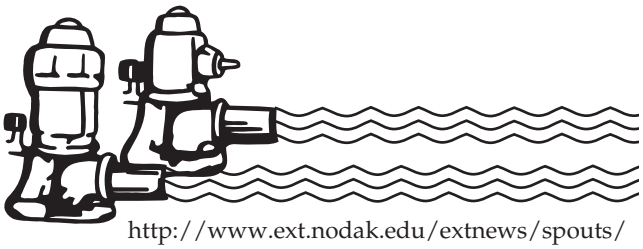

# water spouts

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

No. 224 AUGUST 2006

## Upcoming NDSU Field Days and other crop related events

**Tappen** Aug. 10 (218) 773-3633
Irrigated Potato Field Day
I-94, Pettibone exit, north side

**Staples, Minn.** Aug. 10 (320) 589-1711
High-tunnel Vegetable Production (2 to 8 p.m.)
Central Lakes Agriculture Center

**Verndale, Minn.** Aug, 11 (218) 385-3000
Irrigated Rotational Dairy Pasture (10 a.m. to noon)
A center pivot with 150 cows north of Verndale

**Kidder County Tour** Aug. 29 (701) 223-8332
North Dakota Water Education Foundation
Tour begins and ends in Bismarck

## Kidder County Irrigation/Processing Tour Aug. 29

The North Dakota Water Education Foundation is sponsoring a tour of irrigation and processing in Kidder County on Tuesday, Aug. 29. The tour will visit local landowners, the KidCo whole-peel onion plant, irrigated potatoes and local irrigation research fields.

The tour fee is $15 per person and must be received one week prior to the tour. The tour will begin and end in Bismarck. For more information or to register, call the North Dakota Water Education Foundation at (701) 223-8332 or visit its Web site at *www.ndwater.com*.

## Irrigated Potato Field Day at Tappen

The Northern Plains Potato Growers Association will host its annual Irrigated Potato Field Day at the irrigation research site three miles east of Tappen on Thursday, Aug. 10, from 9 a.m. to noon. The research site is on the north side of I-94 at the Pettibone exit. At noon, the Potato Associates will host a lunch.

A tour of research and demonstration plots will include Gary Secor and Neil Gudmestad talking about potato disease trials, Susie Thompson talking about variety trials and Harlene Hatterman-Valenti talking about herbicide trials and potato agronomic trials, including hill configuration, irrigation and fertility.

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NDSU Extension Service
North Dakota State University

County Commissions, North Dakota State University and U.S. Department of Agriculture cooperating. Duane Hauck, Director, Fargo, North Dakota. Distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. We offer our programs and facilities to all persons regardless of race, color, national origin, religion, gender, disability, age, veteran's status or sexual orientation; and are an equal opportunity institution. This publication will be made available in alternative formats for people with disabilities upon request, (701) 231-7881.

## Tour of High-tunnel Vegetable Production Systems

High tunnels are a type of low-cost greenhouse for early planting of vegetables, allowing earlier production. A tour of high-tunnel systems featuring tomatoes, cucumbers and peppers planted on April 25 will be held at the Central Lakes Agriculture Center in Staples, Minn., on Aug. 10. The tours will take place between 2 and 8 p.m. Contact Jerry Wright, University of Minnesota Extension Service, in Morris, Minn., at (320) 589-1711 or e-mail at jwright@umn.edu.

## Tour of Irrigated Dairy Pasture for Rotational Grazing

Irrigated rotational grazing systems are of great interest to many dairy and beef farmers. A tour of a dairy operation that rotational grazes 150 cows under a standard quarter-section center pivot will take place from 10 a.m. to noon Aug. 11. The farm is north of Verndale, Minn. (about 100 miles east of Fargo on U.S. Highway 10). Contact Vince Crary, Otter Tail County Extension educator, at (218) 385-3000 or e-mail at vcrary@co.otter-tail.mn.us.

## Spraying on the Road is Against the Law

With the hot, dry weather we have been experiencing, center pivots are running more than they have in recent years. Some pivots that haven't been operated for a couple of years may be in use and the end gun may be spraying onto some roads.

In 1989, the North Dakota Legislature passed a law concerning irrigation systems and roads. Section 61-14-16 of the North Dakota Century Code states:

"No person may place, erect, or operate a sprinkler irrigation system, center pivot irrigation system, or other irrigation works or equipment upon or across any highway, street, or road or in such a manner as to willfully allow water from the irrigation works or equipment to flow or fall upon any highway, street, or road."

If you notice the roads near your pivot are wet after irrigation, you should take some time and adjust the end gun's on/off settings to make sure the end gun does not spray onto a road. In the past, wet roads or a motorist driving into water from the end gun have caused accidents. A person violating this section is guilty of an infraction.

Incidentally, this law does not apply to the transportation of irrigation works or equipment upon a highway, street or road. This means a moving irrigation system can be run across a road as long as it isn't spraying water.

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# How Far Can You Economically Pump Irrigation Water?

Quite often the question comes up about the maximum distance water can be pumped to be economical for irrigation. This is straightforward engineering calculation; however, the maximum distance is dependent on how much additional money can be spent on energy and still be an economical investment.

A typical center pivot irrigation system in North Dakota has the well about 1,500 feet from the pivot point, which puts it outside the last tower of the pivot. The well generally is about 100 feet deep. With most pivots having been converted to lower pressures during the last 10 years, the pivot pressure is about 35 to 45 pounds per square inch (psi).

If we assume the vertical lift of water in the well and the pivot pressure are the same for a pivot near the well or a distance away, then the factors that determine the economical distance to pump water are the flow rate, the diameter of pipe, the length of the pipeline (pipe friction losses), the vertical lift between the pump and the point of water delivery, and the most important, how much you want to pay in extra energy charges. Figure 1 shows the cost per irrigated acre to pump water from distances of one-quarter of a mile to four miles, with 0, 100- and 300-foot vertical lifts using off-peak electricity. Figure 2 shows the cost per irrigated acre using diesel fuel at $2.90 per gallon. Figure 3 shows how the vertical lift and length of the pipeline are determined.

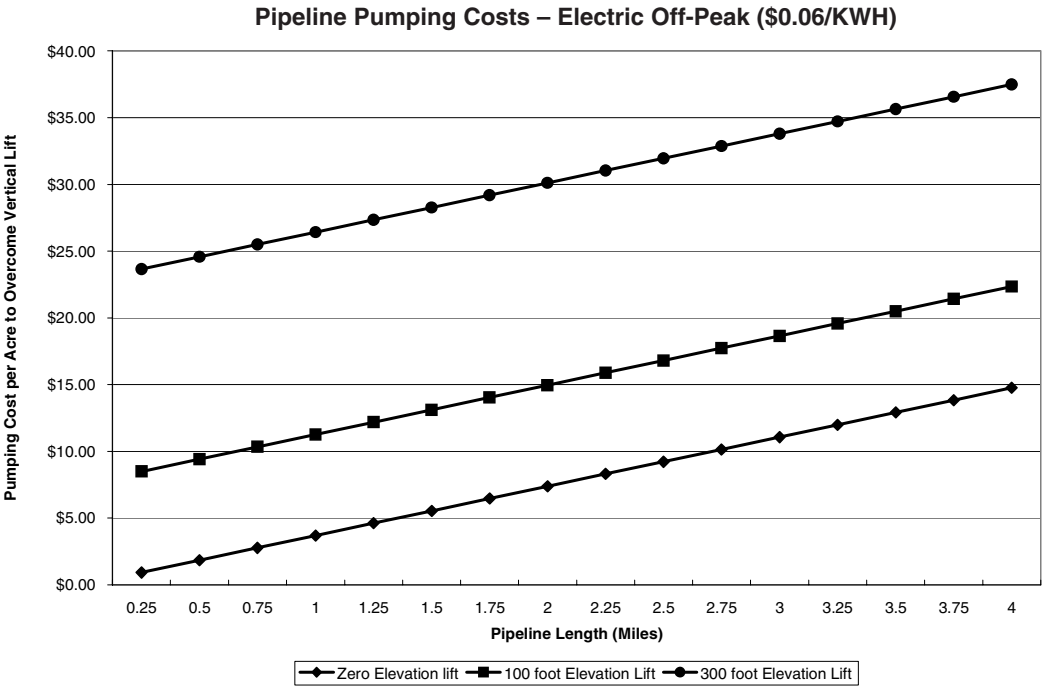


**Figure 1.**

Pumping costs using off-peak electricity for various pipeline lengths and vertical lifts from the pump to the point of discharge.

This graph is based on 800 gallons per minute provided to a 128-acre pivot that is run for 800 hours during the growing season.

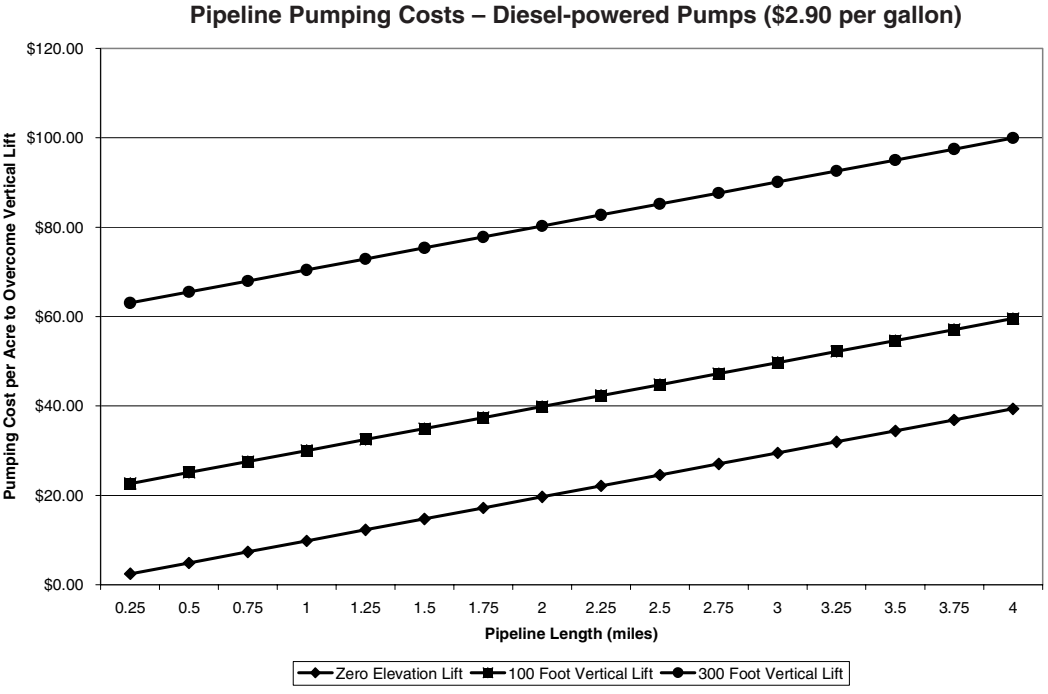


**Figure 2.**

Pumping costs using diesel at the current farm-delivered price of $2.90 per gallon for various pipeline lengths and vertical lifts from the pump to the point of discharge.

This graph is based on 800 gallons per minute provided to a 128-acre pivot that is run for 800 hours during the growing season.

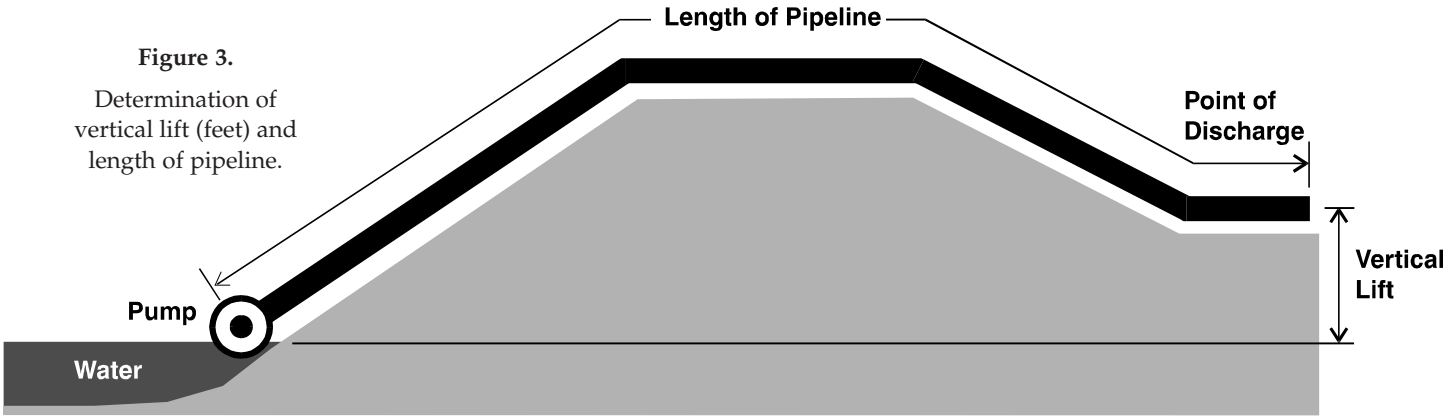


**Figure 3.**
Determination of vertical lift (feet) and length of pipeline.

Figure 1 shows pumping water four miles with zero vertical lift costs $15 per acre with off-peak electrical energy. But at the same energy cost per acre, you can pump water only two miles if the water has to be lifted 100 feet. If you wanted to pay $38 per acre in energy costs, you could pump water four miles with a 300-foot vertical lift.

Figure 2 shows the cost is $40 per acre, using a diesel powered pump (at current prices), to pump water four miles with zero vertical lift, $60 per acre to pump water four miles with a 100-foot vertical lift and $100 per acre if the vertical lift is 300 feet.

Please remember, these pumping energy costs are not the total pumping energy costs. They only reflect the additional energy cost due to pipeline length and vertical lift from the pump. They do not include the pivot pressure, and for wells, the vertical lift to get the water to the surface, or for surface water bodies, the suction lift. Also, if you pay regular electrical rates (not off-peak) the pumping cost will be about double what is shown in Figure 1.

Figures 1 and 2 are based on a 128-acre pivot using 800 gallons per minute (gpm) for 800 hours a growing season.

If we increase the number of pivots to two requiring 1,500 gpm to irrigate 260 acres and use a 12-inch diameter pipeline, then for $13 per acre in off-peak electrical energy costs, you could pump water four miles with a 100-foot vertical lift. For three pivots (390 acres) requiring 2,250 gpm and 15-inch diameter pipe, you could pump water with off-peak electrical power four miles with a 100-foot vertical lift for $11 per acre.

From this example, you can see easily that for an equal vertical lift, the more land that is irrigated, the farther you can pump the water for the same energy costs on a per-irrigated-acre basis. In summary, when the question comes up about the distance irrigation water can be pumped economically, the answer depends on the length of the pipeline and the vertical lift between the pump and the point of discharge.

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## August is the Most Important Irrigation Month

This has been a hot, dry summer so far, putting a strain on irrigation systems and water management. Crop water use is very high during these hot, dry days. But you have to be more vigilant in August because irrigation water management is very important for long-season crops, such as corn, dry beans, potatoes, sunflowers, sugar beets and soybeans. This is the month when all these crops are filling out their pods, ears or seeds, or bulking the tubers and roots. Water stress in August has the greatest impact on yield.

Historically, the average rainfall amount during August is about 2 inches in the eastern half of North Dakota and about 1.5 inches in the west. Less rain, coupled with declining water levels in wells and streams during August, means irrigation water management becomes very important.

Average water use for August, along with expected yield increase due to irrigation of commonly irrigated crops, is shown on the following table.

| | Average water use in August | Yield increase for each additional inch of water applied per acre |
|---|---|---|
| | (inches) | |
| Corn | 6.3 | 8 to 14 bushels |
| Alfalfa | 6.3 | 0.2 to 0.25 tons |
| Pinto Beans | 5.8 | 250 to 300 lbs |
| Potatoes | 5.5 | 22 to 29 cwt |
| Soybeans | 5.9 | 2 to 4 bushels |
| Sunflower | 5.2 | 170 to 190 pounds |

The average daily water use for these crops is about 0.2 inch, but on some days during hot, dry periods, water use can be more than 0.3 inch. More site-specific daily crop water use estimates can be found on the North Dakota Agricultural Weather Network (NDAWN) Web site at *http://ndawn.ndsu.nodak.edu/*. The crop water use tables and maps are under the "Applications" link on the left side of the opening page.

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Crop water use estimates also can be found in publication AE-792, "Irrigation Scheduling by the Checkbook Method," available at your county Extension office. This publication has tables showing crop water use for most irrigated crops based on the peak daily air temperature and week past emergence.

As crops mature, cutting back on irrigation during the latter part of August is common. This may be an expensive mistake. Research has shown corn that was moderately water-stressed toward the end of the growing season had an average yield reduction of 13 percent, compared with corn that was fully irrigated to maturity.

Whether you use NDAWN or AE-792 to obtain daily crop water use values to see how much water to apply, remember the amount of applied irrigation water must be greater to compensate for evaporation and drift losses. Research has shown 85 percent application efficiency is reasonable for North Dakota. This means almost 0.26 inch per acre must be pumped to get a net 0.22 inch into the soil for the crop to use. Likewise, if you set the pivot timer to apply 0.7 inch of water per acre, only about 0.6 inch will infiltrate into the soil for crop use.

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