NDSU EXTENSION SERVICE

water spouts

No. 190 JULY 2001

http://www.ext.nodak.edu/extnews/snouts

Field Days and Irrigation Tours for 2001

MDT – Mountain Daylight Time

Hettinger Research Extension Center	July 10	3:00 p.m. MDT	(701) 567-4323
Dickinson Research Extension Center	July 11	8:00 p.m. MDT	(701) 483-2348
Williston Research Extension Center	July 12	8:45 a.m.	(701) 774-4315
Langdon Research Extension Center	July 17	8 a.m.	(701) 256-2582
Minot North Central Research Extension Center	July 18	9 a.m.	(701) 857-7679
Sidney, Montana Eastern Ag Research Center	July 18	8:30 a.m. MDT	(406) 482-2208
Carrington Irrigation Research Research Extension Center	July 19	9 a.m.	(701) 652-2951
Casselton Agronomy Seed Farm	July 25	5:30 p.m.	(701) 347-4743
Staples, Minnesota Central Lakes Ag Center Commercial Blueberry clinic	Aug 1	6 to 9 p.m.	(218) 894-5196
Staples, Minnesota Central Lakes Ag Center Dry Bean, Soybean Diseases Horticulture Tour	Aug 2	8:30 a.m.	(218) 894-5196
Dawson 2 miles north of I-94 exit Irrigation Potato Research	Aug. 7	10 a.m.	(701) 742-2189
Williston Mon-Dak Ag Field Tours *Irrigation Demo Fields*	Aug 8	9 a.m.	(701) 572-8880
Oakes Irrigation Research Site	Aug. 14	9 a.m.	(701) 742-2189

Hail at Hettinger Research Extension Center

On Monday June 18 an intense hailstorm swept through the Hettinger Research Extension Center. The storm destroyed all of the crop research plots and a few foundation seed increase fields. According to Eric Eriksmoen, research agronomist at Hettinger, there is almost nothing left to be salvaged. All of the small grain plots were heading out, the canola was flowering and the corn was 8 to 12 inches tall. “It looks like everything was mowed off with a dull mower blade.” There will be a forage grass tour starting at 3 p.m. on July 10.

MSIDA Irrigation Tour

The Missouri Slope Irrigation Development Association will be hosting its annual summer irrigation tour July 10. Tour registration will be at Kist Livestock, 1715 40th Ave SE (south side of Memorial Highway) in Mandan between 9 and 9:30 a.m. The tour schedule is as follows:

9-9:30 a.m.	**Gather at Kist Livestock**
10-12:30	**Northern Great Plains Research Farm** (swath grazing)
12:30	**Dennis Renner Farm** (Dakota Growers durum plot)
2:00	**John Boehm Dairy** (irrigators supply alfalfa hay)
3:30	**Meet at Mandan Airport** (near fuel tank)
4:00	**Nelson Sunrise Ranch** (leafy spurge control, flood irrigation, propane and diesel powered pumps with 3-phase generators used with center pivots, various crops)
6:30	**Pitchfork Fondue**

The cost of the tour is $15 (including the pitchfork fondue) or $10 for just the pitchfork fondue at 6:30 pm. For more information contact Kevin Nelson at (701) 663-3012 or Allen Wahl at (701) 258-3928 or any MSIDA director. Please RSVP by July 6.

Tom Scherer (701) 231-7239
NDSU Extension Agricultural Engineer
tscherer@ndsuext.nodak.edu

How Much Does it Cost to Pump an Acre-inch of Water?

Electricity and diesel fuel are the most common energy sources for pumping irrigation water. With rising costs for electricity and diesel fuel, pumping costs will also rise. Figures 1 and 2 show the pumping costs of 1 acre-inch of water for electricity and diesel powered pumping plants, respectively. These graphs apply mainly to center pivot sprinkler systems that obtain water from wells. However, the graphs apply to any irrigation system with similar pressure requirements. Since the water has to be applied to the field, the energy cost to move a center pivot (whether electric or hydraulic) has been included in the pumping cost.

Figures 1 and 2 show the graphs for a high, medium and low pressure pumping plant. The high-pressure system assumes a 50-foot lift in the well and 100 pounds per square inch (psi) of pressure at the pump. The medium-pressure system assumes a 50-foot lift in the well and 70 psi of pressure at the pump. The low-pressure system assumes a 50-foot lift in the well and 40 psi at the pump.

The statewide average irrigation cost for off-peak electric power is about $0.05 per kilowatt-hour (KWH) in North Dakota when adjusted to include the energy charge, the demand charge and/or annual charges. As shown by the arrow on Figure 1, the cost to pump water at this price for a medium pressure pumping plant is about $1.40 per acre-inch of applied water.

The statewide average irrigation cost for regular power is about $0.09 per KWH when adjusted to include the energy charge, the demand charge and/or annual charges. As shown on Figure 1, this corresponds to a pumping cost for a medium pressure pumping plant of $2.50 per acre-inch of applied water.

The current price for farm delivered diesel fuel is about $1.20 per gallon. As shown on Figure 2, this results in a pumping cost for a medium pressure pumping plant of $2.50 per acre-inch of applied water. It also shows that $1.20 per gallon diesel fuel is equivalent to $0.09 per KWH electricity.

Tom Scherer (701) 231-7239
NDSU Extension Agricultural Engineer
tscherer@ndsuext.nodak.edu

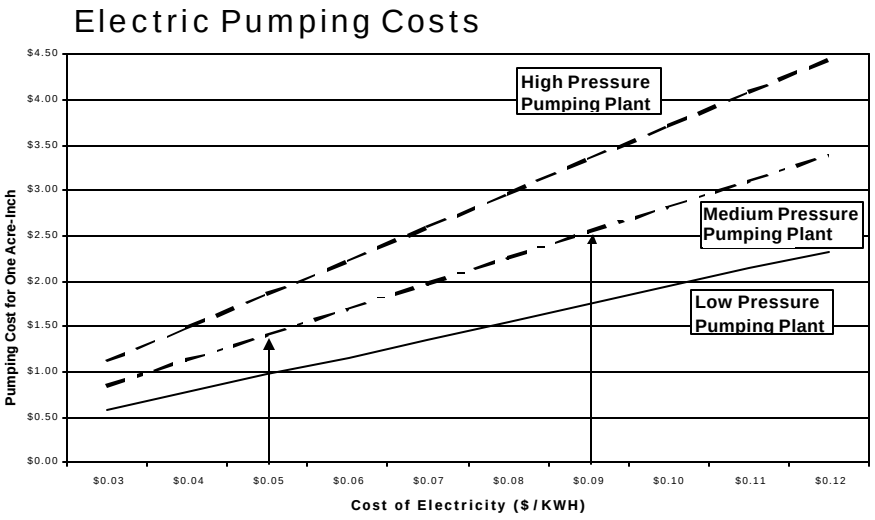


Figure 1.
Electric pumping costs for a high, medium and low pressure irrigation pumping plant.

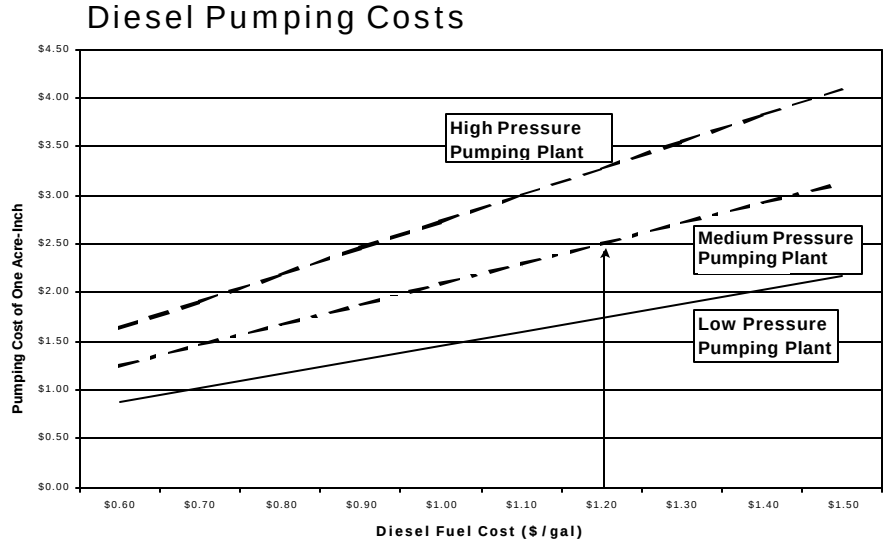


Figure 2.
Diesel pumping costs for a high, medium and low pressure irrigation pumping plant.

How Long Does it Take to Apply an Inch of Water with a Pivot?

Knowing how long it takes to apply a certain amount of water with a center pivot is a very important part of irrigation management. When dealers install a new center pivot or when they re-nozzle an existing pivot, they provide a chart showing the application amount for various settings of the percent timer. The percent timer determines the speed of the pivot and thus, for a given flow rate, the amount of water applied. Sometimes the chart is misplaced or lost for a particular center pivot. Often the flow rate to the pivot will change from what it was when the original chart was made. Over time, the flow rate will decrease which increases the time to apply the desired amount. If you know the following four parameters, you can calculate an application-time chart for any center pivot.

1) Area of coverage (this includes the area covered with an endgun)
2) Desired depth of application (water into the soil)
3) Flow rate to the pivot
4) Sprinkler application efficiency

Use this equation to calculate the application time:

$$A_t = \frac{453 \times \textbf{Area} \times \textbf{Depth}}{\textbf{Q} \times \textbf{E}_A}$$

Where A_t is the application time in hours, Area is the coverage area in acres, Depth is the desired application depth in inches, Q is the system flow rate in gallons per minute and E_A is the application efficiency. An example of calculating an application amount chart for a 128-acre pivot is shown in Table 1.

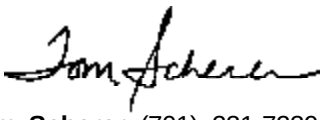
Table 1. Average application amounts (inches) for a 128-acre pivot with an application efficiency of 85%. For example, with 700 gpm it takes 100 hours to apply 1.03 inches of water.

Hours for 1 Rotation	FLOW RATE (gallons per minute)					
	500	600	700	800	900	1000
10	0.07	0.09	0.10	0.12	0.13	0.15
15	0.11	0.13	0.15	0.18	0.20	0.22
20	0.15	0.18	0.21	0.23	0.26	0.29
25	0.18	0.22	0.26	0.29	0.33	0.37
30	0.22	0.26	0.31	0.35	0.40	0.44
35	0.26	0.31	0.36	0.41	0.46	0.51
40	0.29	0.35	0.41	0.47	0.53	0.59
45	0.33	0.40	0.46	0.53	0.59	0.66
50	0.37	0.44	0.51	0.59	0.66	0.73
55	0.40	0.48	0.56	0.65	0.73	0.81
60	0.44	0.53	0.62	0.70	0.79	0.88
65	0.48	0.57	0.67	0.76	0.86	0.95
70	0.51	0.62	0.72	0.82	0.92	1.03
75	0.55	0.66	0.77	0.88	0.99	1.10
80	0.59	0.70	0.82	0.94	1.06	1.17
85	0.62	0.75	0.87	1.00	1.12	1.25
90	0.66	0.79	0.92	1.06	1.19	1.32
95	0.70	0.84	0.98	1.12	1.25	1.39
100	0.73	0.88	1.03	1.17	1.32	1.47

The application efficiency is the ratio of the volume of water that actually gets into the soil to the volume of water that is pumped. Weather conditions during the day can significantly affect this value. In the morning, when there is no wind, the application efficiency might be over 90% for a pivot. By mid-afternoon, when the air temperature is high, the relative humidity is low and the wind is greater than 15 mile per hour, the application efficiency might drop to below 50%. An application efficiency of 85 percent has been shown by research to be a good average value to use for North Dakota conditions.

The values in Table 1 will be correct if mechanical aspects of the sprinkler system are not creating problems. However, plugged nozzles, nozzle wear, sprinklers not rotating properly, pump wear which causes a reduction in pressure or flow rate or both, and leaks in the piping are some of the more common mechanical problems associated with sprinkler systems.

The only way to truly find out the application amount under a pivot is to measure it. A mini can-test can be performed by using four or five identical rain gages. For a typical seven or eight-tower pivot, the first rain gage should be located somewhere between the second and third tower with the rest located between the remaining towers. To continually monitor the application amounts of the pivot, the rain gages could be left in place throughout the growing season.



Tom Scherer (701) 231-7239
Extension Agricultural Engineer
tscherer@ndsuext.nodak.edu

A New Opportunity for North Dakota

In the fall of 2000 the Central Dakota Growers, a farmers' cooperative located in North Dakota reorganized to form a new organization that fit the total state for production. The Commercial Vegetable Growers of North Dakota was created from the solid base of the former cooperative. New board members were recruited from other areas not previously represented. The mission of CVG of ND is to develop the under-utilized water resources in the state by establishing new crops that effectively use the resources to create economic opportunity.

Vegetable crops were seen as the logical focal point. In previous years, the AVIKO potato processing facility was created to fill a need for diversification and help farmers who were previously growing only commodity grain crops. As the acreage needed for potatoes stabilized on a year to year basis, other crops were needed to provide a means to rotate potato land and to add new markets.

NDSU Extension Service
Agricultural and Biosystems Engineering
P.O. Box 5626
Fargo, ND 58105-5626

Non-Profit Org.
U.S. Postage
Paid
Permit No. 818
Fargo, N.D.

With support and funding from North Dakota and several economic development entities in towns and counties, CVG of ND hired a person from the vegetable industry to develop potential markets that can be filled in the state. Mike Kirby from Oviedo, Florida, was hired. Since beginning work, he has lined up contracts to minimize risk on the new ventures. A number of meetings were held in the state to inform potential growers about the project. A core group of growers committed to growing onions and other vegetables for processors in the eastern United States.

At this time over 200 acres of onions have been planted in North Dakota scattered across all of the vegetable production-capable land. Two large vegetable processing companies, one in Maryland and the other in New Jersey, have contracted for 7.2 million pounds of onions from this production. In addition, a long-established grower-shipper of onions in Minnesota has agreed to pack and sell a portion of the onion crop to its established customer base in the fresh market. Positive production and markets met properly in 2001 could lead to increased acreage for 2002.

Cabbage and pumpkins are also being grown this season as part of the CVG of ND effort to create opportunities for vegetable production and markets. Plans are being made to showcase the total new vegetable production with a two-day tour in late August for key representatives of major vegetable processing companies.

If you would like further information about the goals and activities of the Commercial Vegetable Growers of North Dakota, please contact us.

Rudy Radke (701) 356-0222
NDSU Extension Diversification Specialist
Coordinator of the High Value Irrigated Crops Task Force
rradke@ndsuext.nodak.edu

Mike Kirby (407) 920-1658
Director of Marketing
Commercial Vegetable Growers of North Dakota
mkirby@mpinet.net