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Oakes Irrigation Research Site Field Day – Aug. 20

The Oakes Irrigation Research Site field day will be held Thursday, Aug. 20. The program begins with refreshments and rolls at 8:45 a.m., with the tour starting at 9 and ending about 11:30. The 20-acre irrigation research site, associated with the Carrington Research Extension Center, is 3.5 miles south of Oakes on the west side of North Dakota Highway 1.

The tour will start with a review of the current research program, followed by an update on developments to expand the research conducted at the Oakes site.

Other topics to be covered and the presenters are:

- New developments in mechanized water management and the expanded linear irrigation system being installed at the research site this fall – Tom Scherer, NDSU Extension Service irrigation specialist
- Research projects focused on managing white mold (sclerotinia) in soybeans and control of this disease in dry beans – Michael Wunsch, Carrington Research Extension Center plant pathologist

Northern Plains Potato Grower Association Field Day – Aug. 20

The Northern Plains Potato Growers Association field day will start at 7 a.m. Thursday, Aug. 20, at Hoverson Farms with breakfast, which will be followed by research presentations. The farm is on the south side of the intersection of U.S. Highway 2 and North Dakota Highway 18 (about 25 miles west of Grand Forks).

The tour then will proceed to the Forest River Colony near Inkster, N.D., where lunch will be served at noon. Following lunch, a field tour of the irrigated research trials will be held. The tour will conclude with an evening barbeque near Hoople.

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Staples, Minn., Central Lakes College Ag and Energy Center Field Day – Aug. 21

The Central Lakes College Agriculture and Energy Center at Staples, Minn., is sponsoring a demonstration and field day on Aug. 21. The center is at 26505 County Road 2 (about a mile north/northwest of Staples). The field day will begin at 9 a.m. and is open to everyone. Field day highlights include:

- Quad-copter (drone) demonstrations
- Multiple variety trials on more than 50 plots
- Irrigation and water management technology and control

highlights continue on Page 2
• Tractor driving and demonstration with global positioning system (GPS) guidance technology
• More than 40 partners from around the Midwest sharing project information and results to date
• Local foods tour, including the vineyard and orchard
• The latest in technology and applied science in central Minnesota
• Luncheon program that includes Rep. Collin Peterson and Minnesota Agriculture Commissioner Dave Frederickson

For a copy of the field day brochure or more information, visit [www.clcmn.edu/ag-energy-center](http://www.clcmn.edu/ag-energy-center) or call the center at (218) 894-5141.

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Summer Water Tours – North Dakota Water Education Foundation

These summer water tours provide a firsthand look at North Dakota’s critical water issues. Registration is $20 per person and includes tour transportation, meals, refreshments, informational materials and a one-year subscription to North Dakota Water magazine. The tours offered are:

- Southwest Oil Impact and Water Supply – Aug. 13
- Water in the Bakken – Sept. 9
- Buffalo City (Jamestown) Opportunities and Water Use – Oct. 7

To register for one or more of these tours, go to [www.ndwater.com/programs](http://www.ndwater.com/programs) and click on “Summer Water Tours” on the left-hand menu or send a check to NDWEF, P.O. Box 2254, Bismarck, ND 58502. Please indicate which tour or tours you want to attend and include the number of people who plan to attend. For more information, give us a call or send an email.

North Dakota Water Education Foundation, (701) 223-8322
Fax (701) 223-4645
ndwaterusers@btinet.net

Reducing Cavitation and Impeller Wear on Centrifugal Pumps

If your pump sounds like it is pumping gravel, chances are it is due to cavitation.

Cavitation is caused by water going from a liquid to a vapor state. A centrifugal pump operates by creating a partial vacuum (pressure less than atmospheric) at the inlet, or “eye,” of the impeller.

When the vacuum at the eye of the impeller reaches the vapor pressure of water, vapor bubbles form. As the vapor bubbles pass through the vanes of the impeller, the pressure increases and the bubbles implode.

Usually, the implosions occur near the vanes of the impeller and knock off bits of metal. Through time, cavitation will cause the impeller to look like it is riddled with pockmarks and holes, similar to Swiss cheese.

Cavitation will cause the following to occur:
- The pump will sound like it is pumping gravel.
- The pump may vibrate excessively.
- Vibration can cause bearings to fail and affect the motor or engine.
- The packing gland leaks excessively and requires constant adjustment.
- The flow rate and pressure will decrease.

A reduced flow rate can cause irrigation sets to be longer, resulting in more time to complete an irrigation cycle. It certainly will result in more energy consumption and reduced pumping plant efficiency, along with lower irrigation application efficiency.

Cavitation is serious enough to spend some time preventing it from happening. Here are some rules to follow:
- Use a suction pipe that is at least one nominal diameter larger than the pump suction pipe. Larger suction pipe diameters mean lower water velocity and less friction loss.
- Place the pump as near the water source as possible.
- Use an eccentric reducer on the pump inlet so no air is trapped at the pump inlet.
- Do not obstruct the suction pipe with valves or constrictions. However, a foot valve in the water at the end of the suction pipe does not create problems.
- The suction pipe should take the most direct route to the water. A straight length of pipe from the water to the pump inlet is best.
- Use a screened inlet of sufficient area to allow water to enter freely. A small screen area will result in higher entrance velocity, which can cause vortexing, entrain air and pull more debris to the screen.
- Silt, sand and rocks can cause impeller wear. If you have to pump dirty water, make a sump as long as possible to allow silt and sand to settle out before the water reaches the pump intake. Screen the sump to exclude rocks and debris.
- The packing gland is where the shaft from the motor or engine enters the pump at the rear of the volute case. It is there to keep the shaft watertight, cool and lubricated.
- Most packing assemblies have a gland, lantern ring and packing rings. The gland needs to drip water at a steady rate when the pump is running to lubricate and cool the pump shaft. It should be checked whenever the pump is started to ensure it is dripping properly. Never overtighten the gland and cut off the water flow.

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Impact of Air in Irrigation Pipelines

A common misunderstood concept is how air gets into a pipeline and its effect on the operation of the irrigation system.

All irrigators are familiar with the air release valves mounted near the discharge of a pump. When the pump is turned on, the air in the pipeline is discharged from the valve, sometimes watering down those unfortunate enough to be standing in front of it.

Many irrigators also are familiar with the air release valves installed at the high point of a pipeline that goes over a hill between the pump and irrigation system. Because these are often in the middle of fields, they have to be farmed around, and many have been broken off or shut off because they are perceived to be a nuisance and an obstacle to field operations. However, they should be maintained and kept working because they are important for proper operation of the irrigation system.

Air gets into a pipeline in two main ways. The first is at startup, when the pipeline is being filled. Much of this air will be pushed down the pipeline, where some will collect in the high points of the pipeline, and the rest will be pushed out through air release valves. If no air release valves are at the high points, the air will create a bubble that will not be pushed out by flowing water, even under pressure.

The second source of air is the water. By volume, water contains about 2 percent air, even water from a well. This doesn’t sound like much, but consider that this would form a 40-foot bubble in a 2,000-foot pipeline, no matter the pipeline diameter. During pumping, the air will leave the water and contribute to the bubble at the high points of the pipeline.

Can this bubble of accumulated air have an impact on the flow through the pipeline? Absolutely.

Many irrigators have a hard time understanding this principle, but the bubble of accumulated air acts like a pipeline restriction and can reduce the flow rate and increase the pressure at the pump. In addition, sometimes packets of air will be pushed out of the bubble to flow downstream and create the potential for water hammer (a high-pressure surge) that can damage pipeline joints and connections. The solution is to make sure the air release valves at the pump and on the high points of the pipeline are working and maintained.

Air in the water also can affect the operation of the sprinklers on a center pivot. If you notice the sprinklers on the pivot sometimes hiss from escaping air, then air is in water and it probably is accumulating near the top of the gooseneck. This can reduce the flow to the sprinkler head, resulting in uneven water application.

The solution is to install a continuous-air-release valve near the pivot point. A continuous-air-release valve will let air out of the system, even under pressure. The valves are readily available from sprinkler manufacturers.

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When to Stop Irrigating

This year is about as close to a normal weather year as we have seen in a long time. The favorable weather and timely rains have resulted in good growing conditions, and as we enter the drier part of the year, recognizing when a crop has matured is important.

Knowing the indicators of physiological maturity of the crops being irrigated and checking soil moisture levels will help you determine when irrigation no longer is needed.

Corn

Corn should be irrigated until sufficient soil moisture is available to ensure that the milk layer of the kernel moves down to the tip of the kernel or black layer formation (physiological maturity).

To check the milk line, break an ear of corn in half. The milk line is clearly visible on the kernels as the border between the yellow and the dull milky color. When the line is half way down the kernel, the last irrigation should be applied through a sprinkler system. For flood irrigation, the last irrigation should occur when the milk line is about a quarter of the way down the kernels.

The location of the milk line should be checked at several locations in the field. A photo of the milk line, along with a discussion of irrigation needs, can be found at http://msucare.com/crops/corn/corn18.html.

With normal growing degree days, physiological maturity is reached about 55 days after 75 percent of the plants have visible silks. The grain moisture may range from 32 to 40 percent at the time, depending on the hybrid. Yellow dent corn usually is well-dented at physiological maturity.

Dry edible beans

The last irrigation should be when the first pods are filling. Irrigation should be stopped when 50 percent of the leaves are yellowing on the plants.

When overwatered, indeterminate varieties (pinto) may continue to vine and set flower, with delayed maturity. For navy beans, physiological maturity is reached when at least 80 percent of the pods show yellowing and are mostly ripe, with 40 percent of the leaves still green. Pinto beans are physiologically mature when 80 percent of the pods show yellowing and are mostly ripe, and only 30 percent of the leaves are still green.

Beans within pods should not show evidence of any green. If the beans have begun to dry, irrigation will not be needed because the beans no longer are removing much water from the soil profile.

Soybeans

Soybeans should be irrigated until sufficient moisture is available to allow full bean development and pod fill. This stage is when leaves are yellowing (75 to 80 percent) and all pods are filled, with the lower pods just starting.
Beans within pods should have little evidence of green and should be shrinking. Studies show that yellow pods sprinkled with brown are the best clue of physiological maturity. Usually if one or two pods show this symptom on the upper two or more nodes of the plant, it has reached physiological maturity. Also, soybeans should be tolerant of a killing frost at this time.

Sunflowers
They should be irrigated until sufficient moisture is available for the sunflower achenes (seeds) to fill. This is when the backs of the heads turn from a lime green to yellow green and ray petals are completely dried.

Potatoes
Potatoes will utilize soil moisture until harvest. The maturation stage begins with canopy senescence as older leaves gradually turn brown and die. Research has shown that the final irrigation can be used to reduce bruising during the harvesting process.

On sandy soils, soil moisture contents between 60 and 80 percent of field capacity (40 to 20 percent moisture depletion) provide conditions for a desirable soil load into the harvester, with optimum separation of potatoes and soil and a minimum of physical tuber damage.

If the soil is dry before harvest, a final irrigation should be applied at least one week prior to harvest to raise the soil moisture and tuber hydration levels.

Alfalfa
It should be irrigated to maintain active growth until growth is stopped by a hard frost. Alfalfa going into the winter with adequate soil moisture has a much better chance of little or no winterkill.

Sugar beets
They will utilize moisture until harvest time. Irrigation usually should be terminated seven to 14 days before harvest to allow the soil to dry.

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