

Crop Management Diagnostic Clinics

Burr and Zoubek

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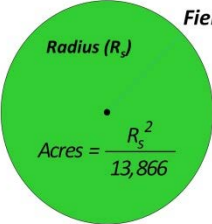
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Gross System Capacity (C_g)





Field

Radius (R_s)

Acres = $\frac{R_s^2}{13,866}$

System Capacity = $\frac{\text{System Flow Rate}}{\text{Field Area}}$


= gpm / acre

$C_g = \frac{750 \text{ gpm}}{125 \text{ acres}} = 6 \text{ gpm / acre}$

2013CMDC-BurrZoubek (1)

Determine how much flow is needed for system

Minimum
Net System Capacity Regions



2013CMDC-BurrZoubek (2)

Nebraska Net System Capacity Recommendations

Net Capacity (to fully meet needs 9 of 10 years)

Soil Texture	Available Water (in/ft)	Region 1 (gpm/ac)	Region 2 (gpm/ac)
Silt Loam	2.5	3.9	4.6
Sandy Clay Loam	2.0	4.1	4.9
Silty Clay Loam	2.0	4.2	5.1
Silty Clay	1.6	4.4	5.1
Sandy Loam	1.4	4.5	5.2
Loamy Sand	1.1	4.8	5.4
Fine Sand	1.0	5.0	5.9
Peak ET		5.7	6.6

2013CMDC-BurrZoubek (3)

- ### Pump Capacity Needed
- **East**
 - Peak - 5.7 gpm * 130 ac/85% = 871 gpm
 - Sandy Loam - 4.5 gpm * 130 ac/85% = 688 gpm
 - Silt Loam - 3.9 gpm * 130 ac/85% = 596 gpm
 - **West**
 - Peak - 6.6 gpm * 130 ac/85% = 1,010 gpm
 - Sandy Loam - 5.2 gpm * 130 ac/85% = 795 gpm
 - Silt Loam - 4.6 gpm * 130 ac/85% = 703 gpm

2013CMDC-BurrZoubek (4)

Know How Much Water You Are Pumping

System Capacity, gpm/acre	System Flow Rate for Land Acres of:				Depth Applied per Day, inches/day	Depth Applied per Week, inches/week	Time to Apply one-inch, days
	120	130	160	240			
3.0	360	390	480	720	0.16	1.1	6.3
3.5	420	455	560	840	0.19	1.3	5.4
4.0	480	520	640	960	0.21	1.5	4.7
4.5	540	585	720	1080	0.24	1.7	4.2
5.0	600	650	800	1200	0.27	1.9	3.8
5.5	660	715	880	1320	0.29	2.0	3.4
6.0	720	780	960	1440	0.32	2.2	3.1
6.5	780	845	1040	1560	0.34	2.4	2.9
7.0	840	910	1120	1680	0.37	2.6	2.7
7.5	900	975	1200	1800	0.40	2.8	2.5
8.0	960	1040	1280	1920	0.42	3.0	2.4
8.5	1020	1105	1360	2040	0.45	3.2	2.2

2013CMDC-BurrZoubek (5)

Root Development

6-8 leaf corn – 18" roots

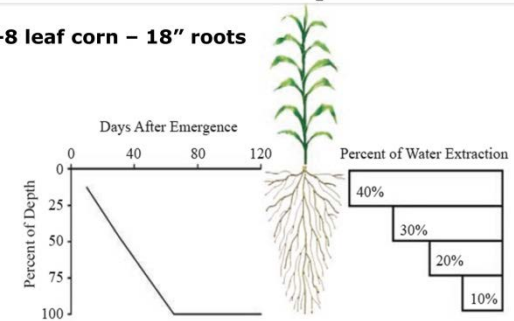


Figure 2. Root zone soil water extraction and plant root development patterns.

2013CMDC-BurrZoubek (6)

Predicting the Last Irrigation

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Know how. Know now.

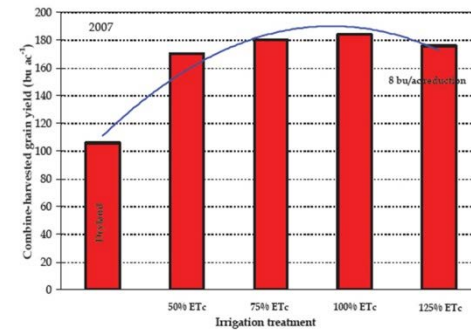
G1871

Predicting the Last Irrigation of the Season

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2013CMDC-BurrZoubek (7)

\$\$ lost in fuel and yield???



2013CMDC-BurrZoubek (8)

Yield and soil water content: bare soil and residue-covered soil, 2007 - 2010

		Yields			Water savings		
		Residue	Bare	Diff.	Yield*	Soil**	Total
Year	Crop	Bu/ac	Bu/ac	Bu/ac	Inch	Inch	inch
2007	Corn	197	172	25	3.0	0	3.0
2008	Corn	186	169	17	2.0	1.5	3.5
2009	Soyb.	68	58	10	3.0	2.0	5.0
2010	Soyb.	61	53	8	2.5	0	2.5

*Additional irrigation water needed on the bare-soil plots to produce same yield as on residue-covered plots
 ** Additional soil water (in the top 4 ft of soil, at the end of the growing season) in the residue-covered plots compared to the bare-soil plots

2013CMD-C-BurrZoubek (9)

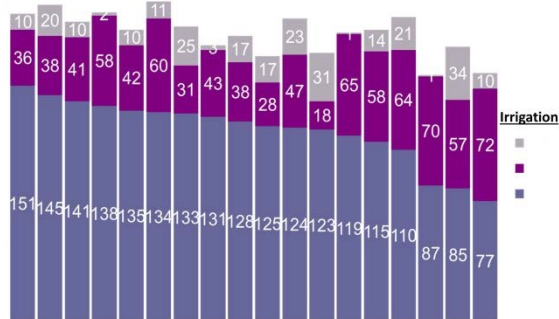
2003-2007 Average of Corn Yields and Water Use by Management Strategy and Site

Site	Management Strategy		
	Fully Water	Water Miser	Def.
Average Yields (bu/acre)			
Holbrook	199	195	
Culbertson	142	158	127
Holdrege	239	244	233
Curtis	203	207	173
Arapahoe	192	185	171
Loomis	204	202	212
Bartley	181	178	183
All Sites ¹	195	197	180
Percent of Fully Watered Yield			
	100	101	92
Applied Water (acre-inches/acre)			
Holbrook	10.0	8.2	
Culbertson	9.2	8.8	6.6
Holdrege	6.0	4.7	2.7
Curtis	8.1	8.1	5.0
Arapahoe	8.9	8.1	6.9
Loomis	4.7	3.6	3.1
Bartley	6.5	4.4	3.8
All Sites ¹	8.0	7.1	4.9
Percent of Fully Watered Applied Water			
	100	89	61

¹ Yield and applied water are weighted by the number of years of data at each site.

2013CMD-C-BurrZoubek (10)

Hybrid by Water Interactions



* Data collected in 2011 from Gothenburg and Brule.

2013CMD-C-BurrZoubek (11)