18.1	-1.0	56.1	0.0	$78
	Pioneer	P9772AM	114	209.0	10.5	78%	18.0	-0.5	56.1	0.0	$47
	Pioneer	P9880AMXT	86	233.9	8.2	86%	18.4	0.1	56.1	-0.8	$41
	Pioneer	P9998Q	38	199.7	-0.6	47%	17.8	0.1	55.7	0.1	($1)
	Pioneer	P9998AM	24	200.4	1.0	54%	18.2	0.5	56.0	-0.2	$9
	Pioneer	P0046AM	45	184.8	2.5	67%	16.9	0.9	56.3	-0.7	$19
	Pioneer	P0075Q	173	217.8	0.4	58%	17.2	0.7	56.4	-0.2	$8
	Pioneer	P0075AM	9	193.7	-9.9	33%	16.8	0.3	57.3	-1.5	($46)
	Pioneer	P0220AM	32	206.3	0.9	56%	18.1	1.5	56.3	0.1	$16
	Pioneer	P0220Q	180	216.8	4.2	70%	17.3	0.9	56.3	0.6	$28

Pioneer® Hybrid/ Brand	Comp Brand	Comp Hybrid/ Brand	# Cmp	Prim Yield (bu/a)	Yld Adv (bu/a)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim Tst Wt (lb/bu)	Tst Wt Adv	AGI Adv
P9880AMXT	DeKalb	DKC47-54RIB	7	215.6	7.0	100%	20.3	-0.1	55.9	-0.4	$33
	DeKalb	DKC49-44RIB	64	224.7	-2.0	39%	18.0	0.4	57.2	-0.1	($6)
	Pioneer	P9492AM	24	230.9	6.1	67%	18.7	-1.7	56.9	-0.1	$15
	Pioneer	P9489Q	21	234.2	4.0	62%	19.0	-1.2	57.0	-0.5	$9
	Pioneer	P9551Q	21	233.2	15.3	86%	19.0	-0.9	56.8	-0.1	$66
	Pioneer	P9540AM	21	230.3	-2.0	43%	18.8	-1.0	56.9	1.0	($20)
	Pioneer	P9619AM	21	221.6	14.8	86%	20.2	-1.3	55.9	0.7	$60
	Pioneer	P9772AM	21	224.4	0.7	52%	19.6	-0.6	56.4	0.9	($2)
	Pioneer	P9823Q	86	225.7	-8.2	13%	18.5	-0.1	57.0	0.8	($41)
	Pioneer	P9998Q	17	219.4	-10.4	24%	19.8	0.4	56.3	0.7	($47)
	Pioneer	P0075Q	74	224.3	-8.7	16%	18.0	0.8	57.2	0.5	($35)
	Pioneer	P0220Q	72	225.5	-2.7	38%	18.2	1.0	57.2	1.4	($5)
P9998AM	DeKalb	DKC45-95RIB	5	240.1	5.5	60%	18.3	-2.4	57.8	0.4	$7
	DeKalb	DKC49-45RIB	6	220.1	12.0	67%	18.7	-0.4	55.9	-0.5	$55
	Pioneer	P9492AM	25	201.2	5.1	60%	18.5	-2.2	56.4	-0.6	$8
	Pioneer	P9489AM	24	199.3	4.6	63%	18.6	-1.3	56.2	-0.1	$11
	Pioneer	P9540AM	23	198.2	-1.2	43%	18.5	-1.1	56.1	1.1	($14)
	Pioneer	P9619AM	25	201.2	9.3	76%	18.5	-1.3	56.4	0.4	$36
	Pioneer	P9772AM	24	199.3	3.0	54%	18.6	-0.7	56.2	0.5	$9
	Pioneer	P9823Q	24	199.3	-1.0	46%	18.6	-0.5	56.2	0.2	($9)
	Pioneer	P0046AM	20	197.9	-5.5	20%	18.4	0.9	56.1	-0.4	($20)
	Pioneer	P0220AM	22	197.8	-0.2	59%	18.5	1.1	56.1	0.3	$7
	Pioneer	P0421AM	10	185.8	-7.0	20%	17.9	0.4	55.6	0.2	($31)
	Pioneer	P0404AM	8	197.1	-7.5	%	17.8	0.3	55.5	0.4	($34)

Pioneer® Hybrid/ Brand	Comp Brand	Comp Hybrid/ Brand	# Cmp	Prim Yield (bu/a)	Yld Adv (bu/a)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim Tst Wt (lb/bu)	Tst Wt Adv	AGI Adv
P0220AM	DeKalb	DKC49-45RIB	8	206.7	4.9	75%	20.2	-2.2	55.0	-1.5	$7
	Pioneer	P9998AM	22	198.0	0.2	41%	19.5	-1.1	55.8	-0.3	($7)
	Pioneer	P0046AM	23	199.0	-3.6	43%	19.6	-0.3	56.1	-0.8	($19)
	Pioneer	P0075AM	5	196.9	-3.5	40%	18.3	-0.7	56.5	0.0	($23)
	Pioneer	P0421AM	14	191.8	-5.9	29%	19.4	-0.3	54.9	-0.1	($29)
	Pioneer	P0404AM	11	192.8	-7.6	18%	18.1	-0.3	55.9	0.7	($39)
	Pioneer	P0507AM	10	200.9	-12.6	10%	19.2	0.7	54.7	0.8	($54)
P0220Q	DeKalb	DKC47-54RIB	10	205.6	7.7	70%	18.7	-0.8	55.1	-3.0	$32
	DeKalb	DKC48-95RIB	10	219.4	-3.0	50%	18.5	-1.6	55.5	-1.9	($29)
	DeKalb	DKC49-44RIB	73	224.1	0.1	45%	18.9	-0.6	55.8	-1.4	($4)
	DeKalb	DKC51-38RIB	7	206.2	5.1	86%	16.9	0.4	56.0	-0.9	$27
	DeKalb	DKC51-25RIB	7	192.8	-0.6	43%	17.2	-0.5	56.2	-0.7	($4)
	DeKalb	DKC52-18RIB	17	224.6	6.5	53%	17.8	-0.3	56.6	-0.2	$30
	DeKalb	DKC54-38RIB	78	224.5	-0.8	41%	18.7	0.1	56.0	-1.5	($3)
	DeKalb	DKC54-64RIB	20	220.7	-0.7	40%	17.1	0.4	56.4	0.3	$0
	Pioneer	P9880AMXT	72	228.2	2.7	60%	19.1	-1.0	55.8	-1.4	$5
	Pioneer	P9823Q	180	212.5	-4.2	29%	18.1	-0.9	55.7	-0.6	($28)
	Pioneer	P9998Q	23	172.7	-3.7	30%	16.2	-0.4	55.7	-0.2	($20)
	Pioneer	P0075Q	201	209.0	-3.5	37%	17.8	-0.2	55.8	-0.9	($19)
	Pioneer	P0306Q	12	210.1	-2.8	50%	20.0	0.2	54.2	-1.3	($13)
	Pioneer	P0421Q	87	224.8	-0.7	48%	19.1	0.1	55.6	-1.2	($2)
	Pioneer	P0404Q	167	218.0	-11.4	12%	18.5	0.5	55.7	-0.7	($52)
	Pioneer	P0507Q	197	209.3	-4.3	32%	17.9	1.1	55.8	-0.3	($12)
	Pioneer	P0622Q	130	202.6	-11.5	22%	17.3	2.1	56.1	-0.4	($39)
	Pioneer	P0688Q	98	214.1	-6.9	27%	18.0	1.9	56.0	-0.6	($17)

Pioneer® Hybrid/ Brand	Comp Brand	Comp Hybrid/ Brand	# Cmp	Prim Yield (bu/a)	Yld Adv (bu/a)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim Tst Wt (lb/bu)	Tst Wt Adv	AGI Adv
P0306Q	Pioneer	P9823Q	5	223.8	10.2	80%	19.5	-1.5	55.6	0.7	$36
	Pioneer	P0075Q	15	204.9	-1.9	47%	20.1	-0.8	55.7	0.5	($15)
	Pioneer	P0220Q	12	212.8	2.8	50%	20.3	-0.2	55.5	1.3	$13
	Pioneer	P0421Q	10	211.6	2.3	70%	21.1	-0.9	55.5	-0.3	$4
	Pioneer	P0404Q	13	203.6	-4.9	23%	20.2	0.1	55.6	0.6	($23)
	Pioneer	P0507Q	14	205.4	-2.1	43%	20.4	0.9	55.7	1.3	($1)
	Pioneer	P0622Q	5	195.8	-4.7	20%	18.8	2.0	56.1	0.7	($7)
	Pioneer	P0688Q	5	195.8	-1.7	60%	18.8	2.2	56.1	1.1	$9
P0404AM	DeKalb	DKC51-25RIB	9	142.4	6.9	67%	16.7	-0.8	57.0	-1.2	$32
	DeKalb	DKC54-64RIB	6	192.2	11.6	67%	14.0	-0.4	58.9	0.3	$58
	DeKalb	DKC55-85RIB	6	109.1	1.6	50%	13.7	0.5	58.4	1.8	$8
	DeKalb	DKC55-54RIB	5	160.3	5.0	80%	14.5	0.7	58.1	-0.6	$29
	Pioneer	P9998AM	8	204.6	7.5	100%	18.1	-0.3	55.2	-0.4	$34
	Pioneer	P0046AM	41	156.3	5.5	63%	15.4	-0.2	56.4	-1.8	$27
	Pioneer	P0075Q	38	164.3	0.6	53%	15.1	-0.5	57.1	-0.4	$3
	Pioneer	P0220AM	11	200.4	7.6	82%	17.8	0.3	55.2	-0.7	$39
	Pioneer	P0220Q	36	163.3	2.4	64%	15.0	-0.2	57.2	0.3	$11
	Pioneer	P0421AM	60	165.3	2.9	57%	15.5	0.0	56.9	0.2	$15
	Pioneer	P0487Q	30	174.2	-9.2	23%	15.2	0.2	57.0	-0.2	($44)
	Pioneer	P0589AM	9	121.9	7.2	67%	13.8	0.0	57.9	-1.1	$36
	Pioneer	P0507AM	9	206.3	-6.3	22%	17.9	1.0	54.9	0.4	($22)
	Pioneer	P0507Q	40	168.8	1.1	60%	14.9	0.7	57.3	0.7	$9
	Pioneer	P0622Q	38	165.4	-4.9	42%	14.7	1.1	57.6	-1.0	($20)
	Pioneer	P0688AM	42	168.5	1.3	50%	15.1	1.1	56.8	-0.5	$11

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P0404Q	DeKalb	DKC49-44RIB	74	236.3	12.5	86%	19.2	-1.0	56.4	-0.7	$52
	DeKalb	DKC51-38RIB	8	220.1	17.7	100%	17.7	-0.3	56.8	0.0	$85
	DeKalb	DKC52-18RIB	16	231.7	18.3	81%	18.1	-0.7	57.0	0.2	$84
	DeKalb	DKC54-38RIB	77	236.5	10.7	87%	19.1	-0.2	56.6	-0.8	$50
	DeKalb	DKC54-64RIB	19	238.8	11.6	89%	17.9	0.1	57.2	1.2	$58
	DeKalb	DKC55-53RIB	10	231.7	2.1	60%	17.4	0.7	56.8	0.0	$16
	DeKalb	DKC56-65RIB	11	239.8	-3.9	27%	17.7	2.5	57.1	1.7	$5
	DeKalb	DKC57-23RIB	5	238.4	7.4	60%	16.5	1.8	58.5	2.4	$54
	DeKalb	DKC57-29RIB	5	240.5	20.6	100%	16.9	0.9	58.2	0.3	$111
	DeKalb	DKC58-64RIB	5	238.4	-10.2	20%	16.5	2.4	58.5	1.0	($27)
	DeKalb	DKC59-81RIB	12	239.3	-5.9	25%	18.2	3.8	56.8	1.9	$10
	Pioneer	P0075Q	167	228.9	7.6	77%	18.9	-0.6	56.3	-0.2	$32
	Pioneer	P0220Q	167	229.4	11.4	88%	19.0	-0.5	56.3	0.7	$52
	Pioneer	P0339Q	7	210.0	-0.3	57%	18.7	-0.1	56.1	-0.8	($3)
	Pioneer	P0306Q	13	208.5	4.9	77%	20.3	-0.1	55.0	-0.6	$23
	Pioneer	P0421Q	87	235.2	10.3	91%	19.5	-0.2	56.2	-0.6	$48
	Pioneer	P0421AM	84	225.5	7.7	75%	18.6	-0.1	56.3	0.8	$37
	Pioneer	P0487Q	135	232.5	-1.8	48%	18.7	0.2	56.5	-0.3	($6)
	Pioneer	P0507Q	169	229.0	6.2	76%	19.0	0.7	56.3	0.3	$36
	Pioneer	P0622Q	104	225.2	-2.5	40%	18.6	1.6	56.5	0.3	$3
	Pioneer	P0688Q	99	224.6	4.8	64%	18.5	1.3	56.5	-0.1	$36
	Pioneer	P0947Q	37	227.2	3.5	62%	17.6	2.4	57.2	0.5	$39
	Pioneer	P0953AM	43	234.3	-8.8	28%	18.2	3.8	56.8	0.8	($5)
	Pioneer	P0924Q	43	228.3	-6.0	47%	17.6	3.1	57.3	0.2	($1)

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P0421AM	Channel	204-74VT2PRIB	5	132.7	4.2	80%	15.5	0.1	57.2	-0.5	$20
	DeKalb	DKC49-44RIB	14	222.9	10.6	86%	18.5	-1.1	55.6	-1.4	$43
	DeKalb	DKC51-38RIB	7	206.6	5.5	57%	17.6	-0.3	56.1	-1.2	$25
	DeKalb	DKC51-25RIB	10	150.6	4.5	80%	17.5	-1.5	56.6	-1.6	$12
	DeKalb	DKC52-18RIB	13	223.8	14.4	77%	17.8	-0.7	55.9	-1.1	$65
	DeKalb	DKC54-38RIB	20	225.0	6.2	80%	18.5	-0.6	56.0	-1.9	$25
	DeKalb	DKC54-64RIB	24	223.0	5.5	71%	17.7	-0.3	56.0	-0.9	$24
	DeKalb	DKC54-65RIB	6	189.6	4.8	67%	16.3	0.1	56.3	-0.3	$24
	DeKalb	DKC55-85RIB	6	104.2	-3.4	17%	13.5	0.8	58.6	2.0	($17)
	DeKalb	DKC55-53RIB	8	227.8	5.8	50%	17.5	0.4	55.6	-0.9	$31
	DeKalb	DKC55-54RIB	6	174.1	2.9	67%	15.9	0.3	57.6	-0.6	$14
	Pioneer	P9998AM	10	192.7	7.0	80%	18.2	-0.4	55.4	-0.2	$31
	Pioneer	P0046AM	44	152.3	1.3	57%	15.5	-0.2	56.3	-1.8	$5
	Pioneer	P0075Q	120	199.1	0.5	52%	17.3	-0.6	55.8	-0.9	($3)
	Pioneer	P0075AM	14	187.7	-5.6	36%	18.1	-0.4	56.5	-1.2	($33)
	Pioneer	P0220AM	14	197.7	5.9	71%	19.1	0.3	54.9	0.1	$29
	Pioneer	P0404AM	60	162.4	-2.9	42%	15.4	0.0	56.7	-0.2	($15)
	Pioneer	P0589AM	10	127.8	2.7	60%	14.4	0.7	57.5	-1.3	$16
	Pioneer	P0507AM	12	210.2	-1.1	58%	19.2	0.7	54.6	0.0	($0)
	Pioneer	P0507Q	121	200.6	-0.9	45%	17.3	0.6	55.8	-0.3	($0)
	Pioneer	P0622Q	114	199.2	-7.7	28%	17.1	1.6	56.0	-0.5	($26)
	Pioneer	P0688AM	44	166.6	-3.0	39%	15.1	1.2	56.8	-0.5	($10)
	Pioneer	P0688Q	72	217.7	-0.9	44%	18.5	1.3	55.6	-0.8	$7

Pioneer® Hybrid/ Brand	Comp Brand	Comp Hybrid/ Brand	# Cmp	Prim Yield (bu/a)	Yld Adv (bu/a)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim Tst Wt (lb/bu)	Tst Wt Adv	AGI Adv
P0421Q	DeKalb	DKC49-44RIB	64	227.9	0.5	55%	19.2	-0.8	57.2	-0.2	($4)
	DeKalb	DKC54-38RIB	66	226.8	-0.8	48%	19.1	0.0	57.1	-0.2	($4)
	Pioneer	P0075Q	90	226.3	-4.1	32%	19.2	-0.3	56.9	0.3	($22)
	Pioneer	P0220Q	87	225.6	0.7	52%	19.3	-0.1	56.8	1.2	$2
	Pioneer	P0306Q	10	209.3	-2.3	30%	20.1	0.9	55.8	0.3	($4)
	Pioneer	P0404Q	87	224.9	-10.3	9%	19.3	0.2	56.8	0.6	($48)
	Pioneer	P0487Q	71	228.3	-16.0	7%	19.0	0.4	57.0	0.2	($74)
	Pioneer	P0507Q	85	224.6	-4.8	31%	19.3	1.0	56.9	0.9	($14)
	Pioneer	P0622Q	25	223.7	-15.6	12%	18.8	1.9	57.2	0.3	($59)
	Pioneer	P0688Q	24	224.1	-8.0	33%	18.4	1.9	57.5	0.4	($22)
P0487Q	DeKalb	DKC51-38RIB	6	209.9	5.7	67%	17.8	-0.8	56.5	-0.4	$22
	DeKalb	DKC52-18RIB	13	235.1	19.7	77%	18.2	-1.0	57.5	0.6	$88
	DeKalb	DKC54-38RIB	76	238.4	14.5	88%	19.3	-0.4	56.9	-0.5	$67
	DeKalb	DKC54-64RIB	20	233.2	8.7	75%	18.0	-0.4	56.8	1.1	$40
	DeKalb	DKC55-53RIB	10	221.1	8.2	70%	17.4	0.4	56.9	0.0	$42
	DeKalb	DKC56-65RIB	7	251.7	-0.7	57%	17.7	2.0	57.2	1.9	$16
	Pioneer	P0075Q	154	225.9	9.7	81%	18.4	-0.8	56.8	0.1	$41
	Pioneer	P0220Q	155	226.8	13.7	83%	18.5	-0.6	56.7	0.8	$61
	Pioneer	P0421Q	71	244.3	16.0	93%	19.4	-0.4	56.8	-0.2	$74
	Pioneer	P0404Q	135	234.2	1.8	52%	19.0	-0.2	56.7	0.3	$6
	Pioneer	P0507Q	157	225.5	8.2	77%	18.4	0.5	56.7	0.6	$44
	Pioneer	P0622Q	105	218.0	-0.5	48%	17.8	1.3	57.0	0.4	$9
	Pioneer	P0688Q	79	229.8	6.3	75%	18.7	1.3	56.9	0.2	$41

Pioneer® Hybrid/ Brand	Comp Brand	Comp Hybrid/ Brand	# Cmp	Prim Yield (bu/a)	Yld Adv (bu/a)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim Tst Wt (lb/bu)	Tst Wt Adv	AGI Adv
	DeKalb	DKC52-18RIB	15	235.8	23.1	87%	19.9	-2.6	55.9	-0.8	$89
	DeKalb	DKC54-38RIB	34	236.6	15.1	88%	20.1	-1.6	57.0	-0.7	$59
	DeKalb	DKC54-64RIB	23	227.8	12.0	74%	18.5	-1.5	57.1	0.3	$47
	DeKalb	DKC55-53RIB	11	225.5	5.7	64%	18.7	-1.0	56.2	-0.7	$19
	DeKalb	DKC56-65RIB	14	240.3	2.6	64%	19.5	0.9	56.3	0.6	$21
	DeKalb	DKC57-23RIB	6	234.5	17.3	67%	18.0	-0.4	57.4	1.3	$82
	DeKalb	DKC57-29RIB	6	232.6	29.3	100%	18.6	-1.2	57.4	-0.5	$132
	DeKalb	DKC58-64RIB	5	248.1	-0.5	20%	18.6	0.3	57.4	0.3	($1)
	DeKalb	DKC59-50RIB	5	196.1	8.3	80%	15.1	0.3	59.6	2.1	$41
	DeKalb	DKC59-82RIB	7	233.2	-6.1	43%	19.6	1.2	56.4	1.8	($18)
	DeKalb	DKC59-81RIB	12	241.8	-6.2	33%	19.9	1.3	56.2	1.2	($16)
P0622Q	Pioneer	P0220Q	130	214.0	11.5	77%	19.3	-2.1	56.5	0.4	$39
	Pioneer	P0306Q	5	200.5	4.7	80%	20.8	-2.0	55.4	-0.7	$7
	Pioneer	P0421Q	25	239.2	15.6	88%	20.7	-1.9	56.9	-0.3	$59
	Pioneer	P0421AM	114	206.9	7.7	71%	18.7	-1.6	56.5	0.5	$26
	Pioneer	P0404AM	38	170.3	4.9	58%	15.8	-1.1	58.5	1.0	$20
	Pioneer	P0404Q	104	227.7	2.5	60%	20.2	-1.6	56.2	-0.3	($3)
	Pioneer	P0487Q	105	218.6	0.5	51%	19.1	-1.3	56.6	-0.4	($9)
	Pioneer	P0507Q	141	212.5	7.6	78%	19.1	-0.9	56.5	0.3	$30
	Pioneer	P0688AM	41	170.9	6.1	66%	16.0	0.0	58.1	0.7	$31
	Pioneer	P0688Q	102	227.4	7.6	81%	20.3	-0.4	56.2	-0.4	$34
	Pioneer	P0947Q	44	235.3	7.9	70%	19.4	0.7	56.5	-0.1	$45
	Pioneer	P0924Q	82	206.5	0.6	57%	17.8	1.1	57.2	-0.1	$12

RED RIVER MARKETING

PLOT NAME	LOCATION	IRRIGATION	TILLAGE
Robert Ehlers	S of Elbow Lake, MN	Non-Irrigated	Conventional
PLANTING DATE	**HARVEST DATE**	**PREVIOUS CROP**	**ROW WIDTH**
04-29-21	09-22-22	Corn	22”

Entry #	Brand	Hybrid/Brand	RM	Yield (bu/a 56#)	Mst (%)	Tst Wt (lb/bu)	AGI	Yield Rank
1	Pioneer	P9193Q	91	166.6	19.9	57.1	$800.35	16
2	Pioneer	P9211Q	92	169	21.2	57.9	$803.09	14
3	Dekalb	DKC43-75RIB	93	167.3	22.6	56.7	$785.64	15
4	Pioneer	P9301Q	93	169.4	21.3	56.8	$804.31	13
5	Pioneer	P9489Q	94	164.1	22.1	58.4	$773.90	18
6	Pioneer	P9492AM	94	181.6	22.2	55.7	$855.70	8
7	Pioneer	P9540AM	95	178.3	25.6	53.7	$815.90	10
8	Pioneer	P9551Q	95	165	27.3	53.1	$743.82	17
9	Pioneer	P9619AM	96	169.7	25.5	55.4	$777.23	12
10	Pioneer	P9823Q	98	189.8	29.1	53.9	$841.95	2
11	Dekalb	DKC49-95RIB	99	172	29.6	55	$759.55	11
12	Pioneer	P9880AMXT	98	187.9	27.3	53.9	$847.05	4
13	Pioneer	P0220Q	102	192.5	29.3	53.9	$852.39	1
14	Dekalb	DKC51-91RIB	101	187.2	31.8	53.9	$810.20	5
15	Pioneer	P0404Q	104	187	33	55.4	$800.36	6
16	Pioneer	P0421Q	104	182.5	31	55	$795.70	7
17	Pioneer	P0507Q	105	180.3	32	56.1	$778.90	9
18	Pioneer	P0622Q	106	188.2	33	53.9	$805.50	3

PLOT NAME	LOCATION	IRRIGATION	TILLAGE
Brutlag Farms Inc.	S of Wendell, MN	Non-Irrigated	Conventional
PLANTING DATE	**HARVEST DATE**	**PREVIOUS CROP**	**ROW WIDTH**
04-30-21	11-2-21	Corn	22”

Entry #	Brand	Hybrid/Brand	RM	Yield (bu/a 56#)	Mst (%)	Tst Wt (lb/bu)	AGI	Yield Rank
1	Dekalb	DKC43-75RIB	93	203	15.6	60	$1010.13	9
3	Pioneer	P9211AM	92	203	16.3	60.6	$1004.44	9
4	Pioneer	P9301AM	93	196.5	16.2	59.9	$973.07	12
5	Pioneer	P9489AM	94	215	16.0	57.7	$1066.90	7
6	Pioneer	P9492AM	94	219.3	16.3	56.8	$1085.10	5
7	Pioneer	P9540AM	95	217.3	17	55.9	$1069.12	6
8	Pioneer	P9551Q	95	195.8	16.2	58	$969.60	13
9	Pioneer	P9619AM	96	201.6	16.4	56.4	$996.71	11
10	Pioneer	P9823Q	98	221.6	17.1	58.1	$1087.42	4
11	Pioneer	P9880AMXT	98	214.3	17.6	57.6	$1049.21	8
12	Pioneer	P0220AM	102	228.2	18	58.6	$1113.62	2
13	Pioneer	P0404AM	104	229.9	18.1	57.1	$1120.99	1
14	Pioneer	P0421AM	104	227.7	16.9	60.8	$1121.19	3

PLOT NAME	LOCATION	IRRIGATION	TILLAGE
Mark Schoening	SW of Underwood, MN	Full	Conservation
PLANTING DATE	**HARVEST DATE**	**PREVIOUS CROP**	**ROW WIDTH**
05-01-21	10-15-21	Soybean	20”

Entry #	Brand	Hybrid/Brand	RM	Yield (bu/a 56#)	Mst (%)	Tst Wt (lb/bu)	AGI	Yield Rank
1	Dekalb	DKC43-75RIB	93	233.4	18.8	58.9	$1132	5
2	Pioneer	P8989AM	89	225.5	18.2	58.4	$1099	11
3	Pioneer	P9188AM	91	233.2	18.8	58.4	$1131	6
4	Pioneer	P9193AM	91	231.7	18.7	58.6	$1124	7
5	Pioneer	P9211AM	92	229.2	19.2	58.7	$1107	8
6	Pioneer	P9301AM	93	228.6	18.6	58.3	$1110	9
7	Pioneer	P9489AM	94	241.1	19.6	59.3	$1161	3
8	Pioneer	P9492AM	94	224.4	20.3	56.8	$1074	12
9	Pioneer	P9540AM	95	246.2	19.9	56.7	$1183	2
10	Pioneer	P9551Q	95	238.8	20.7	56.6	$1140	4
11	Pioneer	P9619AM	96	226.0	20.4	56.6	$1081	10
12	Pioneer	P9823Q	98	258.8	21.2	56.1	$1230	1

PLOT NAME	LOCATION	IRRIGATION	TILLAGE
Brent Johnson	NE of Hoffman, MN	Non-Irrigated	Conventional
PLANTING DATE	**HARVEST DATE**	**PREVIOUS CROP**	**ROW WIDTH**
04-30-21	10-8-21	Soybean	22”

Entry #	Brand	Hybrid/Brand	RM	Yield (bu/a 56#)	Mst (%)	Tst Wt (lb/bu)	AGI	Yield Rank
1	Dekalb	DKC45-95RIB	95	178.5	16.1	57.0	$884	7
2	Pioneer	P9193AM	91	176.4	15.9	56.3	$875	9
3	Pioneer	P9211AM	92	165.0	16.5	55.7	$815	14
4	Pioneer	P9301AM	93	169.5	16.0	56.7	$841	13
5	Pioneer	P9489AM	94	171.7	16.6	53.4	$848	11
6	Pioneer	P9492AM	94	175.7	16.6	53.8	$867	10
7	Pioneer	P9540AM	95	184.7	17.1	54.7	$908	5
8	Pioneer	P9551Q	95	173.5	17.3	54.7	$852	12
9	Pioneer	P9619AM	96	176.9	15.9	54.2	$878	8
10	Pioneer	P9823Q	98	198.7	16.5	56.6	$982	2
11	Pioneer	P9880AMXT	98	184.4	18.0	55.2	$900	6
12	Pioneer	P0220AM	102	197.4	18.5	56.3	$959	3
13	Pioneer	P0404AM	104	199.2	19.3	55.2	$962	1
14	Pioneer	P0421AM	104	193.0	18.2	56.3	$940	4

PLOT NAME	LOCATION	IRRIGATION	TILLAGE
Bob Thormodson	E of Dalton, MN	Non-Irrigated	Conventional
PLANTING DATE	**HARVEST DATE**	**PREVIOUS CROP**	**ROW WIDTH**
05-03-21		Soybean	30”

Entry #	Brand	Hybrid/Brand	RM	Yield (bu/a 56#)	Mst (%)	Tst Wt (lb/bu)	AGI	Yield Rank
1	Dekalb	DKC43-75RIB	93	164.2	16.7	58.4	$810	8
2	Pioneer	P8989AM	89	151.2	15.7	59.5	$752	13
3	Pioneer	P9188AM	91	164.6	15.7	60.0	$818	7
4	Pioneer	P9193AM	91	154.7	17.0	58.9	$761	12
5	Pioneer	P9211AM	92	168.1	17.1	58.3	$827	5
6	Pioneer	P9301AM	93	145.2	17.7	58.4	$714	14
7	Pioneer	P9489AM	94	165.9	17.0	57.0	$812	6
8	Pioneer	P9492AM	94	161.1	17.5	57.4	$789	10
9	Pioneer	P9540AM	95	161.9	17.5	56.4	$793	9
10	Pioneer	P9551Q	95	155.2	17.9	55.5	$758	11
11	Pioneer	P9619AM	96	171.4	17.7	57.7	$838	3
12	Pioneer	P9823Q	98	189.1	17.1	57.1	$930	1
13	Pioneer	P0220AM	102	187.3	17.9	57.9	$915	2
14	Dekalb	DKC45-95RIB	95	172.3	19.1	56.0	$833	4

PLOT NAME	LOCATION	IRRIGATION	TILLAGE
Jason Miller	E of Herman, MN	Non-Irrigated	Conventional
PLANTING DATE	**HARVEST DATE**	**PREVIOUS CROP**	**ROW WIDTH**
05-03-21	10-12-21	Soybean	30”

Entry #	Brand	Hybrid/Brand	RM	Yield (bu/a 56#)	Mst (%)	Tst Wt (lb/bu)	AGI	Yield Rank
1	Enestvedt	E-658	96	210.9	18.0	55.1	$1029	12
2	Enestvedt	E-646	94	210.4	18.9	54.2	$1019	14
3	Pioneer	P9193AM	91	208.3	17.8	57.6	$1018	15
4	Midwest	MW93-07VT2PRIB	93	205.3	19.2	54.1	$992	16
5	Channel	194-49DGVT2PRIB	94	212.8	17.9	55.2	$1039	11
6	Pioneer	P9489AM	94	205.1	20.0	53.8	$984	17
7	Pioneer	P9492AM	94	217.5	18.6	55.5	$1056	9
8	Channel	195-85DGVT2PRIB	95	220.6	19.2	53.8	$1066	7
9	Pioneer	P9619AM	96	226.6	20.0	54.2	$1088	4
10	Channel	197-21VT2PRIB	97	217.9	19.0	55.1	$1055	8
11	Midwest	MW97-62VT2PRIB	97	221.3	20.3	53.5	$1060	6
12	Channel	197-90VT2PRIB	97	240.5	18.4	56.1	$1170	1
13	Pioneer	P9823Q	98	213.0	21.4	53.5	$1010	10
14	Channel	199-45VT2PRIB	99	224.9	22.3	51.6	$1059	5
15	Midwest	MW01-01VT2PRIB	101	229.9	23.9	52.3	$1068	2
16	Pioneer	P0220AM	102	228.3	22.1	53.2	$1077	3
17	Enestvedt	E-658	96	210.7	18.7	55.1	$1022	13

RED RIVER MARKETING

PLOT NAME	LOCATION	IRRIGATION	TILLAGE
Eric Loomer	S of Fergus Falls, MN	Non-Irrigated	Conventional
PLANTING DATE	**HARVEST DATE**	**PREVIOUS CROP**	**ROW WIDTH**
04-22-21	10-6-21	Soybeans	30”

Entry #	Brand	Hybrid/Brand	RM	Yield (bu/a 56#)	Mst (%)	Tst Wt (lb/bu)	AGI	Yield Rank
1	Dekalb	DKC51-40RIB	101	197.1	15.9	57.6	$978	2
2	Pioneer	P0220AM	102	186.7	19.7	55.3	$898	9
3	Pioneer	P9619AM	96	174.7	16.8	57.1	$861	14
4	Pioneer	P9492AM	94	191.4	16.5	56.3	$946	4
5	Pioneer	P9193AM	91	160.7	14.9	57.8	$804	16
6	Dekalb	DKC49-45RIB	99	176.0	16.2	57.8	$872	13
7	Dekalb	DKC45-95RIB	95	177.7	14.6	57.9	$889	12
8	Dekalb	DKC43-75	93	188.7	14.6	57.8	$944	8
9	Dekalb	DKC39-55	89	191.6	13.5	58.3	$958	3
10	Allegiant	ALL10007VT2P	100	191.3	14.9	58.1	$957	5
11	Allegiant	ALL9884VT2P	98	191.2	16.6	57.5	$944	6
12	Allegiant	ALL9594VT2P	95	197.3	14.9	59.1	$987	1
13	Allegiant	ALL9484VT2P	94	186.2	15.7	60.2	$926	10
14	NK Brand	NK9991-5122EZR	99	179.7	17.2	56.7	$883	11
15	NK Brand	NK9653-5222EZR	96	167.9	15.1	58.6	$839	15
16	Dekalb	DKC51-40RIB	101	189.7	16.3	57.2	$939	7

2021 NEW PIONEER® SOYBEAN PRODUCTS

PIONEER®

P03T87E™ RM: 0.3 SCN: PI88788
- Fills the gap for early maturity Enlist option with SCN resistance
- Shorter plant height with wider canopy
- Below average tolerance to white mold
- Average IDC tolerance so avoid IDC prone soils

P05A73X RM: 0.5 SCN: PI88788
- Acceptable plant height and canopy
- Good tolerance to white mold
- Favorable IDC tolerance with strong yields
- Average PRR tolerance paired with 1k PRR gene
- Replaces P05A35X & P06A45X

P06T32E™ RM: 0.6 SCN: PI88788
- Offensive companion to P06T56E™
- Shorter plant height with acceptable canopy width
- Average white mold tolerance
- Respectable IDC tolerance
- Watch placement on poorly drained soils

P09T68E™ RM: 0.9 SCN: PI88788
- No phytophthora gene but good field tolerance
- Average white mold tolerance
- Respectable IDC tolerance
- Acceptable plant height with wider canopy

P10T57E™ RM: 1.0 SCN: PI88788
- Replacement for P10T29E™ – more yield, standability & WM
- No phytophthora gene with average field tolerance
- Respectable IDC tolerance
- Acceptable plant height with wider canopy

P12T94E™ RM: 1.2 SCN: PI88788
- Improved white mold & SDS over P11T55E™
- No phytophthora gene with average tolerance
- Shorter plant stature
- Nice harvest standability

P13A89X RM: 1.3 SCN: PEKING
- Brings increased yield potential with improved traits
- Average IDC & phtyophthora field tolerance
- Taller plant height with good canopy width
- PEKING source for SCN
- Replaces P11A44X, P14A30X & P14A78X

P13T47E™ RM: 1.3 SCN: PI88788
- Greatly improved agros over P13T61E™ (WM, SDS, Standability)
- No phytophthora gene with above average tolerance
- Taller plant height with good canopy width
- Potential volume leader at this RM

P14T81E™ RM: 1.4 SCN: PI88788
- Improved white mold & SDS over P13T61E™
- No phytophthora gene with average tolerance
- Shorter plant stature with wider canopy
- Likely a companion to P13T47E™

P15A20 RM: 1.5 SCN: PI88788
- Conventional option at 1.5 RM with SCN tolerance
- Excellent emergence paired with outstanding harvest standability
- Strong IDC tolerance
- Exceptional tolerance to white mold

P16T05E™ RM: 1.6 SCN: PI88788
- Improved WM & SDS over P16T58E™
- Shorter plant stature with wider canopy
- Potential replacement for P16T58E™
- Strong emergence paired with good harvest standability

P18T91E™ RM: 1.8 SCN: PI88788
- Best E3 option for the IDC acre
- Improved WM & SDS over P16T58E™
- Shorter plant stature with wider canopy
- Improved harvest standability over P20T64E™

P20A22X RM: 2.0 SCN: PI88788
- Outstanding yield potential
- Average plant height and canopy
- Excellent tolerance to white mold & SDS
- 1K/3A gene stack for phytophthora protection

P21T72E™ RM: 2.1 SCN: PI88788
- Enlist yield leader for zone
- Shorter plant height with nice canopy width
- Average white mold tolerance
- Improved harvest standability over P20T64E™ & P22T18E™
- Replaces P21T43E™

PIONEER.COM/YIELD

Enlist E3 Soybeans

Pioneer® Variety/ Brand	Comp Brand	Comp Variety/ Brand	#Cmp	Prim Yield (bu/a 60#)	Comp Yield (bu/a 60#)	Yld Adv (bu/a 60#)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim AGI	AGI Adv
P06T56E	Pioneer	P01T92E	10	40.2	34.8	5.4	90%	10.2	0.2	$503	$67
	Pioneer	P01T43E	9	40.2	36.0	4.3	78%	10.3	0.1	$503	$53
	Pioneer	P03A17X	5	33.4	34.3	-0.9	20%	9.3	-0.5	$417	($12)
	Pioneer	P03A26X	7	33.0	35.1	-2.1	14%	10.0	-0.4	$412	($27)
	Pioneer	P03T87E	20	40.1	41.0	-1.0	40%	10.4	0.1	$501	($12)
	Pioneer	P05A73X	9	36.4	41.8	-5.5	11%	10.2	1.7	$455	($68)
	Pioneer	P05T07E	13	44.7	44.5	0.2	46%	9.4	-0.3	$558	$2
	Pioneer	P06T04E	17	44.7	43.5	1.3	41%	9.6	0.0	$559	$16
	Pioneer	P06T32E	58	45.1	48.2	-3.1	16%	10.5	0.0	$564	($38)
	Pioneer	P06A38E	14	44.8	46.0	-1.3	36%	9.4	-0.5	$559	($16)
	Pioneer	P06A85E	14	44.8	47.6	-2.8	14%	9.4	-0.2	$559	($35)
	Pioneer	P07T65E	13	45.1	47.5	-2.4	31%	9.4	-0.2	$564	($30)
	Pioneer	P07A18X	6	38.0	48.9	-10.9	%	10.5	-0.1	$475	($136)
	Pioneer	P08T79E	14	44.8	51.7	-7.0	7%	9.4	-0.1	$559	($87)
	Pioneer	P09A62X	6	42.4	51.0	-8.7	%	10.7	-0.3	$530	($108)
	Pioneer	P09T24E	47	45.6	52.6	-7.0	11%	10.4	0.0	$570	($87)
	Pioneer	P09T93E	14	44.8	52.1	-7.3	%	9.4	0.0	$559	($92)
	Pioneer	P09T68E	52	45.3	51.6	-6.4	6%	10.6	0.1	$566	($80)
P05T07E	Pioneer	P01T92E	5	41.3	36.0	5.3	100%	8.9	0.3	$516	$66
	Pioneer	P01T43E	5	41.3	37.5	3.8	100%	8.9	0.2	$516	$47
	Pioneer	P03T87E	5	41.3	35.2	6.1	80%	8.9	1.2	$516	$77
	Pioneer	P06T56E	13	44.5	44.7	-0.2	54%	9.1	0.3	$556	($2)
	Pioneer	P04A98E	5	41.3	41.1	0.2	40%	8.9	-0.3	$516	$3
	Pioneer	P06T04E	16	44.3	42.4	1.9	75%	8.9	0.1	$554	$24
	Pioneer	P06T32E	13	44.5	48.4	-3.9	23%	9.1	0.1	$556	($48)
	Pioneer	P06A38E	13	44.5	46.1	-1.6	31%	9.1	-0.2	$556	($20)
	Pioneer	P06A85E	13	44.5	47.4	-2.9	38%	9.1	0.1	$556	($36)
	Pioneer	P07T65E	12	44.4	47.8	-3.5	17%	9.0	0.2	$554	($43)
	Pioneer	P08T79E	13	44.5	51.9	-7.4	8%	9.1	0.2	$556	($92)
	Pioneer	P09T24E	13	44.5	50.9	-6.4	23%	9.1	0.2	$556	($80)
	Pioneer	P09T93E	13	44.5	52.1	-7.6	15%	9.1	0.3	$556	($95)
	Pioneer	P09T68E	13	44.5	47.5	-3.0	38%	9.1	0.3	$556	($37)
	Pioneer	P10T29E	11	45.7	50.5	-4.8	18%	8.9	0.6	$571	($60)
	Pioneer	P10T57E	11	45.7	52.9	-7.2	%	8.9	0.2	$571	($91)

Pioneer® Variety/ Brand	Comp Brand	Comp Variety/ Brand	#Cmp	Prim Yield (bu/a 60#)	Comp Yield (bu/a 60#)	Yld Adv (bu/a 60#)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim AGI	AGI Adv
P06A85E New Limited Supply	Pioneer	P06T56E	14	47.6	44.8	2.8	86%	9.2	0.2	$595	$35
	Pioneer	P05T07E	13	47.4	44.5	2.9	62%	9.1	-0.1	$593	$36
	Pioneer	P06T04E	14	47.6	43.1	4.4	79%	9.2	0.1	$595	$55
	Pioneer	P06T32E	14	47.6	48.4	-0.8	57%	9.2	0.1	$595	($11)
	Pioneer	P06A38E	14	47.6	46.0	1.5	57%	9.2	-0.3	$595	$19
	Pioneer	P09T24E	14	47.6	50.9	-3.3	21%	9.2	0.1	$595	($41)
	Pioneer	P09T93E	14	47.6	52.1	-4.5	7%	9.2	0.2	$595	($56)
	Pioneer	P09T68E	14	47.6	47.3	0.3	50%	9.2	0.2	$595	$4
	Pioneer	P10T29E	12	49.8	50.6	-0.8	42%	9.1	0.5	$623	($10)
	Pioneer	P10T57E	12	49.8	52.9	-3.1	8%	9.1	0.1	$623	($39)
P06T32E	Pioneer	P03T87E	20	43.6	40.9	2.7	70%	10.6	0.1	$546	$34
	Pioneer	P06T56E	58	48.2	45.1	3.1	83%	10.5	0.0	$602	$38
	Pioneer	P05A73X	8	39.1	40.1	-1.0	38%	9.7	0.2	$488	($13)
	Pioneer	P05T07E	13	48.4	44.5	3.9	77%	9.2	-0.1	$605	$48
	Pioneer	P06T04E	16	47.8	42.9	4.9	88%	9.5	0.0	$598	$61
	Pioneer	P06A38E	14	48.4	46.0	2.4	64%	9.3	-0.3	$605	$30
	Pioneer	P06A85E	14	48.4	47.6	0.8	43%	9.3	-0.1	$605	$11
	Pioneer	P07A18X	6	38.6	44.4	-5.8	17%	10.0	-0.3	$483	($72)
	Pioneer	P09A62X	6	42.3	48.0	-5.7	%	10.1	-0.4	$529	($72)
	Pioneer	P09T24E	44	48.6	52.4	-3.7	14%	10.3	0.0	$608	($47)
	Pioneer	P09T93E	14	48.4	52.1	-3.7	14%	9.3	0.1	$605	($46)
	Pioneer	P09T68E	53	47.9	51.3	-3.4	23%	10.5	0.1	$599	($42)
	Pioneer	P10T29E	17	46.0	47.4	-1.4	24%	9.4	0.5	$575	($18)
	Pioneer	P10T57E	52	48.4	52.9	-4.5	12%	10.6	0.0	$606	($56)
	Pioneer	P11T55E	48	48.5	53.7	-5.2	17%	10.4	0.1	$606	($65)
	Pioneer	P11T36E	12	50.1	55.8	-5.7	8%	9.3	0.1	$626	($72)

Pioneer® Variety/ Brand	Comp Brand	Comp Variety/ Brand	#Cmp	Prim Yield (bu/a 60#)	Comp Yield (bu/a 60#)	Yld Adv (bu/a 60#)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim AGI	AGI Adv
P09T24E	Pioneer	P09T93E	14	50.9	52.1	-1.2	50%	9.4	0.1	$636	($15)
	Pioneer	P09T68E	49	51.7	51.0	0.7	59%	10.3	0.1	$647	$9
	Pioneer	P10T29E	18	48.2	46.5	1.7	78%	9.8	0.2	$603	$22
	Pioneer	P10T57E	65	52.0	51.9	0.0	46%	10.7	0.0	$650	$0
	Pioneer	P11T55E	61	52.6	52.7	-0.1	43%	10.6	0.1	$657	($1)
	Pioneer	P11T36E	12	53.7	55.8	-2.1	42%	9.3	0.0	$671	($26)
	Pioneer	P12T94E	60	52.8	54.6	-1.8	32%	10.7	0.4	$659	($23)
	Pioneer	P13T61E	40	53.5	55.7	-2.1	28%	10.2	0.2	$669	($26)
	Pioneer	P13T47E	58	52.5	54.9	-2.4	28%	10.7	0.0	$657	($30)
	Pioneer	P16T75L	13	54.9	54.0	0.9	62%	10.7	-0.1	$686	$11
	Pioneer	P14A23L	12	56.6	60.1	-3.4	33%	10.7	0.4	$708	($43)
	Pioneer	P14T81E	56	53.1	55.9	-2.8	32%	10.6	0.0	$663	($35)
	Stine	12EB32	9	46.2	44.6	1.6	78%	12.1	0.4	$578	$21
P09T68E	Pioneer	P09T24E	49	51.0	51.7	-0.7	39%	10.4	-0.1	$638	($9)
	Pioneer	P09T93E	14	47.3	52.1	-4.8	7%	9.5	0.0	$591	($60)
	Pioneer	P10T29E	27	47.9	48.6	-0.7	44%	10.2	0.1	$599	($8)
	Pioneer	P10T57E	82	52.8	53.9	-1.1	38%	10.9	-0.2	$660	($13)
	Pioneer	P11T55E	68	53.0	55.3	-2.3	34%	10.8	-0.1	$663	($29)
	Pioneer	P11T36E	12	49.0	55.8	-6.9	8%	9.5	-0.1	$612	($86)
	Pioneer	P12T94E	76	53.1	57.0	-3.9	25%	10.9	0.1	$664	($49)
	Pioneer	P13T61E	44	52.6	56.6	-3.9	30%	10.3	0.1	$658	($49)
	Pioneer	P13T47E	72	53.2	57.6	-4.4	17%	10.8	-0.1	$665	($55)
	Pioneer	P16T75L	17	53.6	53.1	0.5	53%	10.7	-0.2	$669	$6
	Pioneer	P14A23L	15	55.5	60.5	-5.0	20%	10.8	0.1	$694	($63)
	Pioneer	P14T81E	68	53.6	59.2	-5.5	19%	10.9	-0.3	$670	($69)

Pioneer® Variety/ Brand	Comp Brand	Comp Variety/ Brand	#Cmp	Prim Yield (bu/a 60#)	Comp Yield (bu/a 60#)	Yld Adv (bu/a 60#)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim AGI	AGI Adv
P09T93E New Limited Supply	Pioneer	P09T24E	14	52.1	50.9	1.2	50%	9.4	-0.1	$651	$15
	Pioneer	P09T68E	14	52.1	47.3	4.8	93%	9.4	0.0	$651	$60
	Pioneer	P10T29E	12	54.4	50.6	3.8	83%	9.4	0.2	$680	$47
	Pioneer	P10T57E	12	54.4	52.9	1.4	50%	9.4	-0.1	$680	$18
	Pioneer	P11T55E	12	54.4	53.9	0.5	58%	9.4	0.1	$680	$6
	Pioneer	P11T36E	12	54.4	55.8	-1.5	33%	9.4	-0.1	$680	($18)
	Pioneer	P12T94E	12	54.4	55.2	-0.9	58%	9.4	0.0	$680	($11)
	Pioneer	P13T61E	12	54.4	54.8	-0.4	50%	9.4	0.3	$680	($5)
	Pioneer	P13T47E	12	54.4	55.0	-0.6	42%	9.4	-0.1	$680	($8)
	Pioneer	P14T81E	12	54.4	55.8	-1.4	17%	9.4	0.0	$680	($18)
P10T57E	Asgrow	AG15XF1	9	51.5	54.2	-2.7	33%	11.8	0.1	$644	($34)
	Pioneer	P09T24E	65	51.9	52.0	0.0	51%	10.7	0.0	$649	($0)
	Pioneer	P09T93E	12	52.9	54.4	-1.4	50%	9.3	0.1	$662	($18)
	Pioneer	P09T68E	82	53.9	52.8	1.1	61%	10.7	0.2	$674	$13
	Pioneer	P10A76X	7	46.9	49.6	-2.8	29%	11.7	0.3	$586	($35)
	Pioneer	P10T29E	42	51.7	50.0	1.8	69%	10.3	0.2	$647	$22
	Pioneer	P11T55E	101	53.5	54.5	-1.0	40%	10.8	0.1	$669	($12)
	Pioneer	P11T36E	24	53.0	57.0	-3.9	29%	10.0	-0.1	$663	($49)
	Pioneer	P12T94E	112	54.1	56.3	-2.2	30%	10.9	0.3	$676	($27)
	Pioneer	P13T61E	58	54.1	56.6	-2.5	36%	10.3	0.2	$676	($31)
	Pioneer	P13T47E	108	54.0	57.1	-3.1	26%	10.8	0.0	$675	($39)
	Pioneer	P16T75L	17	54.8	53.9	0.9	53%	10.5	0.0	$685	$11
	Stine	12EB32	12	45.9	46.9	-1.1	50%	12.1	0.2	$574	($13)

Pioneer® Variety/ Brand	Comp Brand	Comp Variety/ Brand	#Cmp	Prim Yield (bu/a 60#)	Comp Yield (bu/a 60#)	Yld Adv (bu/a 60#)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim AGI	AGI Adv
P11T55E	Asgrow	AG12XF1	5	49.7	49.5	0.2	20%	12.2	-0.2	$621	$2
	Asgrow	AG13XF0	5	49.7	48.8	0.8	60%	12.2	0.1	$621	$11
	Asgrow	AG15XF1	7	53.3	50.3	3.0	71%	12.4	0.1	$667	$38
	Pioneer	P06T04E	12	53.9	44.2	9.7	100%	9.5	-0.2	$674	$121
	Pioneer	P06T32E	48	53.7	48.5	5.2	83%	10.5	-0.1	$672	$65
	Pioneer	P06A38E	12	53.9	46.9	6.9	100%	9.5	-0.5	$674	$87
	Pioneer	P06A85E	12	53.9	49.8	4.1	83%	9.5	-0.3	$674	$51
	Pioneer	P07A18X	9	56.9	56.0	0.9	56%	11.3	-0.4	$711	$11
	Pioneer	P09A62X	9	56.3	54.4	1.9	56%	11.2	-0.6	$704	$23
	Pioneer	P09T24E	61	52.7	52.6	0.1	57%	10.7	-0.1	$658	$1
	Pioneer	P09T93E	12	53.9	54.4	-0.5	42%	9.5	-0.1	$674	($6)
	Pioneer	P09T68E	68	55.3	53.0	2.3	66%	10.7	0.1	$691	$29
	Pioneer	P10A76X	9	50.9	50.1	0.8	78%	11.5	0.2	$637	$10
	Pioneer	P10T29E	28	51.8	48.9	2.9	79%	10.2	0.2	$647	$36
	Pioneer	P10T57E	101	54.5	53.5	1.0	59%	10.9	-0.1	$681	$12
	Pioneer	P11T36E	24	54.2	57.0	-2.7	25%	10.1	-0.2	$678	($34)
	Pioneer	P12T94E	95	54.6	55.7	-1.1	39%	10.8	0.3	$682	($14)
	Pioneer	P13T61E	58	54.7	56.4	-1.7	41%	10.2	0.2	$684	($21)
	Pioneer	P13T47E	95	54.6	56.2	-1.6	31%	10.8	0.0	$682	($21)
	Pioneer	P16T75L	15	55.8	53.8	2.0	67%	10.7	0.0	$697	$24
	Pioneer	P14A23L	13	57.2	59.4	-2.3	38%	10.7	0.3	$715	($28)
	Pioneer	P14T81E	90	54.9	57.5	-2.6	30%	10.7	-0.1	$686	($33)
	Pioneer	P15A63X	7	48.6	50.8	-2.2	43%	11.5	-0.1	$608	($27)
	Pioneer	P16T58E	76	56.4	59.7	-3.3	29%	10.5	0.4	$705	($41)
	Pioneer	P16T05E	61	57.2	58.9	-1.7	36%	10.7	0.3	$716	($21)
	Stine	12EB32	8	44.5	44.6	0.0	63%	11.8	0.3	$557	($0)

Pioneer® Variety/ Brand	Comp Brand	Comp Variety/ Brand	#Cmp	Prim Yield (bu/a 60#)	Comp Yield (bu/a 60#)	Yld Adv (bu/a 60#)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim AGI	AGI Adv
P11T36E New Limited Supply	Asgrow	AG12XF1	5	51.4	49.5	1.9	60%	12.2	-0.2	$643	$24
	Asgrow	AG13XF0	5	51.4	48.8	2.6	60%	12.2	0.1	$643	$33
	Pioneer	P09T24E	12	55.8	53.7	2.1	58%	9.3	0.0	$698	$26
	Pioneer	P09T93E	12	55.8	54.4	1.5	67%	9.3	0.1	$698	$18
	Pioneer	P09T68E	12	55.8	49.0	6.9	92%	9.3	0.1	$698	$86
	Pioneer	P10A76X	5	51.4	48.8	2.7	80%	12.2	0.5	$643	$33
	Pioneer	P10T29E	24	57.0	50.4	6.5	100%	10.0	0.4	$712	$81
	Pioneer	P10T57E	24	57.0	53.0	3.9	71%	10.0	0.1	$712	$49
	Pioneer	P11T55E	24	57.0	54.2	2.7	75%	10.0	0.2	$712	$34
	Pioneer	P12T94E	24	57.0	54.5	2.5	67%	10.0	0.1	$712	$31
	Pioneer	P13T61E	24	57.0	55.3	1.6	63%	10.0	0.4	$712	$20
	Pioneer	P13T47E	24	57.0	54.7	2.2	67%	10.0	0.0	$712	$28
	Pioneer	P14T81E	24	57.0	55.7	1.3	63%	10.0	0.0	$712	$16
P12T94E	Asgrow	AG12XF1	5	49.2	49.5	-0.3	60%	12.3	-0.3	$615	($4)
	Asgrow	AG13XF0	8	52.3	52.3	0.0	50%	11.5	-0.1	$654	$0
	Asgrow	AG15XF1	10	53.7	52.8	0.8	50%	11.7	0.0	$671	$10
	Pioneer	P09T24E	60	54.6	52.8	1.8	67%	11.1	-0.4	$682	$23
	Pioneer	P09T93E	12	55.2	54.4	0.9	42%	9.3	0.0	$691	$11
	Pioneer	P09T68E	76	57.0	53.1	3.9	75%	11.0	-0.1	$713	$49
	Pioneer	P10A76X	9	52.2	50.7	1.5	56%	11.7	0.0	$652	$18
	Pioneer	P10T29E	38	55.7	51.3	4.4	82%	10.5	0.0	$696	$55
	Pioneer	P10T57E	112	56.3	54.1	2.2	69%	11.2	-0.3	$703	$27
	Pioneer	P11T55E	95	55.7	54.6	1.1	60%	11.1	-0.3	$696	$14
	Pioneer	P11T36E	24	54.5	57.0	-2.5	33%	10.0	-0.1	$681	($31)
	Pioneer	P13T61E	60	56.0	56.6	-0.6	43%	10.6	0.1	$700	($8)
	Pioneer	P13T47E	108	56.0	57.2	-1.2	39%	11.1	-0.3	$700	($15)
	Pioneer	P16T75L	17	57.9	53.7	4.2	76%	10.6	-0.1	$724	$52
	Pioneer	P14A23L	16	60.8	61.3	-0.4	44%	10.6	0.1	$761	($5)
	Pioneer	P14T81E	104	56.5	58.4	-2.0	32%	10.9	-0.2	$706	($24)
	Pioneer	P15A63X	7	48.9	50.8	-1.8	29%	11.5	-0.2	$612	($23)
	Pioneer	P16T58E	85	57.8	60.6	-2.8	29%	10.6	0.3	$723	($35)
	Pioneer	P16T05E	71	58.4	60.5	-2.1	35%	10.8	0.2	$730	($27)
	Pioneer	P17A21L	15	65.4	63.9	1.5	47%	10.9	0.3	$817	$19
	Stine	12EB32	11	47.6	46.9	0.6	45%	12.9	-0.8	$595	$8

Pioneer® Variety/ Brand	Comp Brand	Comp Variety/ Brand	#Cmp	Prim Yield (bu/a 60#)	Comp Yield (bu/a 60#)	Yld Adv (bu/a 60#)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim AGI	AGI Adv
P13T47E	Asgrow	AG12XF1	5	48.2	49.5	-1.3	40%	12.3	-0.3	$603	($16)
	Asgrow	AG13XF0	10	56.3	55.5	0.9	50%	11.5	-0.2	$704	$11
	Asgrow	AG15XF1	14	59.7	57.0	2.7	57%	11.8	0.1	$747	$34
	Pioneer	P08T79E	12	55.0	53.1	1.9	58%	9.3	0.0	$687	$23
	Pioneer	P09A62X	7	56.0	52.1	3.9	71%	10.0	-0.3	$700	$49
	Pioneer	P09T24E	58	54.9	52.5	2.4	72%	10.7	0.0	$686	$30
	Pioneer	P09T93E	12	55.0	54.4	0.6	58%	9.3	0.1	$687	$8
	Pioneer	P09T68E	72	57.6	53.2	4.4	83%	10.7	0.1	$720	$55
	Pioneer	P10A76X	9	52.4	50.7	1.7	56%	11.5	0.1	$655	$21
	Pioneer	P10T29E	39	56.4	51.6	4.7	82%	10.5	0.1	$705	$59
	Pioneer	P10T57E	108	57.1	54.0	3.1	74%	10.8	0.0	$714	$39
	Pioneer	P11T55E	95	56.2	54.6	1.6	67%	10.8	0.0	$703	$21
	Pioneer	P11T36E	24	54.7	57.0	-2.2	33%	10.0	0.0	$684	($28)
	Pioneer	P12T94E	108	57.2	56.0	1.2	60%	10.8	0.3	$714	$15
	Pioneer	P13T61E	66	56.6	56.4	0.2	53%	10.7	0.2	$708	$3
	Pioneer	P16T75L	19	58.9	55.4	3.5	68%	10.9	0.0	$736	$44
	Pioneer	P14A23L	22	61.4	64.1	-2.6	55%	11.2	0.3	$768	($33)
	Pioneer	P14T81E	198	61.2	62.4	-1.1	30%	11.3	0.0	$765	($14)
	Pioneer	P15A63X	7	48.9	50.8	-1.9	14%	11.5	-0.1	$611	($23)
	Pioneer	P16T58E	180	62.4	63.9	-1.6	41%	11.2	0.2	$780	($20)
	Pioneer	P16T05E	169	62.9	64.5	-1.6	33%	11.4	0.1	$786	($20)
	Pioneer	P17A21L	22	64.6	66.1	-1.4	45%	11.4	0.3	$808	($18)
	Stine	12EB32	12	49.2	46.9	2.2	83%	11.8	0.4	$615	$28
	Stine	14EC23	5	60.6	62.1	-1.5	40%	10.8	0.0	$757	($19)
	Stine	16EC32	10	62.1	63.6	-1.5	50%	11.0	-0.2	$776	($18)

Pioneer® Variety/ Brand	Comp Brand	Comp Variety/ Brand	#Cmp	Prim Yield (bu/a 60#)	Comp Yield (bu/a 60#)	Yld Adv (bu/a 60#)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim AGI	AGI Adv
P13T61E	Asgrow	AG12XF1	5	50.9	49.5	1.4	80%	12.4	-0.4	$636	$17
	Asgrow	AG13XF0	5	50.9	48.8	2.1	80%	12.4	-0.1	$636	$26
	Pioneer	P09T24E	40	55.7	53.5	2.1	73%	10.4	-0.2	$696	$26
	Pioneer	P09T93E	12	54.8	54.4	0.4	50%	9.7	-0.3	$685	$5
	Pioneer	P09T68E	44	56.6	52.6	3.9	68%	10.4	-0.1	$707	$49
	Pioneer	P10T29E	27	55.5	50.2	5.3	78%	10.7	-0.2	$694	$66
	Pioneer	P10T57E	58	56.6	54.1	2.5	64%	10.6	-0.2	$707	$31
	Pioneer	P11T55E	58	56.4	54.7	1.7	59%	10.4	-0.2	$705	$21
	Pioneer	P11T36E	24	55.3	57.0	-1.6	38%	10.3	-0.4	$692	($20)
	Pioneer	P12T94E	60	56.6	56.0	0.6	55%	10.6	-0.1	$708	$8
	Pioneer	P13T47E	66	56.4	56.6	-0.2	45%	10.8	-0.2	$705	($3)
	Pioneer	P16T75L	13	58.2	57.8	0.4	54%	11.0	-0.1	$728	$5
	Pioneer	P14A23L	13	58.2	60.8	-2.6	31%	11.0	0.4	$728	($32)
	Pioneer	P14T81E	66	56.9	58.1	-1.3	38%	10.7	-0.2	$711	($16)
	Pioneer	P15A63X	7	50.8	50.8	0.0	57%	11.5	-0.1	$635	($0)
	Pioneer	P16T58E	62	57.3	60.0	-2.7	29%	10.7	0.2	$716	($34)
	Pioneer	P16T05E	48	57.8	59.0	-1.2	40%	10.9	0.2	$722	($15)
P14T81E	Asgrow	AG12XF1	5	49.2	49.5	-0.3	80%	12.0	0.0	$615	($4)
	Asgrow	AG13XF0	10	57.2	55.5	1.7	70%	11.3	0.0	$715	$21
	Asgrow	AG15XF1	15	58.7	57.8	1.0	40%	11.7	0.2	$734	$12
	Pioneer	P11T55E	90	57.5	54.9	2.6	70%	10.6	0.1	$719	$33
	Pioneer	P11T36E	24	55.7	57.0	-1.3	38%	10.0	0.0	$696	($16)
	Pioneer	P12T94E	104	58.4	56.5	2.0	68%	10.7	0.2	$730	$24
	Pioneer	P13T61E	66	58.1	56.9	1.3	62%	10.5	0.2	$726	$16
	Pioneer	P13T47E	198	62.4	61.2	1.1	68%	11.3	0.0	$780	$14
	Pioneer	P16T75L	19	56.6	55.5	1.2	63%	11.0	0.0	$708	$14
	Pioneer	P14A23L	22	61.0	63.4	-2.3	36%	11.2	0.3	$763	($29)
	Pioneer	P15A63X	7	50.6	50.8	-0.2	43%	11.3	0.0	$633	($2)
	Pioneer	P16T58E	179	63.5	63.8	-0.3	45%	11.2	0.2	$793	($4)
	Pioneer	P16T05E	168	64.0	64.4	-0.4	44%	11.4	0.2	$800	($6)
	Pioneer	P17A21L	23	65.9	65.6	0.3	52%	11.4	0.3	$824	$4
	Stine	12EB32	12	50.3	46.9	3.4	92%	11.9	0.4	$629	$42
	Stine	14EC23	5	61.8	62.1	-0.3	40%	10.8	0.0	$772	($4)
	Stine	16EC32	11	64.3	62.8	1.5	64%	11.1	-0.1	$804	$19

Pioneer® Variety/ Brand	Comp Brand	Comp Variety/ Brand	#Cmp	Prim Yield (bu/a 60#)	Comp Yield (bu/a 60#)	Yld Adv (bu/a 60#)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim AGI	AGI Adv
P16T05E	Asgrow	AG13XF0	9	58.1	55.8	2.2	78%	12.2	-0.4	$726	$28
	Asgrow	AG15XF1	16	60.1	58.0	2.1	63%	12.4	0.0	$751	$27
	Asgrow	AG18XF1	7	53.7	57.2	-3.5	29%	13.3	-0.1	$671	($44)
	Asgrow	AG20XF1	11	67.8	68.3	-0.5	55%	12.7	0.6	$847	($6)
	Asgrow	AG21XF0	14	64.9	66.9	-2.0	21%	12.5	0.3	$811	($25)
	Pioneer	P11T55E	61	58.9	57.2	1.7	64%	11.0	-0.3	$737	$21
	Pioneer	P11T36E	12	56.8	58.1	-1.3	42%	10.6	0.0	$710	($16)
	Pioneer	P12T94E	71	60.5	58.4	2.1	65%	11.1	-0.2	$757	$27
	Pioneer	P13T61E	48	59.0	57.8	1.2	60%	11.1	-0.2	$737	$15
	Pioneer	P13T47E	169	64.5	62.9	1.6	66%	11.5	-0.1	$806	$20
	Pioneer	P16T75L	17	58.7	55.9	2.8	71%	12.1	-1.1	$733	$35
	Pioneer	P14A23L	20	63.2	63.7	-0.5	45%	11.8	-0.3	$790	($6)
	Pioneer	P14T81E	168	64.4	64.0	0.4	54%	11.6	-0.2	$805	$6
	Pioneer	P15A63X	5	49.0	47.3	1.7	60%	12.6	-0.1	$612	$22
	Pioneer	P16T58E	208	64.1	64.0	0.1	50%	11.7	0.1	$801	$1
	Pioneer	P17A21L	23	67.1	65.6	1.4	57%	12.0	-0.2	$838	$18
	Pioneer	P18T91E	183	65.0	64.9	0.1	52%	11.6	-0.1	$812	$1
	Pioneer	P18A73E	47	61.2	63.4	-2.1	28%	12.0	-0.1	$766	($26)
	Pioneer	P20T64E	169	65.8	66.5	-0.8	42%	11.7	0.2	$822	($9)
	Stine	14EC23	5	65.0	62.1	2.9	80%	10.8	0.0	$813	$36
	Stine	16EC32	11	64.5	62.8	1.7	45%	11.2	-0.1	$806	$22
	Stine	19EA33	6	69.0	63.9	5.1	100%	12.5	0.4	$862	$64
	Stine	19EC22	9	66.5	66.7	-0.2	44%	12.1	0.2	$831	($3)
	Stine	20EB23	9	72.9	70.9	2.0	56%	11.8	0.8	$911	$25

Pioneer® Variety/ Brand	Comp Brand	Comp Variety/ Brand	#Cmp	Prim Yield (bu/a 60#)	Comp Yield (bu/a 60#)	Yld Adv (bu/a 60#)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim AGI	AGI Adv
P16T58E	Asgrow	AG12XF1	5	54.2	49.5	4.7	100%	12.4	-0.4	$678	$59
	Asgrow	AG13XF0	9	58.1	53.9	4.2	89%	11.4	-0.3	$726	$52
	Asgrow	AG15XF1	17	60.2	57.0	3.2	59%	12.2	0.0	$752	$40
	Asgrow	AG18XF1	7	56.1	57.2	-1.2	43%	13.5	-0.3	$701	($15)
	Asgrow	AG20XF1	10	70.4	71.0	-0.6	20%	12.3	0.9	$880	($8)
	Asgrow	AG21XF0	13	68.3	68.4	-0.1	46%	12.1	0.5	$853	($2)
	Pioneer	P11T55E	76	59.7	56.4	3.3	71%	11.0	-0.4	$746	$41
	Pioneer	P11T36E	24	59.0	57.0	2.1	75%	10.3	-0.4	$738	$26
	Pioneer	P12T94E	85	60.6	57.8	2.8	69%	10.9	-0.3	$757	$35
	Pioneer	P13T61E	62	60.0	57.3	2.7	71%	10.8	-0.2	$751	$34
	Pioneer	P13T47E	180	63.9	62.4	1.6	59%	11.4	-0.2	$799	$20
	Pioneer	P16T75L	18	59.3	56.6	2.6	61%	11.8	-0.9	$741	$33
	Pioneer	P14A23L	23	63.5	64.5	-1.0	52%	11.6	-0.1	$794	($13)
	Pioneer	P14T81E	179	63.8	63.5	0.3	55%	11.4	-0.2	$797	$4
	Pioneer	P15A63X	6	53.0	48.1	4.8	83%	12.2	-0.5	$662	$61
	Pioneer	P16T05E	208	64.0	64.1	-0.1	50%	11.7	-0.1	$800	($1)
	Pioneer	P17A21L	25	65.1	65.9	-0.7	40%	11.8	-0.1	$814	($9)
	Pioneer	P18T91E	185	65.0	65.1	-0.1	54%	11.7	-0.3	$813	($2)
	Pioneer	P18A73E	47	62.5	63.4	-0.8	47%	12.3	-0.4	$782	($10)
	Pioneer	P20T64E	171	65.8	66.9	-1.1	39%	11.8	0.1	$822	($14)
	Pioneer	P19A66E	47	62.5	64.5	-2.0	32%	12.3	-0.3	$782	($24)
	Stine	14EC23	5	65.6	62.1	3.5	80%	10.9	-0.1	$820	$44
	Stine	16EC32	10	63.8	61.8	2.0	50%	11.2	-0.4	$798	$25
	Stine	19EA33	6	67.0	63.9	3.1	83%	12.6	0.3	$837	$39
	Stine	19EC22	7	67.7	70.3	-2.6	14%	11.9	0.0	$846	($32)
	Stine	20EB23	9	71.2	70.9	0.3	56%	12.0	0.6	$890	$4

Pioneer® Variety/ Brand	Comp Brand	Comp Variety/ Brand	#Cmp	Prim Yield (bu/a 60#)	Comp Yield (bu/a 60#)	Yld Adv (bu/a 60#)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim AGI	AGI Adv
P17A87E New Limited Supply	Asgrow	AG15XF1	6	54.3	49.3	4.9	83%	13.4	0.5	$678	$61
	Asgrow	AG18XF1	6	54.3	55.1	-0.9	50%	13.4	0.1	$678	($11)
	Pioneer	P14T81E	12	59.4	55.6	3.8	83%	10.7	-0.1	$742	$47
	Pioneer	P16T58E	47	62.6	62.5	0.1	47%	12.0	0.3	$782	$1
	Pioneer	P16T05E	47	62.6	61.2	1.4	70%	12.0	0.0	$782	$17
	Pioneer	P18A98X	6	54.3	54.2	0.1	50%	13.4	0.2	$678	$1
	Pioneer	P18A33X	6	54.3	55.3	-1.0	50%	13.4	-0.1	$678	($12)
	Pioneer	P18T91E	47	62.6	60.7	1.9	72%	12.0	-0.2	$782	$23
	Pioneer	P18A73E	47	62.6	63.4	-0.8	53%	12.0	-0.1	$782	($10)
	Pioneer	P20T64E	47	62.6	63.6	-1.0	38%	12.0	0.2	$782	($12)
	Pioneer	P19A66E	47	62.6	64.5	-1.9	34%	12.0	0.0	$782	($24)
	Pioneer	P21T72E	35	63.7	64.0	-0.3	46%	12.4	-0.1	$796	($3)
	Pioneer	P21A53E	35	63.7	65.8	-2.1	20%	12.4	0.1	$796	($27)
	Pioneer	P20T95E	46	62.4	62.6	-0.2	46%	12.0	0.5	$780	($3)
P18A73E New Limited Supply	Asgrow	AG15XF1	6	54.0	49.3	4.6	83%	13.5	0.5	$674	$58
	Asgrow	AG18XF1	6	54.0	55.1	-1.2	50%	13.5	0.0	$674	($14)
	Pioneer	P14T81E	12	61.0	55.6	5.4	92%	10.8	-0.3	$763	$68
	Pioneer	P16T58E	47	63.4	62.5	0.8	53%	11.9	0.4	$792	$10
	Pioneer	P16T05E	47	63.4	61.2	2.1	72%	11.9	0.1	$792	$26
	Pioneer	P18A98X	6	54.0	54.2	-0.2	33%	13.5	0.1	$674	($2)
	Pioneer	P18A33X	6	54.0	55.3	-1.3	33%	13.5	-0.1	$674	($16)
	Pioneer	P18T91E	47	63.4	60.7	2.6	77%	11.9	-0.1	$792	$33
	Pioneer	P20T64E	47	63.4	63.6	-0.2	47%	11.9	0.3	$792	($2)
	Pioneer	P19A66E	47	63.4	64.5	-1.1	32%	11.9	0.1	$792	($14)
	Pioneer	P21T72E	35	64.2	64.0	0.2	51%	12.3	0.1	$802	$3
	Pioneer	P21A53E	35	64.2	65.8	-1.7	29%	12.3	0.3	$802	($21)

Pioneer® Variety/ Brand	Comp Brand	Comp Variety/ Brand	#Cmp	Prim Yield (bu/a 60#)	Comp Yield (bu/a 60#)	Yld Adv (bu/a 60#)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim AGI	AGI Adv
P18T91E	Asgrow	AG15XF1	16	60.9	58.0	2.9	63%	12.0	0.4	$761	$37
	Asgrow	AG18XF1	7	53.6	57.2	-3.6	29%	12.8	0.3	$670	($45)
	Asgrow	AG20XF1	13	68.9	68.7	0.2	54%	12.3	0.7	$861	$3
	Asgrow	AG21XF0	16	65.7	66.8	-1.1	31%	11.9	0.6	$821	($14)
	Pioneer	P13T61E	34	57.7	57.4	0.3	50%	10.9	0.3	$722	$4
	Pioneer	P13T47E	141	65.8	63.5	2.3	68%	11.3	0.2	$822	$28
	Pioneer	P16T75L	7	60.7	58.4	2.3	86%	11.7	-0.4	$759	$29
	Pioneer	P14A23L	13	65.5	66.1	-0.6	54%	11.5	0.3	$819	($8)
	Pioneer	P14T81E	143	65.6	65.0	0.6	53%	11.3	0.2	$820	$8
	Pioneer	P16T58E	185	65.1	65.0	0.1	45%	11.4	0.3	$814	$2
	Pioneer	P16T05E	183	64.9	65.0	-0.1	48%	11.5	0.1	$811	($1)
	Pioneer	P17A21L	18	68.4	69.6	-1.2	44%	11.9	0.0	$855	($14)
	Pioneer	P18A98X	11	58.7	61.7	-3.0	45%	12.3	0.4	$734	($37)
	Pioneer	P18A33X	11	56.3	60.1	-3.9	27%	12.1	0.3	$703	($48)
	Pioneer	P18A73E	47	60.7	63.4	-2.6	23%	11.8	0.1	$759	($33)
	Pioneer	P20T64E	178	65.7	66.7	-1.0	39%	11.5	0.4	$821	($13)
	Pioneer	P19A66E	47	60.7	64.5	-3.7	21%	11.8	0.2	$759	($47)
	Pioneer	P21A81L	26	67.9	70.7	-2.8	35%	11.7	0.4	$849	($35)
	Pioneer	P21T72E	162	66.4	67.1	-0.7	43%	11.6	0.3	$830	($8)
	Pioneer	P21A53E	35	62.4	65.8	-3.4	6%	12.3	0.3	$780	($43)
	Stine	14EC23	5	66.9	62.1	4.8	80%	10.8	0.0	$837	$60
	Stine	17EB02	5	73.7	74.6	-0.9	20%	12.3	0.7	$921	($11)
	Stine	16EC32	11	66.1	62.8	3.3	73%	11.0	0.0	$826	$41
	Stine	19EA33	7	67.0	63.8	3.2	57%	12.0	0.5	$838	$40
	Stine	19EC22	9	66.7	66.7	0.0	33%	12.0	0.2	$833	($1)
	Stine	20EB23	9	71.7	70.9	0.8	44%	11.8	0.7	$896	$10

Pioneer® Variety/ Brand	Comp Brand	Comp Variety/ Brand	#Cmp	Prim Yield (bu/a 60#)	Comp Yield (bu/a 60#)	Yld Adv (bu/a 60#)	Yld %Wins	Prim Mst (%)	Mst Adv	Prim AGI	AGI Adv
P19A66E New Limited Supply	Asgrow	AG15XF1	6	54.3	49.3	4.9	83%	13.5	0.4	$678	$61
	Asgrow	AG18XF1	6	54.3	55.1	-0.9	33%	13.5	-0.1	$678	($11)
	Pioneer	P14T81E	12	62.2	55.6	6.6	100%	10.8	-0.3	$778	$83
	Pioneer	P16T58E	47	64.5	62.5	2.0	68%	11.9	0.3	$806	$24
	Pioneer	P16T05E	47	64.5	61.2	3.2	79%	11.9	0.1	$806	$40
	Pioneer	P18A98X	6	54.3	54.2	0.1	50%	13.5	0.0	$678	$1
	Pioneer	P18A33X	6	54.3	55.3	-1.0	33%	13.5	-0.2	$678	($12)
	Pioneer	P18T91E	47	64.5	60.7	3.7	79%	11.9	-0.2	$806	$47
	Pioneer	P18A73E	47	64.5	63.4	1.1	68%	11.9	-0.1	$806	$14
	Pioneer	P20T64E	47	64.5	63.6	0.9	57%	11.9	0.3	$806	$12
	Pioneer	P21T72E	35	65.2	64.0	1.3	60%	12.3	0.0	$816	$16
	Pioneer	P21A53E	35	65.2	65.8	-0.6	51%	12.3	0.2	$816	($7)
	Pioneer	P23T49E	35	65.2	61.9	3.4	80%	12.3	0.6	$816	$42
	Pioneer	P23A40E	35	65.2	64.7	0.6	60%	12.3	0.2	$816	$7
	Pioneer	P24T35E	35	65.2	64.5	0.8	69%	12.3	0.4	$816	$10
P21A53E New Limited Supply	Pioneer	P16T58E	35	65.8	63.3	2.5	71%	12.5	0.2	$823	$31
	Pioneer	P16T05E	35	65.8	62.8	3.1	80%	12.5	-0.1	$823	$38
	Pioneer	P18T91E	35	65.8	62.4	3.4	94%	12.5	-0.3	$823	$43
	Pioneer	P18A73E	35	65.8	64.2	1.7	71%	12.5	-0.3	$823	$21
	Pioneer	P20T64E	45	61.5	60.5	1.0	62%	12.3	0.2	$769	$12
	Pioneer	P19A66E	35	65.8	65.2	0.6	49%	12.5	-0.2	$823	$7
	Pioneer	P21T72E	45	61.5	60.1	1.4	69%	12.3	0.0	$769	$18
	Pioneer	P23T49E	45	61.5	59.4	2.2	67%	12.3	0.5	$769	$27
	Pioneer	P23A40E	45	61.5	61.9	-0.3	60%	12.3	0.1	$769	($4)
	Pioneer	P24T76E	39	60.6	59.3	1.3	67%	12.1	0.0	$757	$16
	Pioneer	P24T35E	45	61.5	61.2	0.4	64%	12.3	0.3	$769	$4

RED RIVER MARKETING

PLOT NAME	LOCATION	IRRIGATION	TILLAGE
Brutlag Farms	W of Wendell, MN	Non-Irrigated	Conventional
PLANTING DATE	**HARVEST DATE**	**PREVIOUS CROP**	**ROW WIDTH**
05-10-21	9-27-21	Corn	22”

Entry #	Brand	Hybrid/Brand	RM	Yield (bu/a 56#)	Mst (%)	Tst Wt (lb/bu)	AGI	Yield Rank
1	Pioneer	P06T32E	0.6	49.3	11.4	57.1	$493	11
2	Pioneer	P06T56E	0.6	44.3	11.2	58.7	$444	12
3	Pioneer	P09T68E	0.9	51.8	11.5	58.6	$518	10
4	Pioneer	P10T57E	1.0	56.4	10.9	59.3	$564	7
5	Pioneer	P11T55E	1.1	57.0	10.4	60.5	$570	6
6	Pioneer	P12T94E	1.2	59.2	11.2	58.7	$592	5
7	Pioneer	P13T47E	1.3	56.3	12.3	59.7	$563	8
8	Pioneer	P14T81E	1.4	61.3	10.9	59.7	$613	2
9	Pioneer	P16T05E	1.6	66.2	13.4	55.7	$662	1
10	Pioneer	P16T58E	1.6	59.9	17.8	53.1	$599	3
11	Pioneer	P16T75L	1.4	59.4	12.4	58.7	$594	4
12	Pioneer	P11T55E	1.1	54.5	10.8	58.7	$545	9

PLOT NAME	LOCATION	IRRIGATION	TILLAGE
Mark Ehlers	N of Elbow Lake, MN	Non-Irrigated	Conventional
PLANTING DATE	**HARVEST DATE**	**PREVIOUS CROP**	**ROW WIDTH**
05-06-21	9-25-21	Corn	22”

Entry #	Brand	Hybrid/Brand	RM	Yield (bu/a 56#)	Mst (%)	Tst Wt (lb/bu)	AGI	Yield Rank
1	Pioneer	P06T32E	106	56.3	9.7	58.9	$563	11
2	Pioneer	P09T24E	109	58.6	9.3	59.7	$586	8
3	Pioneer	P09T68E	109	59.1	9.0	58.9	$591	7
4	Pioneer	P10T57E	110	60.2	9.3	58.9	$602	4
5	Pioneer	P11T55E	111	61.4	9.0	60.3	$614	3
6	Pioneer	P12T94E	112	59.9	9.0	58.9	$599	5
7	Pioneer	P13T47E	113	64.3	9.1	60.0	$643	1
8	Pioneer	P13T61E	113	59.7	9.0	60.0	$597	6
9	Pioneer	P14T81E	114	58.1	9.6	59.9	$581	10
10	Pioneer	P16T05E	116	58.2	10.3	60.5	$582	9
11	Pioneer	P16T58E	116	62.4	9.2	57.6	$624	2

PLOT NAME	LOCATION	IRRIGATION	TILLAGE
Robert Ehlers	S of Elbow Lake, MN	Non-Irrigated	Conventional
PLANTING DATE	**HARVEST DATE**	**PREVIOUS CROP**	**ROW WIDTH**
5-06-21	9-28-21	Corn	22”

Entry #	Brand	Hybrid/Brand	RM	Yield (bu/a 56#)	Mst (%)	Tst Wt (lb/bu)	AGI	Yield Rank
1	Pioneer	P09T68E	0.9	60.9	9.5	59.5	$761	4
2	Pioneer	P10T57E	1.0	55.8	8.9	60.6	$697	8
3	Pioneer	P11T55E	1.1	53.9	9.5	58.6	$673	9
4	Pioneer	P12T94E	1.2	51.8	9.6	58.7	$648	10
5	Pioneer	P13T47E	1.3	60.7	9.8	59.5	$759	6
6	Pioneer	P14T81E	1.4	58.1	10.0	58.0	$726	7
7	Pioneer	P16T58E	1.6	61.2	10.6	57.8	$765	3
8	Pioneer	P16T05E	1.6	63.6	10.2	52.6	$795	1
9	Pioneer	P18T91E	1.8	60.8	11.3	57.6	$760	5
10	Pioneer	P16T75L	1.4	63.1	10.0	58.7	$789	2

PLOT NAME	LOCATION	IRRIGATION	TILLAGE
Devin Nelson	NE of Elbow Lake, MN	Non-Irrigated	Conventional
PLANTING DATE	**HARVEST DATE**	**PREVIOUS CROP**	**ROW WIDTH**
05-19-21	10-6-21	Corn	22”

Entry #	Brand	Hybrid/Brand	RM	Yield (bu/a 60#)	Mst (%)	Tst Wt (lb/bu)	AGI	Yield Rank
1	Pioneer	P16T58E	1.6	50.6	12.7	58.6	$632.50	14
2	Pioneer	P16T05E	1.6	54.7	12.8	57.8	$683.75	10
3	Pioneer	P14T81E	1.4	56.9	12.6	59.3	$711.25	**5**
4	Dyna-Gro	S14EN22	1.4	53.9	12.8	58.6	$673.75	12
5	Credenz	1372E	1.3	56.3	12.8	56.8	$703.75	6
6	Becks	1420E3	1.4	57.9	13.1	57.1	$723.75	**4**
7	Pioneer	P13T47E	1.3	67	12.9	58.9	$837.50	**1**
8	Pioneer	P12T94E	1.2	59.7	12.9	58.3	$746.25	**3**
9	Dyna-Gro	S11EN40	1.1	54.6	13.2	56.9	$682.50	11
10	Pioneer	P11T55E	1.1	60.7	13.1	57.8	$758.75	**2**
11	Pioneer	P10T57E	1.0	56.1	13.1	59.3	$701.25	7
12	Pioneer	P09T68E	0.9	55.2	13.6	59.5	$690	9
13	Dyna-Gro	S09EN41	0.9	56	13.5	58	$700	8
14	Credenz	0731E	0.7	50.9	13.7	56.4	$636.25	13
15	Peterson	2106E	0.6	45.1	14.2	55.6	$563.75	16
16	Pioneer	P06T32E	0.6	46.6	13.7	54.8	$582.50	15

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FEATURE

Fluffy soil syndrome: When tilled soil does not settle

Aaron Lee M. Daigh and Jodi DeJong-Hughes

Soil tillage is one of the most common management practices in any crop production system across the world. Over the centuries, tillage tools have evolved from simple tools for preparing a soft, weed-free area for easy planting to sophisticated implements for managing high levels of crop residues, facilitating the warming of frigid soils, and incorporating some forms of fertilizers. On one hand, a producer who tills can increase their potential for a high yielding crop during the upcoming growing season. On the other hand, tillage can innately induce some well-known challenges (Triplett and Dick 2008):

1. Risk of increasing wind and water erosion
2. Accelerating the oxidation of soil organic matter
3. Limiting the formation of stable soil aggregates
4. Risk of compacting the subsoil just below the depth of tillage

Many more advantages and disadvantages associated with soil tillage exist, but this list includes some of the more commonly discussed issues among agronomists in the US upper Midwest and northern Great Plains regions. However, agronomists rarely, if ever, consider the risk for tillage to create inadequate particle-to-particle contact, and therefore, poor seed-to-soil (or root-to-soil) contact.

Since the winter that bridged 2014 and 2015, much of the US upper Midwest and northern Great Plains regions have experienced relatively dry winters with little snow cover and few precipitation events occurring between fall primary tillage and spring planting of crops. These dry winters and springs limit the amount of soil settling that would typically occur in the tilled depth of soil. Producers and extension specialists have begun to notice unique patterns of poor crop stands in some fields where healthy plants tend to grow only in the compacted tractor-tire pathways and along the edges of low-lying depressions where plants did not drown (figure 1). This syndrome, which we have come to refer as fluffy soil syndrome (FSS) at extension field days with crop producers, occurs when tilled soil does not settle over the winter and spring months, resulting in crops suffering from inadequate soil particle-to-particle contact.

Figure 1

Tilled fields in western Minnesota with (a and b) visual symptoms of poor particle-to-particle contact effects on crop performance (fluffy soil syndrome [FSS]). These aerial photographs were taken in July of 2015 and show healthy plant growth within compacted tire pathways and poor plant growth between tire pathways. The areas along the low-lying depressions likely provided wetting and drying cycles that alleviated some of the FSS. The effect of FSS on crop performance can be difficult for producers to see in their fields from the roads, but is unmistakable from aerial images.

(a)

(b)

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Red River Marketing Co Drone Photos from 2021 Growing Season 'Fluffy Soil' Examples

FLUFFY SOIL SYNDROME

Causes of Fluffy Soil Syndrome: Coupling of Management Practices and Soil Physical Processes. Fluffy soil syndrome is the direct result of soil tillage followed by the absence, or lack, of wetting/drying or freezing/thawing cycles. Tillage practices used to alleviate subsoil compaction (i.e., in-line subsoiling without crop residue incorporation) or to size crop residues into small pieces (i.e., shallow vertical tillage) will not contribute to FSS. Only tillage practices that aggressively loosen the soil, within the depths where seeds are subsequently placed and where seedling root systems first develop, are expected to lead to FSS. Such tillage practices may include implements that incorporate 70% or more of crop residues (e.g., moldboard plows, chisel plows, disc harrows, and cultivators) into the soil by either inverting or rigorously tilling the soil.

In these types of tillage systems, the implement's shanks, shovels, spikes, disks or coulters induce shear stresses on the soil. This causes the soil to deform, rupture, and fracture as the soil strains and the stresses exceed the soil's strength. Once soil particles and small aggregates initially dislodge and "fluff," they will undergo some degree of immediate settling due to gravity and the weight of other tilled particles falling on top of other particles (Horton et al. 2016). After this immediate phase of post-tillage settling due to gravity, soil properties will have been significantly altered from their pre-tilled state and will persist until wetting/drying or freezing/thawing cycles cause soil particles to settle further. Significant changes in physical properties include the following:

1. Decreased soil bulk density (thus, an increase in total soil porosity)
2. Rearrangement of soil pore networks, architecture, and tortuosity
3. Reduced number of contact points among mineral and aggregate surfaces
4. Increased distance between these contact points
5. Decreased hydraulic conductivities at low soil water contents
6. Increased transfer of soil gasses
7. Increased occurrence of evaporation within the subsurface
8. Decreased conduction and convection of soil heat

However, soil tillage only creates the initial conditions required for FSS by altering the soil's physical properties. A tilled soil would need to maintain its "loosened" properties throughout the months/weeks before and after planting for FSS to occur. During normal winter and spring months in the US upper Midwest and northern Great Plains regions, soils experience repeated wetting/drying and freezing/thawing cycles between the first fall primary tillage and spring planting of a crop (figure 2).

Soil drying and freezing are similar processes in some regards. Ice nucleation and formation during freezing occurs first in large pores, effectively dropping the soil water potential energy and creating a hydraulic gradient in the direction of the ice formation. This flow of liquid water toward the ice desiccates neighboring smaller pores, causing shrinkage on the bulk soil (Hamilton 1966; Dagesse 2016). However, if the freezing soil contains more than 85% water-filled pore space, the expanding ice will cause the bulk soil to also expand (Hamilton 1966). During the freezing or drying processes, small soil particles within the water will accumulate near the contact points between larger particles or soil aggregates. This accumulation of particles with charged surfaces at the contact points can irreversibly cement the contact points together and stabilize these points as water films progressively thin (Horton et al. 2016). Subsequent thawing is therefore also similar in many regards to soil wetting. As the ice melts, the soil water potential energy increases and the hydraulic gradient reverses, causing the desiccated neighboring pores to then expand in shrink-swell soils. This cycling of freezing/thawing and shrinking/swelling repeats numerous times even under a snow-covered soil, causing near-continuous changes to soil aggregation and strength and thus supplying the forces needed for soil settling (figure 2; Edwards et al. 2007; Wang et al. 2012).

If the tilled, or "fluffed," soil does not settle, but persists into and beyond spring planting, properties of the loosened soil will limit flows and supply rates of liquid water and dissolved nutrients to the seed/seedling while also maximizing water vapor transport to the atmosphere and potential for desiccation. Some research reports indicate seeds obtain most of their water via the transfer of water vapor and not liquid water flows (Wuest 2002, 2007). However, soils vulnerable to FSS have very high porosities in the tilled zone making them more prone to diffusive, convective, and dispersive gas transport to the atmosphere (Parlange et al. 1998; Grifoll et al. 2005). In order for water vapors to meet seed/seedling root water demands, an adequate supply of evaporating liquid water from either the tilled mineral surfaces or from underlying non-tilled soil horizons must be available to replace vapor losses to the atmosphere at the time the seed is planted (Bouaziz and Bruckler 1989). Otherwise, desiccation will occur. This may be particularly challenging in a low density, tilled soil that is rapidly accumulating heat (Nassar and Horton 1997). Additionally, the seed may not be able to imbibe the water vapor at a high enough rate due to the seed's physiology even if adequate supply rates of water vapor to the seed exist (Jordan 1983). The seed/seedling may also become prone to disease since a partially wet (slow water imbibition), slowly germinating seed in a soil experiencing rapid accumulation of heat presents an environment for plant pathogens to target.

In the end, the effect of low water supply rates on the seed/seedling's ability to maintain hydration, grow, and survive is what governs FSS in producer fields. The absence of FSS in tire pathways and in low laying areas is due to the ability for the compacted, moist soil to supply adequate rates of water flow to the seed/seedling roots. Interestingly, we have also observed healthy plants growing in straight lines where no tire pathway is evident from the soil surface (figure 1). However, these straight lines occur in patterns that match the trafficking of other agricultural equipment prior to soil tillage. In these locations, a compacted subsurface from previous tire traffic is likely supplying liquid water flows from deep in the soil profile up to the tilled depths where water vapor transport may be adequately supplied for good seed germination and subsequent plant growth.

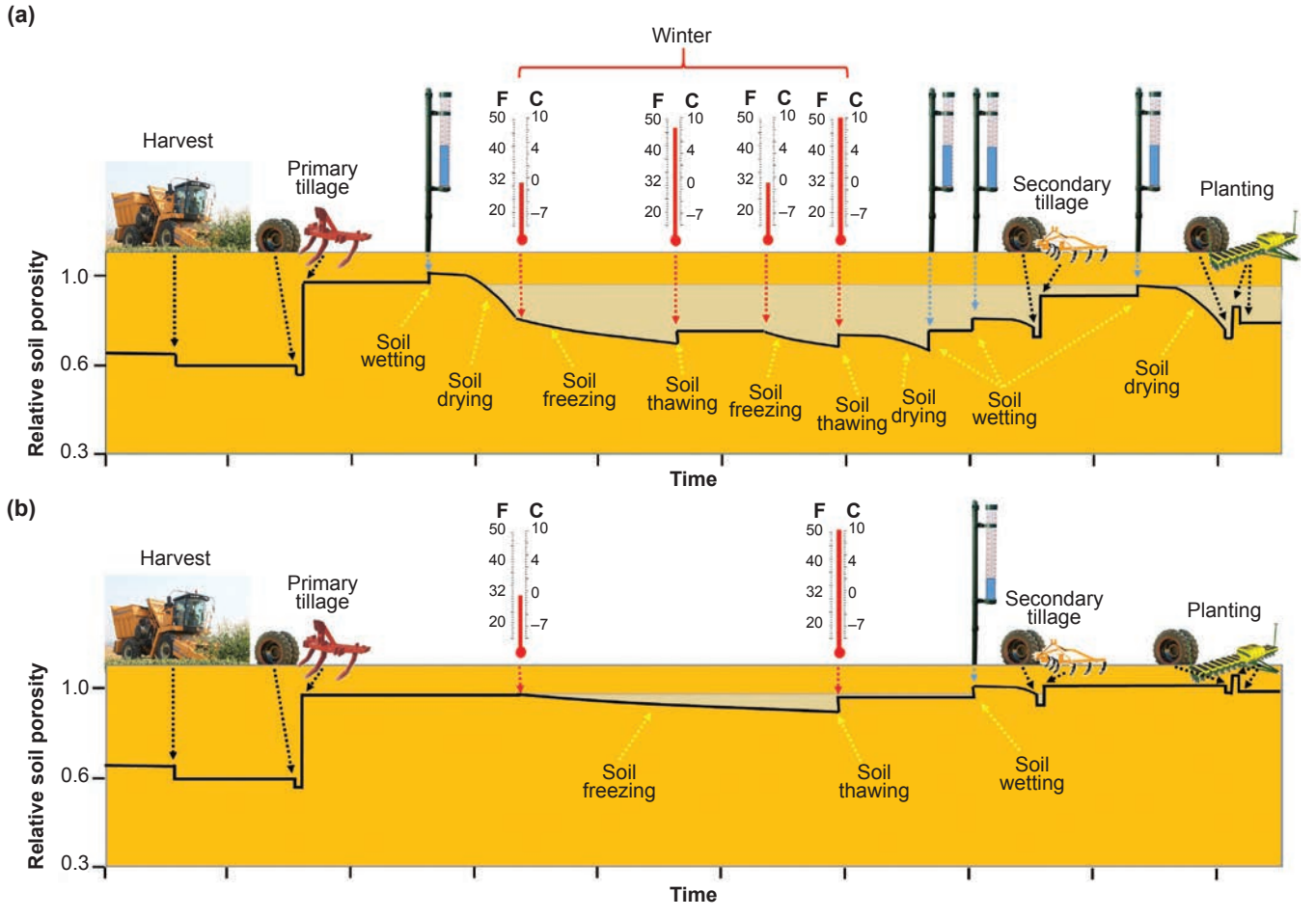
Consequences on Seed Performance and Soil Erosion Potential. The consequence of FSS is oftentimes difficult for producers to see from the roads bordering their fields, but is unmistakable from aerial photos (figure 1). Since nearly all nonirrigated and adequately drained agricultural soils remain only partially saturated throughout the growing season, liquid water flows are restricted to (1) small pores and (2) water films along particle surfaces and their contact points with neighboring particles or aggregates (Daigh et al. 2014a, 2014b; Horton et al. 2016; Schott et al. 2017). Therefore, these contact points control a large portion of the water, nutrient, gas, and heat flows in the soil matrix and to the seed/seedling roots (Carminati et al. 2008). A lack of contact points limits water and nutrient flows to the seed while maximizing gas exchange and thermal insulation, whereas an abundance of contacts limits gas exchange and thermal insulation while maximizing water and nutrient flows to the seed. A soil low in particle-to-particle contacts and under dry conditions will cause cell-water stress and the potential for plant stunting, wilting, and possibly death. Additionally, the low soil strength associated with few contact points coupled with poor crop stands can leave soils exposed and vulnerable to wind erosion extending from the fallow season and well into the growing season (figure 1).

LANDS PROSPECTIVELY VULNERABLE TO FLUFFY SOIL SYNDROME

The occurrence of FSS will vary based on the tillage practice, the depth of water tables and landscape position to supply water into the tilled zones, local climate and weather patterns, and a soil's texture and organic matter contents. However, the ability to predict precisely where and when FSS will occur is likely to be very difficult. The nature of how soil particles undergoing settling processes will in turn change the soil's pore characteristics (diameter, roughness, connectedness, and tortuosity) and have subsequent effects on soil water transport is immensely complex. Scientists' ability to predict such systems is difficult as these processes occur on a small

Figure 2

Hypothetical diagrams of (a) typical soil settling due to repeated wetting/drying and freezing/thawing cycles and (b) absence of significant soil settling during dry winter and spring months (fluffy soil syndrome [FSS]). Diagrams show relative soil porosity over time from harvest of the previous crop to the planting of the next crop. Tan shaded areas denote soil settling (a decrease in relative soil porosity) that occurs after primary tillage in the fall months.



scale that is obscured by the opaque nature of soil. Even if observations of these often hidden, small-scale processes were technologically possible, extensive real time, in situ monitoring would be needed to accurately characterize (or parameterize) the soil settling process and the subsequent effects on water transfer. However, some generalizations can be made based on what we do know about tillage practices and the mechanisms controlling soil deformation and water flows.

The USDA's National Agricultural Statistics Service reported 42, 39, and 31 million ha (105, 96, and 76 million ac) of US croplands with conventional tillage, no-till, and conservation tillage practices, respectively, during 2012 (USDA NASS 2014). Among these categories, most conventional and conservation tillage practices (essentially any tillage practice that aggressively tills or inverts throughout the top 10 to 30 cm [4 to 12 in] of soil) will potentially create the initial conditions necessary for FSS. Implements that provide tillage on the shallower end of this range (e.g., soils worked solely with a field cultivator) may not express FSS, even when post-tillage soil settling is minimal, if the underlying subsoil is adequately moist and not limited in supplying an upwards flux of water to the relatively thin tillage depth. The risk of FSS increases as the depth of tillage increases. This is due to the greater distances that water must flow from a moist subsoil to the seed/seedling. Other practices, such as strip tillage, which aggressively uses shanks or coulters to till in the plant row while leaving the interplant row mechanically untouched, are not likely candidates for FSS. This is because the interplant row stores significantly higher levels of soil water as compared to the tilled plant row (Alghamdi et al. 2016). The stored soil water in the adjacent interplant row may (1) supply adequate amounts of liquid water-film flow and water vapor flows to the seed/seedling and (2) supply enough moisture to the tilled zone to promote wetting/drying processes with subsequent soil settling.

For a tilled soil to obtain the necessary initial conditions for FSS and then for those properties to persist in time, the soil needs a minimum quantity of charged surface area. A soil innately low in the number of charged surfaces and low in physical quality (e.g., low organic matter sands) will immediately settle to a much greater extent than a soil innately high in the number of charge surfaces (e.g., high organic matter vertisols) (Horton et al. 2016). However, this is only true if we assume producers obtain seedbeds with small, crumb-sized soil aggregates void of large clods or smeared surfaces in soils with moderate-to-high levels of charged surfaces. An abundance of large clods may form if a soil with poor physical quality is tilled while too dry (Dexter and Birkas 2004; Dexter 2004). The same soil if tilled while too wet may cause smearing along the bottom of the plow depth or develop an abundance of smeared soil "slabs." Both situations would require additional tillage passes to break up clods and any smeared soil masses (Sitkei 1967; Ojeniyi and Dexter 1979).

SOIL MANAGEMENT CONSIDERATIONS AND TILLAGE ALTERNATIVES

Reduce Tillage. Tillage creates the initial conditions needed for FSS. Therefore, the best options for minimizing the risk of FSS is to limit tillage. Producers can reduce the depth of tillage, limit the total land area tilled, or transition away from tillage altogether. Shallow vertical tillage implements offer an efficient way to reduce the depth of tillage. These implements only scratch the soil surface while sizing crop residues into small pieces for quick breakdown while also thinning the crop residue layer for more efficient springtime soil warming and drying. If somewhat deeper tillage is still desired by the producer, then using a field cultivator prior to planting can accomplish a good compromise between chisel-plowing and vertical tillage. Strip tillage allows producers to till as deep as chisel plowing while minimizing the total land area tilled. This is done by tilling in rows where seeds will later be placed and leaving the interplant-row zones untouched. Although soil settling may still be minimal in the tilled rows, the moisture from the adjacent nontilled zones may provide an adequate supply of moisture for plant growth and for subsequent wetting/drying cycles that promote soil settling.

Minimize Field Traffic. Crop producers routinely arrange and then rearrange the soil's internal architecture during a crop year. For instance, soil compaction stems directly from the traffic of combines, weight wagons, grain carts, tractors, fertilizer carts and applicators, tillage implements, planters, and herbicide/pesticide carts and applicators. Tillage is then used to quickly alleviate the compaction with shanks, coulters, shovels, shares, and disc while also burying crop residues. At planting, the seed drill blades open the soil, and compaction wheels close the soil. A similar process occurs when injecting fertilizers. Overall, these field operations amount to a lot of soil disturbance. The more mechanical disturbance to the soil, the lower the soil aggregation and the more producers will desire tillage. By reducing field traffic, the desire for tillage as a means to alleviate compaction also decreases. A number of natural processes exist for rearranging the soil's internal architecture and alleviating soil compaction, processes such as freezing/thawing, wetting/drying, root penetration, burrowing animals, and decay of organic materials. Although these natural processes occur much more slowly than the process of tillage, changing management practices to minimize field traffic and rely on natural processes to alleviate soil compaction will help producers transition to using less tillage.

Develop and Maintain Stable Soil Aggregates. Stable aggregates are high in shear strength, abundant in internal particle-to-particle contact, efficient at protecting of soil organic carbon (C), and well-known for their ability to store significant quantities of water and nutrients near their center (Sexstone et al. 1985; Six et al. 1998; Bronick and Lal 2005). Therefore, a tilled soil that contains an abundance of stable soil aggregates will not be as likely to express FSS as compared to a tilled soil lacking stable aggregates. The soil aggregates will supply water and nutrients to the seed/seedling analogous to how the untilled portion of strip-tilled soil may provide water to the adjacent tilled zones. The only differences in these two situations are the scale at which the process works and the distance the water must

travel from moist areas to the seed/seedling. However, if strongly aggregated soils are to be tilled, producers should target optimum soil moisture conditions so to avoid the formation of large clods (soil conditions too dry) and smearing (soil conditions too wet) of aggregates. Producers should seek out efficient practices to increase soil organic matter and therefore promote the formation of stable soil aggregates; such practices include incorporating high C manures, litters, green mulches, and crop rotations into their systems.

CONCLUSIONS

In recent years, relatively dry winter and spring months in the US upper Midwest and northern Great Plains regions have caused some tilled soils to undergo minimal settling. These soils have produced unique patterns of plant growth in the following growing season. When tilled soil does not settle over the winter and spring months, FSS occurs and results in crops suffering from inadequate soil particle-to-particle contact. Tillage initiates the conditions for soils to be at risk for FSS, but the absence of wetting/drying or freezing/thawing cycles is what allows the loosened soil state to persist into the following growing season with potentially detrimental effects on the crop and susceptibility for wind erosion. Producers can minimize their risk for FSS by reducing field-traffic derived soil compaction, reducing the depth and area of soil tillage, and by incorporating high C materials to promote the formation of stable soil aggregates.

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Early Season Drought Effects on Corn

Key Points:

- Corn is less susceptible to drought during vegetative growth than during pollination and grain fill, but severe early-season drought can significantly reduce yield.
- Drought stress during the vegetative stages can reduce corn plant size and leaf area and limit the number of kernels on the ear.
- Development of nodal roots and brace roots can be inhibited in dry soil.

Early Season Drought

- Water availability is the most common yield-limiting factor in corn production.
- In North America, drought stress most often occurs during the latter half of the growing season during pollination and grain fill, when crop demand for water is greatest (Table 1).
- Drought stress early in the season is less common and generally less detrimental to corn yield, but it can negatively impact the crop depending on the severity and duration of the stress.

Corn Germination and Emergence

- Corn seeds need to imbibe 30-35% of their weight in water to initiate the germination process.
- If the soil surrounding the seed is too dry to supply the necessary moisture, germination will be delayed.
- Dry soils at planting often lead to uneven emergence, as some seeds germinate more quickly than others due to variation in the soil microenvironment.
- Shallow planting can exacerbate the problem, as soil near the surface dries more quickly.
- Poor seed to soil contact and residue in the seed furrow can also compound the effect of dry soil, by reducing the ability of water to move from the soil to the seed.
- Fertilizers placed in the seed furrow may also inhibit germination due to their salt effect being more pronounced in drier soil. Salts have an affinity to water and can draw moisture away from or out of the germinating seed or root tissues.

Table 1. Average daily corn water use, water use per growth stage, and cumulative water use over the course of the growing season.

Growth Stage	Daily Water Use Rate (in)	Water Use Per Stage (in)
Emergence (VE)	0.08	0.8
4-leaf (V4)	0.10	1.8
8-leaf (V8)	0.18	2.9
12-leaf	0.26	1.8
Early tassel (R1)	0.32	3.8
Silking (R2)	0.35	4.1
Blister Kernel (R3)	0.32	1.9
Beginning Dent (R4.7)	0.24	3.8
Full Dent (R5.5)	0.20	3.8
Maturity (R6)	0.10	1.4

Corn Response to Drought Stress

- Reduced water uptake under drought conditions can limit the rate of photosynthesis in the plant.
- Corn plants respond to drought stress by closing stomates and rolling leaves to reduce the volume of water transpired through the plant. This response benefits the plant by protecting it through short bouts of drought stress.
- However, closing the stomates also reduces the ability of the plant to take in carbon dioxide, which slows down photosynthesis and plant growth.
- The eventual impact on yield is determined by the severity and duration of stress. Drought stress lasting four or more days is likely to reduce yield (Table 2).

Table 2. Estimated corn yield loss when drought stress persists for four or more consecutive days. (Drought stress indicated when the uppermost , fully expanded leaf was visibly wilted.)

Corn Growth Stage	Estimated Yield Loss per Day of Stress (%)
Early vegetative (VE - V12)	1 – 3
Late vegetative (V12 to VT)	2 – 5
Pollination to Blister (R2)	3 – 9
Milk (R3)	3 – 6
Dough (R4)	3 – 5
Dent (R5)	2 – 4
Maturity (R6)	0

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Corn Development During Vegetative Stages

- **Emergence-V3** – Corn seedling depends on resources from the seed and the seminal root system, which ceases growth around V3.
- **V3-V6** – Nodal root system begins development, becoming the primary source of soil resources by V6.
- **V5-V7** – Number of kernel rows on the ear is established
- **V7-V11** – Maximum number of potential kernels on the ear is established

Effects on Corn Growth and Development

- Although not outwardly visible, there is a lot of physiological development happening inside corn plants during the early to mid-vegetative growth stages
  - By V6, all aboveground plant parts have been initiated, including all leaves, ear shoots, and the tassel.
  - Development during this time establishes the size of the overall plant and the size of each leaf.
- Drought stress during this time can impact the eventual yield potential of the plant by reducing:
  - The number of kernel rows on the ear
  - The number of kernels per row
  - Total leaf area and photosynthetic capacity of the plant

Figure 1. Corn plants at the V3-V4 showing severe stress during the drought of 2012. Drought symptoms at this stage may include leaf rolling, reduced growth, leaf death, and – in severe cases – plant death.

Drought Effects on Root Development

- Some degree of soil dryness early in the season can actually be beneficial, as it facilitates deeper initial rooting.
- However, excessive dryness can limit root growth and eventually lead to root desiccation and death.
- Extreme dryness and high soil surface temperatures can kill developing nodal roots, resulting in a condition known as "rootless" or "floppy" corn, where the plant is supported solely by the seminal root system and is prone to fall over (Figure 2).
  - Shallow planting can exacerbate the risk of rootless corn by placing developing nodal roots closer to the soil surface.
- Drought conditions can also inhibit brace root development, causing the roots to grow out horizontally over the surface of the hard, dry soil instead of penetrating the soil (Figure 2), making the plant more susceptible to lodging.

Figure 2. Left: Rootless corn caused by shallow planting followed by dry soil conditions, which inhibited nodal root development. **Right:** Underdeveloped and callused brace roots resulting from hot, dry conditions during brace root development.

Drought Effects on Nutrient Uptake

- Reduction in water uptake by a corn plant can also mean a reduction in nutrient uptake.
- The nutrient most likely to become deficient under drought stress is potassium.
  - Potassium exists as a cation in the soil solution.
  - As soil water is depleted, potassium ions become more tightly bound to the negatively charged surfaces of soil colloids, making them less available for plant uptake.
- Potassium deficiency can exacerbate the effect of drought stress on the plant.
  - Potassium plays a key role in regulating the opening and closing of stomata.
  - Plants with insufficient potassium can be slower to close their stomates in response to the onset of drought stress.

How to Improve Corn Resilience to Drought

- Five management practices can help make the crop more resilient to early-season drought stress when it occurs:
  1. Ensure adequate potassium fertility.
  2. Reduce or eliminate spring tillage, if possible, to help preserve soil moisture.
  3. Avoid planting too shallow – target a depth of around 2 inches in most situations.
  4. Ensure good seed to soil contact at planting.
  5. Manage soils to improve structure and water-holding capacity and minimize compaction.

Author: Mark Jeschke

Vol. 13 No. 14 June 2021

PIONEER® BRAND OPTIMUM® AQUAMAX® PRODUCTS

DELIVER MORE BUSHELS PER DROP UNDER DROUGHT STRESS AND TOP-END YIELD POTENTIAL IN IDEAL GROWING CONDITIONS.

Pioneer.com/AQUAmax

THE BEST OF THE BEST

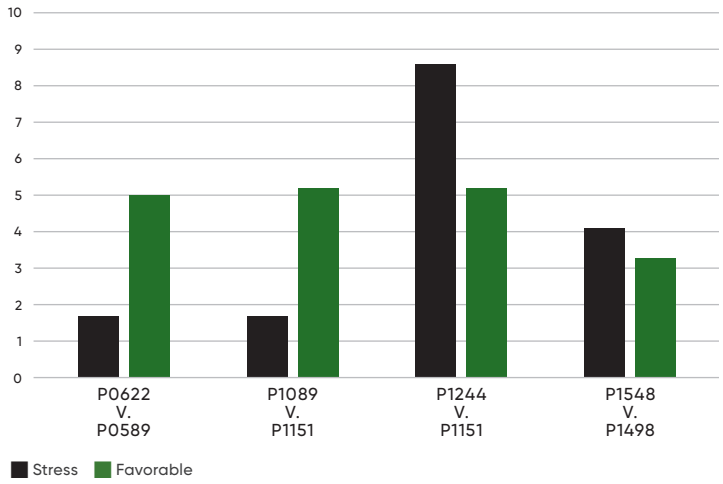
Not just any hybrid can be an Optimum® AQUAmax® product. Hybrids must meet a minimum amount of drought testing data to be given the elite designation of an Optimum AQUAmax product, including yield and agronomic trait advantage versus current industry-leading products. Testing includes at least three years in targeted drought testing environments, which has led to improved drought characterization and understanding of stress tolerance in our products.

PROVEN PERFORMERS

They're tested in your local environment to gauge their overall performance and agronomic fit for your geography. Optimum AQUAmax products delivered a yield advantage over the competition across a range of environments in 2020*:

- 6.3 bu/A in yield levels below the 150 bu/A threshold
- 4.6 bu/A in yield levels between 150 and 200 bu/A
- 4.5 bu/A in yield levels above 200 bu/A

Latest Pioneer® brand Optimum® AQUAmax® product families shine over the previous best, avg yield advantage 2018-2020**

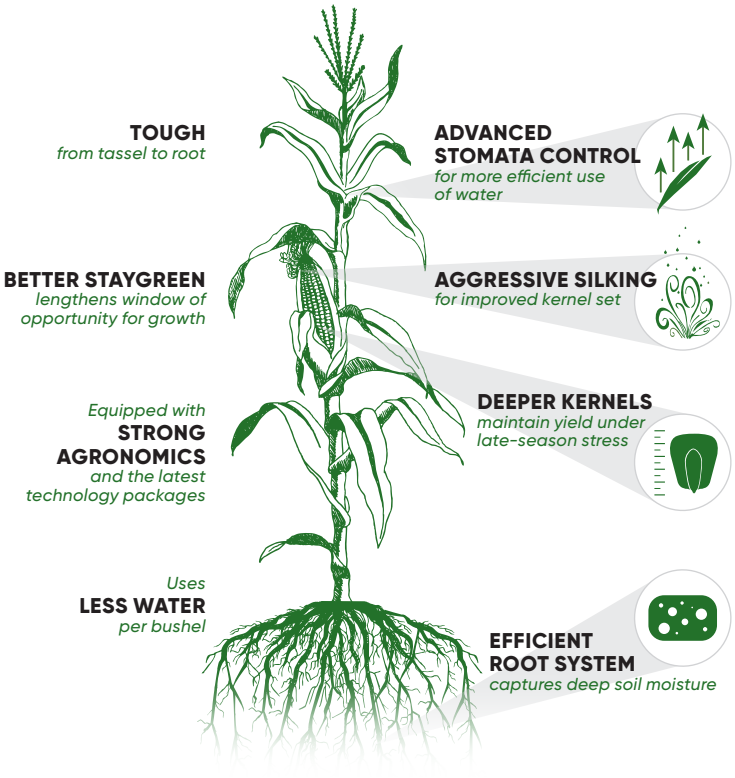


CORN REVOLUTION GENETICS

Optimum AQUAmax products are available for the 2022 growing season that span 16 genetic platforms.

The latest additions to the Optimum AQUAmax product line are part of the Corn Revolution that is delivering additional value to farmers through their performance and consistency.

Pioneer® brand Optimum® AQUAmax® products include key native traits designed to help withstand drought conditions and protect against yield loss.



TALK TO YOUR LOCAL PIONEER SALES PROFESSIONAL TO MAKE OPTIMUM AQUAMAX PRODUCTS PART OF YOUR DIVERSIFIED CORN PACKAGE.

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Corn Rootworm Management in Canada

Summary

- Corn rootworm (CRW) can be found across Ontario and Quebec.
- Corn rootworms can evolve and overcome management tactics. Controlling this pest is difficult.
- Crop rotation, avoiding corn on corn, is key to reducing CRW populations.
- Corn growers should develop a scouting program that monitors larvae and adult numbers, which predicts potential egg laying and future problems.

Figure 1. Northern (left) and western (right) corn rootworm beetles.

Pest Facts

- **Northern corn rootworm -** Adults are yellowish to pale green beetles about ¼" or 6mm long.
- **Western corn rootworm** - Adults are yellow with black stripes on the wings.
- Mature rootworm larvae are white and lender about ½" or 1.25cm long. They have brown heads and a dark plate on the top side of the terminal segment.
- Adults begin emerging in early to mid-July with male beetles emerging before females.

Crop Injury

- Both larvae and adults feed on corn.
- Larvae feed on and within roots from mid-June to mid-July.
- Adults feed on pollen, silks and leaves leaving 'window panes' between the veins on the leaves.

Injury Symptoms

Corn Lodging or Goosenecking

- Corn rootworm larvae feed on corn roots which can cause lodging and reduced nutrient and water uptake.
- Damage can be seen when roots are dug up and washed (Figure 2).

Figure 2. Severe corn rootworm feeding damage.

Silk Clipping

- Adults can clip silks at pollination, reducing pollination success.

Management Strategies

Crop Rotation

- Crop rotation is critical for managing CRW populations. Since corn is the primary host, avoid planting corn on corn.

Scouting

- Monitor larvae and adult beetle numbers to predict potential egg laying and future problems. The level of rootworm feeding, and beetle activity will determine the best management options.
- Adult beetles can be trapped using sticky traps (see Figure 3). Traps are collected and replaced weekly.

Figure 3. A new Pherocon®AM/NB sticky trap set at ear height.

Results from an Ontario 2020 Trapping Trial

- Sampling of CRW populations in 2020 revealed the variable geographic nature of CRW pressure and effects of crop rotation.
- All locations with moderate to very high pressure were continuous corn locations, lending support for the use of rotation out of corn as a critical management tool to keep CRW populations low.
- One location with very high pressure was in the center of a geography that has now been confirmed by the Canadian Corn Pest Coalition to be showing CRW resistance to Bt traits associated with a long-term history of continuous corn.
- Similar investigations into possible CRW Bt resistance observed under continuous corn are underway in other fields across the geography tested.
- Continuous corn practices have been shown by university and Pioneer research to increase CRW pressure and can result in the development of resistance to Bt traits. Improved rotational practices are the best way to keep these valuable Bt traits effective going forward.
- Results indicate that WCRW is the predominant species present in SW Ontario. NCRW populations were present at some locations but at low rates relative to the WCRW. Discovery of only a single NCRW beetle in soybean fields is likely incidental but worth further investigation given the extended diapause shown by some NCRW populations.

Considerations / Action Thresholds

- If traps average <20 beetles per week:
  - **Low/Moderate** CRW populations are anticipated next year.
  - Select a control option for each field:
    - Rotate acres to another crop.
    - Plant a corn rootworm Bt corn product. (If a Bt-rootworm product has already been planted 3 years in a row or you are in a geography where CRW Bt resistance is already confirmed/suspected, rotate out of corn.)
- If traps average >20 beetles per week:
  - **High** rootworm populations are anticipated next year
  - Select a control option for high populations:
    - Rotate acres to another crop.
    - If corn must be grown, apply foliar insecticide in the current year to control beetles prior to egg-laying. If CRW Bt resistance is suspected in your geography, consider using a non CRW Bt product with application of in furrow insecticide.
- To maintain efficacy of Bt corn rootworm products, it is essential to develop a rootworm management plan that:
  - Breaks the cycle
  - Manages populations
  - Protects the Bt trait
- Please contact your Pioneer Sales Professional or local Extension professionals to assist you in developing field-specific best management practices for your operation.

Author: Laura Sharpe

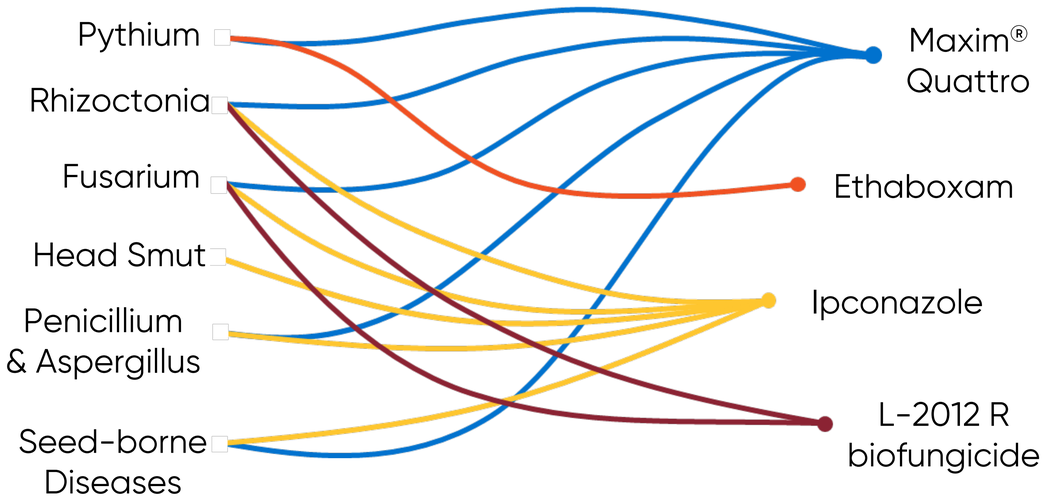
Corn Rootworm
Sticky Trap Trial

	7/27 WEEK 1	8/3 WEEK 2	8/10 WEEK 3	8/17 WEEK 4
HERMAN CONVENTIONAL CORN ON SOYBEANS	4	1.3	8	5.3
ELBOW LAKE TRAITED CORN ON CORN	4	4	12	5.3
BARRETT CONVENTIONAL CORN ON SOYBEANS	1	1	3	1.5
DALTON TRAITED CORN ON CORN	10	8	19	7.8
TINTAH CONVENTIONAL CORN ON CORN	13	9	6	1.5

RED RIVER MARKETING CO

Corn Seed Treatment

Enhanced disease protection with multiple modes of action



Lumialza™

NEMATICIDE SEED TREATMENT

+3.7 bu/A

- Expanding bio-barrier **shields roots** from harmful nematodes
- **80+ days** of root protection
- Activity against all **7 key species**
- Yield improvement of **3.7 bu/a under low pressure**

Bio-barrier

LumiGEN® premium insecticide seed treatment package on Pioneer® brand corn is the broadest spectrum protection in the industry.

Insecticide Seed Treatments Characterization

Pest	Premium Package Lumialza™ bio-nematicide Lumivia™ 250 Lumisure™ 250	Enhanced CRW Package Lumialza™ bio-nematicide Lumisure™ 1250	Bayer Option Poncho® Votivo® 500	Regional Seed Co. Option Cruiser® 250
Corn Nematodes	+++	+++	++	–
Wireworm	+++	++++	+++	++
Cutworm	++++	++	+[1]	+[1]
Fall Armyworm	++++	–	–	–
Seed Corn Maggot	+++	+++	+++	++
White Grub	+++	++++	+++	++
Grape Colaspis	+++	+++	++	++
Billbug	++	+++	–	–
Flea Beetle	++	+++	++	++
Corn Rootworm	–	++	–	–

- No control
+ Feeding reduction ++ Average protection +++ Above average protection ++++ Excellent protection
[1] labeled for control

CORTEVA™ agriscience

The information descried in the characterization chart is based on a review of product labels. These comparisons include one rate. Additional seed treatment options are available with all brands compared.

10-state broad-acre head-to-head strip trial comparing Lumialza™ nematicide seed treatment vs. non-nematicide seed treatment utilizing the same insecticide and fungicide recipe in seed applied technology replicated and strip trial data. Yields averaged 3.7 bu/a advantage under low pressure and ranged from 3 to 9 bu/a under higher pressure, in 184 low pressure and 54 moderate to high pressure locations.

PIONEER®

THE NEW TECHNOLOGY FOR CORN NEMATODE PROTECTION

PIONEER®

Lumialza™

NEMATICIDE SEED TREATMENT

Lumialza™ is a biological nematicide seed treatment that provides early season protection against plant parasitic nematodes, while cooperating with beneficial organisms in the soil. Lumialza seed treatment shields roots from harmful nematodes and provides more than 80 days of root protection across all root zones. Increased root biomass, plant vigor, and height uniformity result in improved plant performance. Because of their small size and patchy distribution pattern, nematodes are often overlooked for the yield-impacting problem they are. Whether in low or high nematode pressure environments, Lumialza seed treatment provides an extensive zone of root protection and peace of mind.

Colonization of roots by *Bacillus amyloliquefaciens*, strain PTA-4838.

Lumialza Seed Treatment Key Benefits

- Demonstrated an average 3.7 bu/a yield advantage even under low nematode pressure in U.S. field trials
- Expanding bio-barrier shields roots and provides enhanced protection from nematodes
- 80+ days of root protection in the upper, middle, and lower root zones
- Provides activity against all key corn nematode species
- Reduced nematode injury to roots and increased root biomass leads to optimized yield potential
- Significant reduction in root damage from lesion, stunt, and spiral nematodes at 80 days after planting
- Protects seedlings through most vulnerable stages of growth
- Improved plant vigor and crop height uniformity, in the presence of key nematode species
- Offers biological alternative to existing nematode management strategies

Lumialza Seed Treatment Key Attributes

- Biological nematicide using a naturally occurring soil bacterium, *Bacillus amyloliquefaciens*, strain PTA-4838
- Protects against root damage caused by nematodes and reduces nematode reproduction
- Colonizes roots throughout root profile, protecting both primary and secondary roots
- Forms biological barrier from nematode attack and paralyzes juvenile nematodes
- Efficacious at low use rate
- Safe, compatible with beneficial arbuscular mycorrhizal fungi (AMF) in the soil
- Excellent seed safety profile
- Highly compatible with other commercial seed treatment technologies
- Favorable environmental profile

Pest Spectrum

Lumialza™ nematicide seed treatment targets nematode pests including dagger (*Xiphinema americanum*), root-knot (*Meloidogyne incognita*), lance (*Hoplolaimus galeatus*), lesion (*Pratylenchus brachyurus*), and needle (*Longidorus sylphus*) nematodes.

Corn nematodes prefer to feed on new, succulent cell tissue where cells are actively dividing, however all root area is susceptible to damage.

Crop	Scientific Name	Common Name
corn	*Xiphinema americanum*	dagger nematode
	Hoplolaimus galeatus	lance nematode
	Longidorus sylphus	needle nematode
	Pratylenchus brachyurus	root lesion nematode
	Belonolaimus longicaudatus	sting nematode
	Trichodorus allius	stubby-root nematode
	Meloidogyne incognita	root-knot nematode

Partial listing of nematode pests susceptible to Lumialza seed treatment when used according to label.

Nematicidal Action

- **Absorption and Translocation**

  Lumialza seed treatment is a biological organism and as a result, will behave differently than synthetic nematicide treatments. The *Bacillus amyloliquefaciens* strain in Lumialza seed treatment colonizes roots near the seed and soil surface, but also throughout the soil profile, resulting in an extensive zone of root protection.

- **Mode of Action**

  Bacillus amyloliquefaciens, strain PTA-4838 is a gram-positive bacteria that provides nematode control by colonizing the roots to form a biological barrier from nematode attack, as well as causing paralysis of juvenile nematodes.

Environmental Profile

Lumialza seed treatment has a favorable environmental profile if applied according to label recommendations. It is safe and compatible with naturally occurring soil microorganisms and is effective on target nematode species at low use rates.

Lumialza seed treatment provides early season protection against plant parasitic nematodes, resulting in reduced feeding damage and increased root biomass.

Lumialza seed treatment increases aboveground plant vigor, height, and biomass when in the presence of nematodes.

CORTEVA™ agriscience

10-state broad-acre head-to-head strip trial comparing Lumialza™ nematicide seed treatment vs. non-nematicide seed treatment utilizing the same insecticide and fungicide recipe in seed applied technology replicated and strip trial data. Lumialza nematicide seed treatment delivered an average 3.7 bu/A yield advantage in lower nematode pressure environments and up to 9 bu/A depending on nematode species and population, in 238 stress locations. See your Pioneer sales representative for details.

WHY YOU NEED TO TEST YOUR FIELDS TO KNOW YOUR NUMBERS.

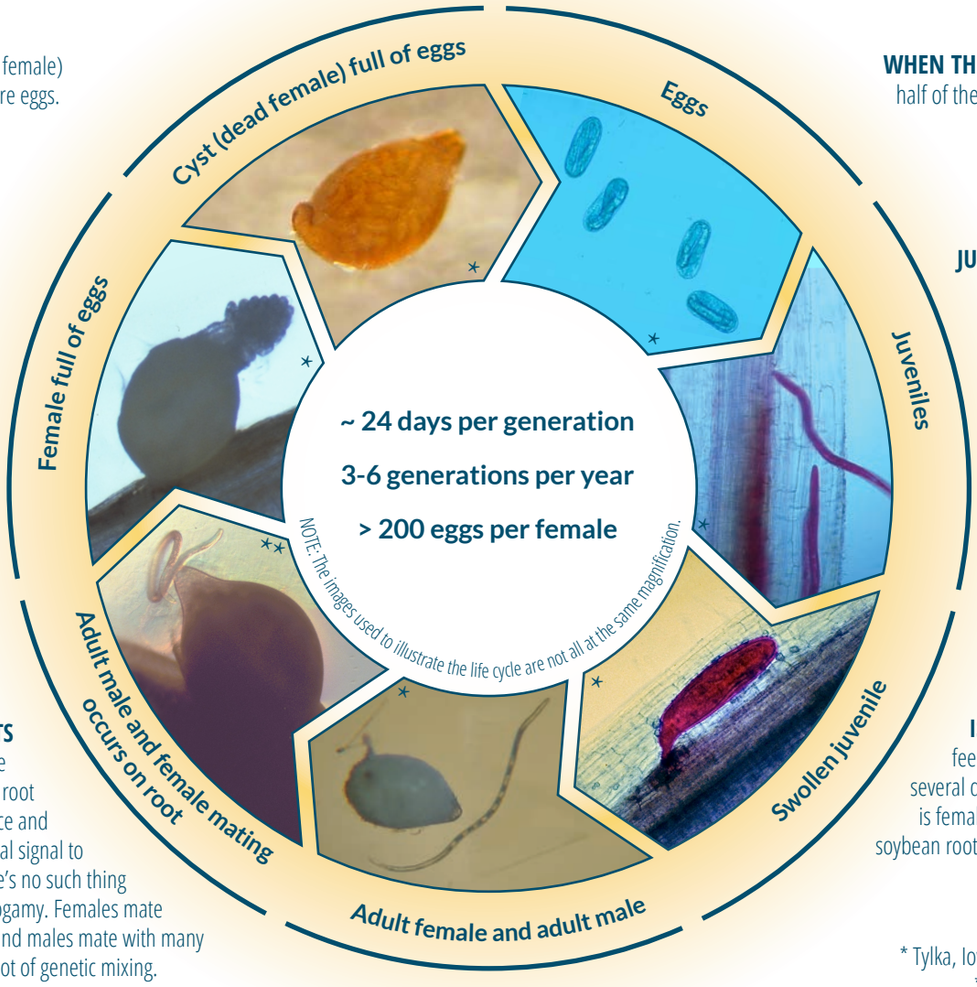
What's your number?
Take the test. Beat the pest.
The **SCN** Coalition™
Funded by the soybean checkoff

THE SOYBEAN CYST NEMATODE
life cycle.

The SCN life cycle can be completed in as few as 24 days during the growing season. There can be from three to six generations per year.

EACH CYST (dead female) contains 200 or more eggs.

AFTER MATING, she makes about 50 eggs outside her body and fills up with another 200+ internally. Then she dies and her body wall hardens to form the cyst.



WHEN THE CYST BREAKS, half of the eggs will become male and half will become female.

JUVENILE WORMS hatch from eggs and burrow into soybean roots to feed and develop. There's no way to tell whether a juvenile is male or female at this stage.

THIS JUVENILE IS SWOLLEN from feeding in the root for several days. If this juvenile is female, she'll stay in the soybean root and keep feeding.

THE FEMALE GETS SO LARGE that she ruptures out of the root onto the root surface and sends out a chemical signal to attract mates. There's no such thing as nematode monogamy. Females mate with many males, and males mate with many females. There's a lot of genetic mixing.

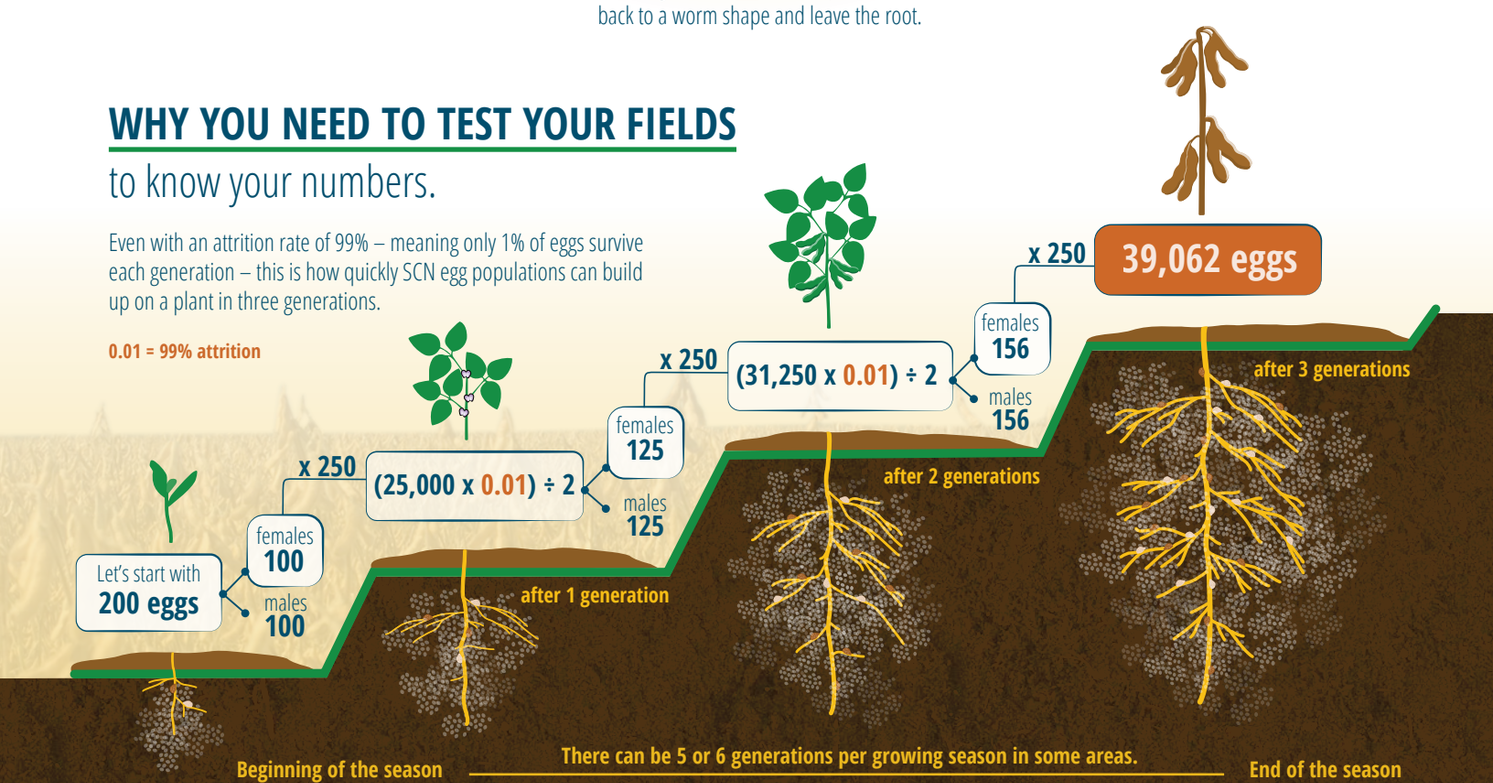
* Tylka, Iowa State University
** Chitwood, USDA

IF THE JUVENILE IS MALE, it will revert back to a worm shape and leave the root.

WHY YOU NEED TO TEST YOUR FIELDS
to know your numbers.

Even with an attrition rate of 99% – meaning only 1% of eggs survive each generation – this is how quickly SCN egg populations can build up on a plant in three generations.

0.01 = 99% attrition

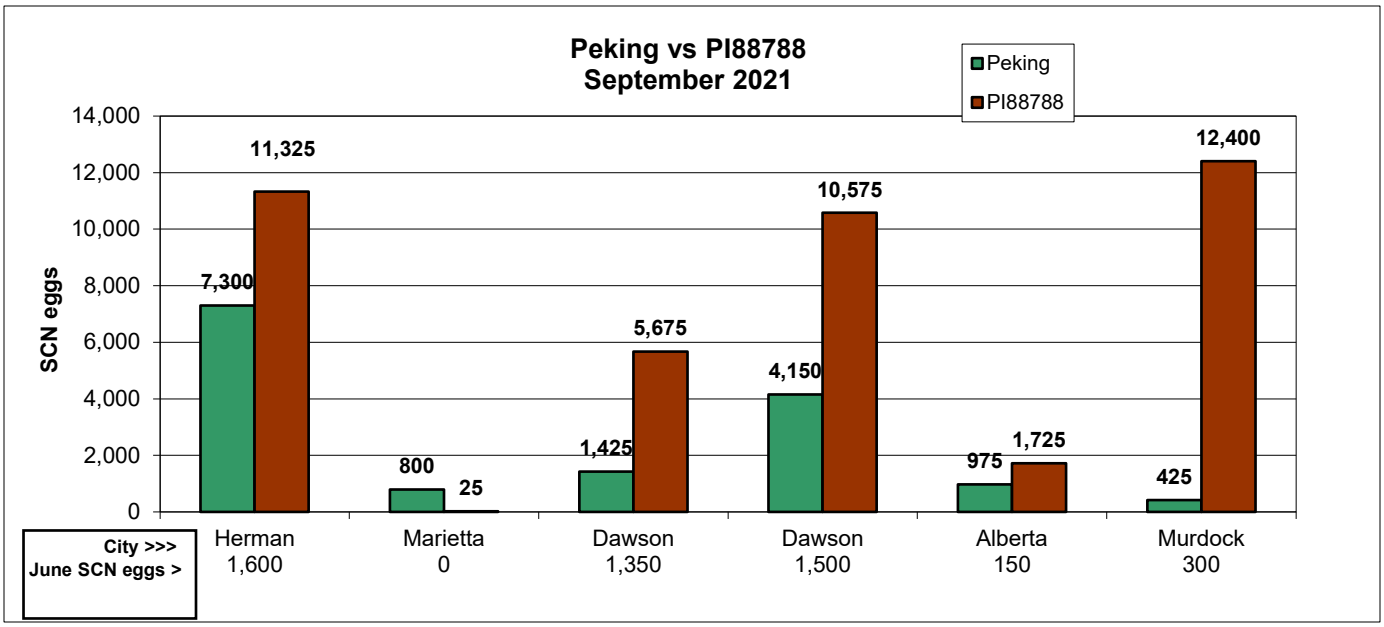


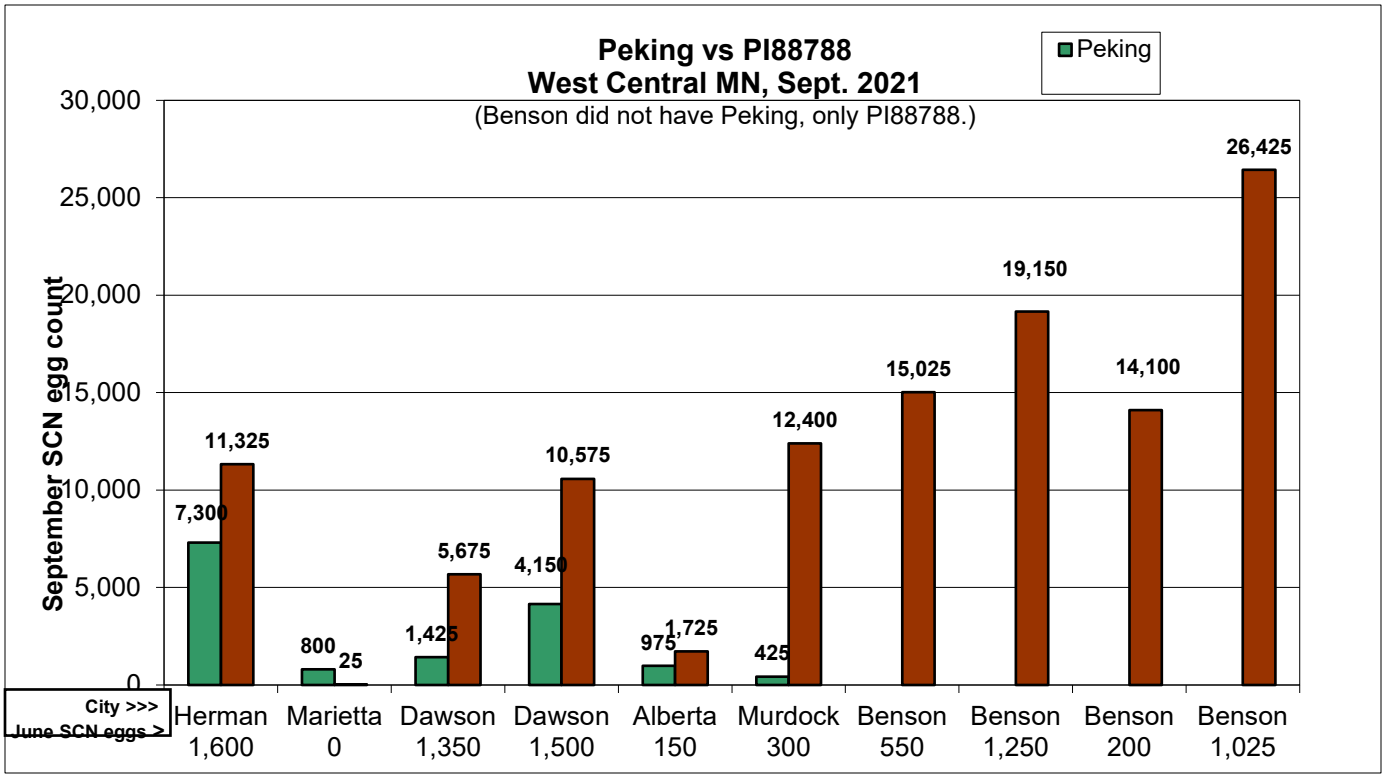
Visit *TheSCNcoalition.com* for more information.

Soybean Cyst Nematode Sampling Summary: 2021; Avg of 2 Samples/Variety/Location

Pioneer® Variety	SCN Source	Yield Bu/A	Spring Sample	Fall Sample	Change	Change %	Grower Name	County
P14A23L	Peking	54.3	1,425	7,300	5,875	512%	Terry Tolifson	Grant
P16T75L	PI88788	33.6	1,775	11,325	9,550	638%		
P14A23L	Peking	69.9	0	800	800	100%	Justin Stamp	Lac Qui Parle
P16T75L	PI88788	65.5	0	25	25	100%		
P14A23L	Peking	68.0	950	1,425	475	150%	John Kostad	Lac Qui Parle
P16T75L	PI88788	60.2	1,775	5,675	3,900	320%		
P14A23L	Peking	64.0	1,250	4,150	2,900	332%	Dean Martinson	Lac Qui Parle
P16T75L	PI88788	69.0	1,725	10,575	8,850	613%		
P14A23L	Peking	63.1	100	975	875	975%	Mike Kill	Stevens
P16T75L	PI88788	66.0	200	1,725	1,525	863%		
P14A23L	Peking	61.0	150	425	275	283%	Jesse Olson	Swift
P16T75L	PI88788	56.2	450	12,400	11,500	2756%		
P14A23L	Peking	63.4	646	2,513	1,867	392%	Avg of P14A23L; Peking	
P16T75L	PI88788	58.4	988	6,954	5,892	881%	Avg of P16T75L; PI88788	
Avg of All		60.9	817	4,733	3,879	637%	Avg of both varieties/sources	

Soybean Cyst Nematode Sampling Summary: 2021; Avg of 2 Samples/Loc; Survey done in cooperation with AgVise labs and Richard Jenny in Benson, MN





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Soybean Water Use

Key Points:

- Seasonal soybean water use can range from 20 to 26 inches during the growing season, with over 60% of total water use occurring during the R1 to R6 growth stages.
- The majority of soil water uptake by soybeans occurs within the top 2 to 3 feet of the soil profile.
- Adequate water is most critical during pod development and seed fill (R3-R6).

Evapotranspiration (ET)

Evaporation

- Early in the growing season, water loss from the soil occurs primarily through evaporation from the soil surface.
- As the crop growth and more leaf area shades the soil, evaporation will decline as transpiration increases.
- Crop residue on the soil surface can significantly reduce the amount of water lost through evaporation by reflecting solar radiation and protecting the soil from wind.

Transpiration

- In the process of transpiration, plants take up water from the soil and transport it to the leaves. Small openings in the leaves (stomata) allow water vapor to pass from the plant into the atmosphere, cooling the plant.
- The rate of transpiration increases with higher air temperature, solar radiation, and wind speed.
- High humidity levels reduce transpiration by decreasing the difference in water potential between the leaf airspace and the ambient air.

Soybean Water Use Over the Growing Season

- Daily ET varies greatly throughout the growing season due to day-to-day variability in weather conditions.
- On average, daily ET increases through the vegetative growth stages, peaks during early pod fill, and declines as the crop approaches maturity. (Table 1).
- Over 60% of total water use occurs during the R1 to R6 reproductive growth stages.
- Seasonal soybean water use can range from 20 to 26 inches during the growing season (Kranz and Specht, 2012) compared to a typical range of 21 to 28 inches for corn.

Soybean Rooting Depth and Water Uptake

- Well-developed root systems are essential for soybean water uptake and growth.
- Soybean root systems that are unimpeded by soil factors can reach a maximum depth of over 60 inches, similar to that of corn (Ordóñez et al., 2018).
- The majority of soil water uptake by soybeans occurs within the top 2 to 3 feet of the soil profile (Kranz and Specht, 2012).

Table 1. Average daily soybean water use (ETc), water use per growth stage, and cumulative water use over the course of the growth season.

Growth Stage	Daily Water Use Rate	Water Use Per Stage	Cumulative Water Use
	——— inches ———		
2nd Trifoliate (V2)	0.08	0.56	1.00
4th Trifoliate (V4)	0.09	0.63	2.19
6th Trifoliate (V6)	0.14	0.98	3.17
Beginning Bloom (R1)	0.20	2.00	5.17
Full Bloom (R2)	0.25	1.75	6.92
Early Pod Development (R3)	0.28	1.96	8.88
Pod Elongation (R4)	0.32	3.20	12.08
Early Pod Fill (R5)	0.33	3.30	15.38
Mid Pod Fill	0.32	3.20	18.58
Full Pod (R6)	0.25	1.75	20.33
Lower Leaves Yellowing (R7)	0.15	1.50	21.83
Maturity (R8)	0.10	1.00	22.83

Impact of Water Availability

- Soybeans can typically withstand moderate drought stress during vegetative growth with little effect on yield.
- Excessive rainfall during vegetative stages can cause the plants to put on more vegetative growth that will not necessarily lead to higher yields. Larger plants can be more susceptible to lodging during thunderstorms later in the season.
- Adequate water is most critical to soybeans during pod development and seed fill (R3-R6).
- Ample water during flowering followed by drought stress during seed fill will result in smaller seeds.

Kranz, W.L., and J.E. Specht. 2012. Irrigating Soybean. NebGuide G1367. University of Nebraska-Lincoln Extension. https://extensionpublications.unl.edu/assets/pdf/g1367.pdf Ordóñez et al. 2018. Maize and soybean root front velocity and maximum depth in Iowa, USA. Field Crops Res. 215:122-131.

Author: Dan Berning

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Enlist™
weed control system

Advantages of the Enlist™ weed control system

	Enlist™ herbicides	In-crop dicamba herbicides
Herbicide tolerances	2, 4-D choline Glufosinate Glyphosate	Dicamba Glufosinate Glyphosate
Authorized herbicides for system	Enlist One® herbicide Enlist Duo® herbicide (Glyphosate pre-mix available in system)	Xtendimax®, Engenia®, Tavium® herbicides
Federal Restricted Use Pesticide?	No	Yes
Application window limit in traited soybeans	Through R2 stage No calendar date cutoffs	No later than R1 growth stage, or June 30 national cutoff date
Time of day application limitation	No	Yes, applications only from 1 hour after sunrise to 2 hours before sunset
Ability to tank-mix with qualified glufosinate?	Yes, Liberty® herbicide qualified as a tank-mix partner with Enlist One	No qualified glufosinate tank-mix products
Glyphosate blend product option available with system?	Yes, Enlist Duo® is a proprietary blend of 2,4-D choline plus glyphosate, with Colex-D® technology	No glyphosate pre-mix products available within system
Herbicide applications if soybeans w/o the respective trait are downwind?	Soybeans without the Enlist trait are NOT a “susceptible crop” – can make an application of Enlist herbicides when soybeans are adjacent downwind.	Non-dicamba-tolerant soybeans ARE a “sensitive crop” – cannot make an application when soybeans are adjacent downwind
Downwind required buffer distance	30′	240′ 310′ in areas specified by Endangered Species Protection Bulletins

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Enlist™ herbicides refers to Enlist One® and Enlist Duo® herbicide with Colex-D® technology. In-crop dicamba herbicides refers to Xtendimax® with VaporGrip Technology and Engenia®. Engenia® and XtendiMax® with VaporGrip Technology herbicides are restricted use pesticides. ALWAYS READ AND FOLLOW DIRECTIONS FOR USE ON PESTICIDE LABELING. IT IS A VIOLATION OF FEDERAL AND STATE LAW to use any pesticide product other than in accordance with its labeling Engenia® and XtendiMax® herbicides are not registered for sale or use in all states. Additional state restrictions and requirements may apply. Applicator must comply with any additional state requirements and restrictions. Contact your local representative for details and availability. Always read and follow all label directions and precautions for use when using any pesticide alone or in tank-mix combinations. Xtendimax® and VaporGrip® Technology are trademarks of Monsanto Technology LLC. VaporGrip® Technology is used under license from Monsanto Company. Engenia® is a trademark of BASF. The information provided on this poster is for reference only. Always refer to the product labels for complete details and directions for use. Enlist Duo® and Enlist One™ herbicides are not registered for sale or use in all states or counties. Contact your state pesticide regulatory agency to determine if a product is for sale or use in your area. Enlist Duo and Enlist One herbicides are the only 2,4-D products authorized for use in Enlist crops. Consult Enlist herbicide labels for weed species controlled. Always read and follow label directions.

Pioneer® brand products are provided subject to the terms and conditions of purchase which are part of the labeling and purchase documents. ™ ® SM Trademarks and service marks of Corteva Agriscience and its affiliated companies.

PIONEER®

COMPARISON OF ENLIST E3® VS. XTENDFLEX® SYSTEMS

PIONEER®

Advantages of the Enlist™ weed control system

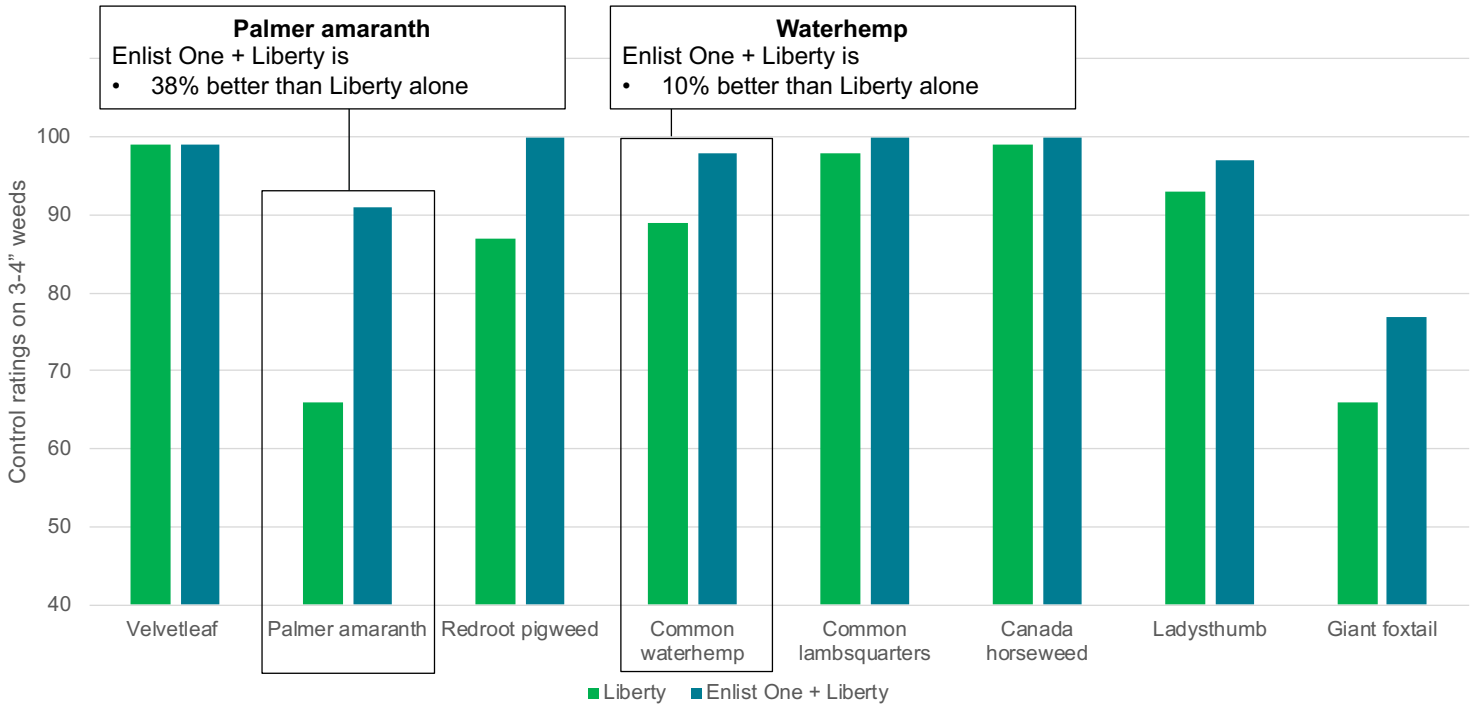
- The Enlist™ weed control system provides effective weed control, on-target application and ease of use for farmers managing the toughest weeds.
- Enlist E3® soybeans provide robust tolerance to 2,4-D choline, glyphosate and glufosinate for flexible weed control options.
- Enlist herbicides – 2,4-D choline with Colex-D technology – are designed to be the cornerstone of a herbicide program approach on every Enlist acre.
- Enlist One® and Enlist Duo® herbicides both offer near-zero volatility, reduced potential for physical drift and better handling characteristics.

	Enlist E3® soybeans	XtendFlex® soybeans
Herbicide tolerances	2,4-D choline Glufosinate Glyphosate	Dicamba Glufosinate Glyphosate
Corresponding authorized herbicides for system	Enlist One® herbicide Enlist Duo® herbicide Glyphosate pre-mix available in system	Xtendimax®, Engenia®, Tavium® herbicides
Application window in traited soybeans	√ Through R2 stage No cutoff dates	X National cutoff date of June 30, per federal label
Use of other herbicides postemergence	Glyphosate and glufosinate products √ Can tank mix Liberty with Enlist One √ Can tank mix multiple forms of glyphosate	Glyphosate and glufosinate products X Cannot tank mix dicamba and glufosinate X Only K-salt glyphosates qualified to tank mix with dicamba

Enlist One® + Liberty® Herbicides delivers stronger performance vs. Liberty® alone.

Results completed in 7 trial locations in 2020.

3-4" Weed Height



Key practices for weed resistance management:

- A tank mix of an Enlist herbicide and other qualified herbicides, including Liberty, allows applicators to spray multiple sites of action on tough weeds. Single herbicide modes of action are not recommended.
- For pigweed and waterhemp pressure, farmers should consider a tank mix of Enlist One® herbicide + Liberty® herbicide, the preferred glufosinate tank-mix partner with Enlist One.
- Layering residual herbicides as part of a tank mix with Enlist herbicides helps provide season-long control of tough broadleaf weeds and grasses.
- Find qualified tank-mix partners that may be used with Enlist Duo® herbicide or Enlist One® herbicide on **EnlistTankMix.com**.

Enlist™ weed control system

CORTEVA™ agriscience

Visit us at **Enlist.com**

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Second-Year Soybean Production

Soybeans Following Soybeans

- High soybean prices relative to corn can favor shifting acreage away from corn to more soybean production.
- In some cases, this may involve planting fields to soybeans in two consecutive years.
- Planting soybeans in the same field in consecutive seasons is generally not recommended by extension agronomists; however, there are several management considerations that can help maximize productivity for growers pursuing this strategy.

Yield Potential

- Growers should expect lower yields in second year soybeans.
- Research results have varied, but a yield reduction of 3-5% compared to soybeans following corn is not an unreasonable expectation.
  - **2.3%** average yield reduction in an 8-yr Univ. of Kentucky study with individual year reductions up to 13% (Grove, 2017).
  - **6.5%** average yield reduction in a 4-yr study in Ontario (OMAFRA, 2009).
  - **0%** average yield reduction in a long-term Univ. of Wisconsin study (Lauer et al., 1997).
- Plant stress caused by environmental conditions, diseases, or insects can easily increase yield losses in second year soybeans.

Management Considerations

Field Selection

- Avoid poorly-drained soils due to higher risk of *Pythium*, *Phytophthora*, sudden death syndrome, and brown stem rot.
- Consider cover crops in fields with slopes prone to erosion – soybeans produce less residue than corn and decompose more quickly.

Variety Selection

- Avoid planting a field to the same soybean variety two years in a row.
- Select soybean varieties with high levels of disease resistance.
- Test for SCN and select SCN-resistant varieties.
  - SCN proliferates in long-term soybean cropping systems.
  - Resistant varieties can reduce SCN reproduction by 70-80%.

Seed Treatments

- Use a fungicide seed treatment to protect against diseases such as *Pythium* and *Phytophthora* that can increase in severity under continuous soybean production.
- Pioneer® brand soybeans treated with ILeVO® fungicide seed treatment provides control of sudden death syndrome and certain soil-borne nematodes such as soybean cyst and root knot nematodes.
  - Soybeans treated with ILeVO fungicide treatment produced significantly higher grain yield (4.9 bu/acre) in high SCN environments in Pioneer testing (O'Bryan and Burnison, 2016).
  - In moderate SDS environments the addition of ILeVO fungicide treatment increased grain yield 4.5 bu/acre.

Soil Fertility

- Growers often routinely rely on carryover fertilizers for soybean when rotated with well-fertilized corn. Soybean after soybean may require additional fertilizer, especially potassium.

Disease Management

- Many diseases can overwinter on soybean residue, some can be managed with fungicide, some cannot.
  - Stem canker and pod and stem blight can overwinter on residue but fungicides are not as effective on these.
  - Septoria brown spot and frogeye leaf spot are two diseases that can be managed with foliar fungicides.
- Scout fields regularly to check for disease problems.

Weed Management

- Any weed escapes in the previous soybean crop are likely to result in greater weed management challenges in second-year soybean.
- Use multiple modes of action
- Soil residual herbicides applied pre-emergence and with a post-emergence application can help manage problem weeds.

Fungicide

The LumiGEN® soybean seed treatment portfolio, powered by Lumisena® fungicide seed treatment, delivers unmatched disease protection and healthy root growth promotion.

PIONEER®

	Trade Name	Phytophthora	Pythium	Rhizoctonia	Fusarium	Phomopsis
LumiGEN® Seed Treatments	Lumisena® fungicide (Oxathiapiprolin)	●				
	EverGol® Energy fungicide (Metalaxyl)		●			
	EverGol® Energy fungicide (Penflufen)			●		●
	EverGol® Energy fungicide (Prothioconazole)			●	●	
	L-2030 G biofungicide			●*	●*	
	Modes of Action	**1**	**1**	**3**	**2**	**1**
CruiserMaxx® Vibrance® seed treatment	Mefenoxam	●	●			
	Fludioxonil			●	●	●
	Sedaxane			●		
	Modes of Action	**1**	**1**	**2**	**1**	**1**
Acceleron® seed applied solutions	Metalaxyl	●	●			
	Fluxapyroxad			●	●*	
	Pyraclostrobin		●*	●	●*	●*
	Modes of Action	**1**	**2**	**2**	**2**	**1**
Generic offer example	Metalaxyl	●	●			
	Fludioxonil			●	●	●
	Modes of Action	**1**	**1**	**1**	**1**	**1**

Lumisena®
FUNGICIDE SEED TREATMENT

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* Labeled suppression.

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Acceleron® is a registered trademark of Monsanto Technology LLC

CruiserMaxx® and Vibrance® are registered trademarks of Syngenta.

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