water spouts

No. 238 AUGUST 2008

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

Upcoming NDSU Field Days

Tappen Irrigated Potato Field Day I-94, exit 217 (Pettibone), north side	Aug. 21	(701) 231-7076

Irrigated Potato Field Day at Tappen

The Irrigated Potato Field Day will be held on Thursday, Aug. 21, at the irrigated potato research site near Tappen, N.D. The field day will begin at 4 p.m. and end with a meal sponsored by the Potato Associates.

The irrigated site is used by potato scientists at NDSU to conduct research plot trials for disease management, variety evaluation and production under irrigated conditions for the benefit of the irrigated potato industry, which primarily is in central North Dakota. Researchers from NDSU will be present to explain and discuss the trials.

The irrigated research site is owned and supported by the Northern Plains Potato Growers Association to conduct irrigated potato research. The research site is three miles east of Tappen on the north side of Interstate 94 at exit 217 (Pettibone exit). The field day is open to all interested people.

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Summer Water Tours – North Dakota Water Education Foundation

In the next month, the North Dakota Water Education Foundation will offer two water tours. These tours provide a firsthand look at North Dakota's critical water issues and the newest value-added "crop" – wine grapes. Registration is $15 per person and includes tour transportation, meals, refreshments, informational materials and a one-year subscription to *North Dakota Water* magazine.

Understanding Garrison Diversion and MR&I – Aug. 13

This tour begins and ends in Bismarck. The passage of the Garrison Diversion Reformulation Act in 1986 and the Dakota Water Resources Act in 2000 changed the emphasis of the Garrison Diversion project to municipal, rural and industrial (MR&I) water supply projects. Tour stops will include the Snake Creek Pumping Plant, Lake Sakakawea, Audubon National Wildlife Refuge, Brekken-Holmes Recreation Area, McClusky Canal, Turtle Lake Irrigation District, local farms and Lonetree Wildlife Management Area.

Grapes, Vineyards and Wineries – Sept. 10

This tour begins and ends in Casselton. Stops will include fruit and grape wineries, vineyards and grape research taking place throughout eastern North Dakota.

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Estimating Yield of Irrigated Crops

The weather this growing season has been rather strange. A cool, wet spring followed by a relatively mild summer has resulted in less than normal heat units. Very few days have had high temperature over 90 F, thus crop development is behind normal in most areas of North Dakota. With variable crop development coupled with high crop prices, trying to estimate potential yields can be very helpful.

Corn yield

Producers have several techniques for estimating corn grain yield prior to harvest. This version was developed by the Agricultural Engineering Department at the University of Illinois and is the one most commonly used.

A numerical constant for kernel weight is figured into the equation to calculate grain yield. Since weight per kernel will vary depending on hybrid and environment, the yield equation should be used only to **estimate relative grain yield**. For example, yield will be overestimated in a year with poor grain fill conditions, while it will be underestimated in a year with good grain fill conditions.

Step 1. Count the number of harvestable ears per 1/1,000th acre (Table 1) from several representative locations in the field. Don't pick the best or worst areas. Pick every fifth ear in the sample row.

Step 2. Count the number of kernel rows per ear. Calculate the average of all the ears.

Step 3. Count the number of kernels per row on each of the same ears, but do not count kernels on either the butt or tip that are less than half size. Calculate the average.

$$\text{Estimated Yield} = \frac{\text{(results from step 1 x step 2 x step 3)}}{90}$$

Soybean yield

The most accurate estimates of soybean yield are taken within three weeks of maturity. Assume 2.5 beans per pod.

Step 1. Determine the number of feet of row needed to make 1/1,000 of an acre (Table 1).

Step 2. Count the number of plants in 10 different randomly selected sample areas. Calculate the average.

Avg. = ________ plants per 1/1,000 of an acre

Step 3. Count the number of pods per plant on 10 randomly selected plants from each sample area. Calculate the average.

Avg. = ________ number of pods plant

Step 4. Calculate the number of pods per acre by multiplying the plant population by the number of pods per plant.

Results from Step 2 x Step 3 x 1,000 = ________ pods per acre

Step 5. Calculate the number of seeds per acre by multiplying pods per acre by 2.5 seeds per pod.

Result from Step 4 x 2.5 = ________ seeds per acre

Step 6. Calculate the number of pounds per acre by dividing seeds per acre by an estimate of 2,500 seeds per pound.

Result from Step 5 ÷ 2,500 = ________ pounds per acre

Table 1. Length of row that represents 1/1,000th acre. An accurate estimate of plant population per acre can be obtained by counting the number of plants in a length of row equal to 1/1,000 of an acre.

Row width	Length of single row to equal 1/1,000th of an acre	
(inches)	(feet)	(inches)
6	87	1
7	74	8
8	65	4
10	52	3
15	34	10
20	26	2
28	18	8
30	17	5
32	16	4
36	14	6

Step 7. Estimate yield by dividing pounds per acre by 60 pounds per bushel.

Result from Step 6 ÷ 60 = ________ estimated yield in bushels per acre

Example: Soybeans are planted on 15-inch rows (34.9 feet equals 1/1,000 of an acre from Table 1). The average number of plants per 34.9 feet is 122, with an average of 21 pods per plant. The estimated yield is: (122 x 21 x 1,000 x 2.5) / (2,500 x 60) = 42.7 bushels per acre

Dry edible bean yields

You can estimate dry bean yields by knowing the number of seeds per pod, pods per plant and plants per 1/1,000th of an acre. At the time of counting seeds and pods, the maturity status of each should be determined.

If a seed or pod will not mature, it shouldn't be counted. Then count the total plants per 1/1,000th acre to complete the data collection.

Yield estimation

Within a representative and uniform plant stand, randomly select five plants each from at least five locations in the field.

Keeping all plant data separate, pull and count the pods from each plant and then count the seeds to determine average seeds per pod for all five replications. These data are combined with the average number of plants per 1/1,000th acre.

Average number of seeds per pound

Kidneys	900-1,000
Pintos	1,400
Great Northerns	1,600-1,800
Pinks/Small Reds	1,600-2,000
Navies/Blacks	3,000

Seeds per pound can vary 10 percent to 20 percent for different varieties within a bean class. If available, use reported estimates for seed number per pound for your variety.

The accuracy of yield estimates can be improved by counting seeds and pods from at least 10 plants per replication.

Calculations

Step 1. Average seeds per plant = (average seeds per pod) x (average pods per plant).

Step 2. Yield in pounds per acre = (Average seeds per plant) x (plants per 1/1,000th of an acre) x (1,000) divided by seeds per pound of the variety equals.

Reprinted and edited from a previous *Water Spouts* article by Duane R. Berglund, NDSU Extension agronomist (retired).

Web-based Tools to Improve Irrigation Energy Efficiency

Irrigation is a heavy user of energy and, as pumping costs continue to increase, improving energy efficiency is a very desirable goal. Although irrigation rates for electricity have increased slightly in the last few years, irrigators that use diesel, natural gas and propane have seen their pumping costs increase dramatically. Exploring options for improving pumping efficiency is the object of three Web sites you might find useful.

The first Web site was developed by the Natural Resource Conservation Service (NRCS). It contains a set of four online energy conservation estimator tools designed to help farmers quickly analyze their energy use. The four topics are irrigation, tillage, animal housing and nitrogen (*www.nrcs.usda.gov/technical/energy/*). These tools are designed to increase energy awareness in agriculture and help farmers and ranchers identify where they can reduce energy costs. The results generated are based on NRCS models and illustrate the magnitude of savings for different scenarios.

The energy tool for irrigation enables you to estimate the potential savings associated with pumping water for irrigation. NRCS technical specialists developed this model for crops grown in a specific region based on energy prices and pumping requirements. This tool does not provide field-specific recommendations.

The second Web site, developed for the NRCS by the University of Wisconsin (*http://144.92.31.19/default.aspx*), is an energy self-assessment estimator. It has nine energy conservation modules, one of which is for irrigation. This site requires a little more time and irrigation system-specific information to do a complete evaluation. It will perform energy audits for center pivot, lateral-move, solid-set sprinkler (hand-move), drip/trickle, flood and furrow irrigation systems.

The third Web site contains a well-documented set of energy saving tips for irrigated agriculture (*http://attra.ncat.org/attra-pub/energytips_irrig.html*). It was compiled by the National Sustainable Agricultural Information Service. This is an online publication that contains sections dealing with recommended installations of pumps, explanations of electrical use and charges on your power bill; common causes of wasted energy and hardware improvements, and explains a simple method to determine irrigation pumping plant efficiency.

Crop Water Use in August

Irrigation water management during August is very important for long-season crops, such as corn, dry beans, potatoes, sugar beets and soybeans.

In normal years, crops use more water in July than August and the average rainfall amounts are correspondingly greater in July. The average rainfall in July is 2.75 inches in Carrington and 2.35 inches at Oakes, whereas the average rainfall in August for both locations is about 2 inches. This indicates that the irrigation water demand is generally greater in August than in July. Couple this with declining water levels in wells and streams during August and irrigation water management obviously becomes very important.

Average water use of common irrigated crops for July and August is shown on the following table.

Average Water Use (inches)

	July	August
Corn	6.6	6.3
Alfalfa	6.6	6.3
Pinto Beans	7.0	5.8
Potatoes	7.0	5.5
Soybeans	6.5	5.9

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As crops mature, cutting back on irrigation during the latter part of August is common. This can be an expensive mistake. Research has shown that corn, 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.

Crop water use tables in publication AE-792, "Irrigation Scheduling by the Checkbook Method," show that water use is similar for most full-season crops during August. The following table shows the estimated daily water use based on maximum temperature.

Maximum Air Temperature	Estimated Daily Water Use for Long-season Crops in August
50-59 F	0.08 inch
60-69 F	0.13 inch
70-79 F	0.19 inch
80-89 F	0.24 inch
90-99 F	0.29 inch

More site-specific crop water use estimates can be obtained from the North Dakota Agricultural Weather Network Web site (*http://ndawn.ndsu.nodak.edu*). Click on *Applications* on the left side of the page. Remember, the table above and the values from the Web site give the actual water use by the crop.

Applied irrigation water must be greater to compensate for evaporation and drift losses. Research has shown that 85 percent application efficiency is reasonable for North Dakota. This means that 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 pump 1.18 inches of water per acre, only 1 inch will infiltrate into the soil for crop use.

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