NDSU EXTENSION SERVICE

water spouts

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Field Days and Irrigation Tours for 2002*

MDT – Mountain Daylight Time

Streeter Central Grasslands Research Extension Center	June 25	6 p.m.	701/424-3606
Hettinger Research Extension Center	July 9	5 p.m. MDT	701/567-4323
Dickinson Research Extension Center	July 10	8:30 a.m. MDT	701/483-2348
Williston Research Extension Center	July 11	9 a.m.	701/774-4315
Carrington *Irrigation Research* Research Extension Center	July 16	9 a.m.	701/652-2951
Minot North Central Research Extension Center	July 17	9 a.m.	701/857-7679
Sidney, Montana Eastern Ag Research Center	July 17	8:30 a.m. MDT	406/482-2208
Langdon Research Extension Center	July 18	9 a.m.	701/256-2582
Tappen Area Irrigated Potato Field Day I-94, Pettibone Exit North side of freeway	Aug 6	9 a.m.	701/231-7076
Williston Mon-Dak Ag Field Tours *Irrigation Demo Fields*	Aug 7	9 a.m.	701/572-8880
Oakes Irrigation Research Site	Aug. 20	9 a.m.	701/742-2189

* Dates and times may be subject to change

MSIDA Irrigation Tour

The Missouri Slope Irrigation Development Association (MSIDA) will be hosting its annual summer irrigation tour July 9. Tour registration will be in the parking lot at Kist Livestock, 1715 40th Ave SE (south side of Memorial Highway) in Mandan between 9:00 and 9:30 a.m. The tour schedule is as follows:

- 9-9:30 a.m. Register and gather at Kist Livestock
- 10-noon Price feedlot (dairy heifers and beef)
  Boeckel's feedlot (purebred Angus and irrigated alfalfa)
- Noon Lunch in Hazen
- 1:30-6 p.m. Site visits in the Hazen/Beulah area
  (stops to be determined)
- 6 p.m. Steak supper at the Ron Gunsch Farm

The cost of the tour is $15 or $10 for just the steak supper. You must provide your own transportation or car pool with someone else. For more information, contact Kevin Nelson (701) 663-3012, Allen Wahl (701) 258-3928 or any MSIDA regional director.

Now is the Time to Start Managing Irrigation Water

Since last fall, moisture has been in short supply in North Dakota. There wasn't much rain last fall, snowfall across the state was much below average and the rain received this spring is below average across the entire state. Figure 1 shows the cumulative rainfall amounts from April 15 to June 5 received at each of the North Dakota Agricultural Weather Network (NDAWN) stations. We all know that

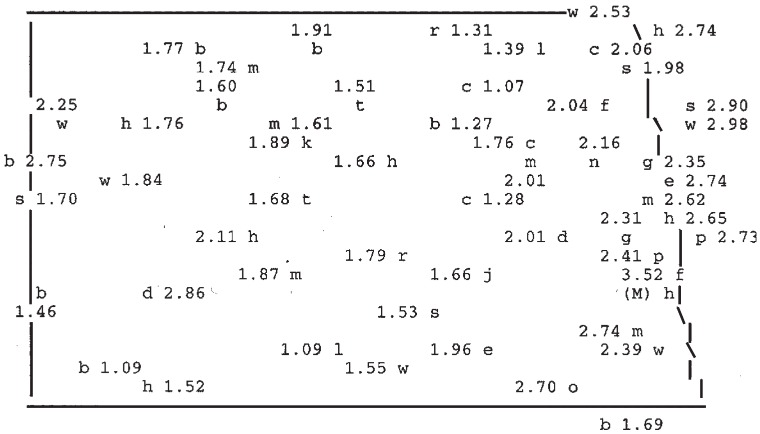

Figure 1. Total rain received at each of the weather stations on the NDAWN system from April 15 to June 5, 2002. Numbers in parenthesis indicate the number of days with missing observations.

rainfall amounts vary significantly over the landscape and Figure 1 shows that for the state as a whole, North Dakota is well below average.

For the irrigator this means starting irrigation systems earlier than normal. It also means that subsoil moisture may be low. Subsoil moisture (soil moisture below 18 inches) is commonly viewed as a reservoir to be used later in the season during high water use periods.

Check subsoil moisture

Low subsoil moisture can affect the yields of deep-rooted crops such as small grains, corn, sugarbeets, sunflower and alfalfa. At the start of the growing season, the subsoil moisture should be near field capacity. By using the "feel method" you can estimate the soil moisture level with reasonable accuracy. The feel method involves taking a soil sample, forming a ball in your hand and squeezing. The response of coarse textured soils to squeezing at field capacity will leave no free water on the soil ball but a wet outline of the soil ball will be left on the hand. If the ball of soil breaks easily, then the soil is less than field capacity.

Managing subsoil moisture is always difficult because it involves determining if enough rain will be received to recharge the soil profile before the high water use period begins or if an extra irrigation is required. It's easy to recharge the root zone with irrigation when the crop is young because it is not using much water. Most of the applied water will infiltrate into the soil. This may not be true later in the season when the crop is using a greater amount of water. Center pivots with less than 6 gallons per minute flow capacity per irrigated acre may not be able to keep up with crop demand later in the season. Recharging the subsoil now may be wise for irrigators with low-flow capacity irrigation systems.

The best and easiest way to check the subsoil moisture is with a soil probe (Figure 2). The soil probe should be at least 4 feet long in order to check the soil moisture down to a 3-foot depth. A typical soil probe is made of stainless steel and removes a soil core about ¾ inch in diameter. They can be purchased from most fertilizer dealers.

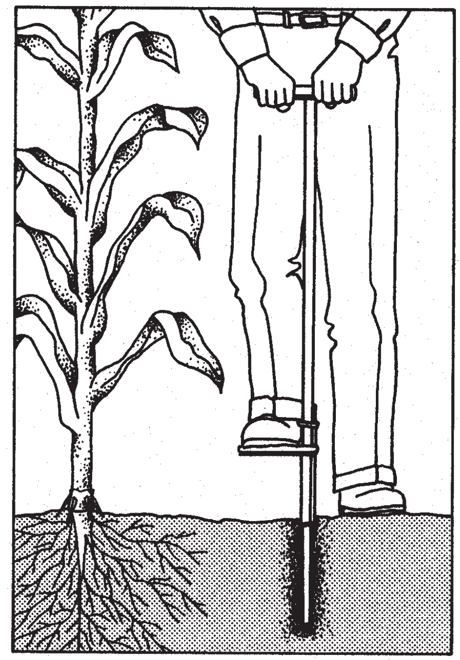

Figure 2. Checking subsoil with a soil probe.

Scheduling irrigation

With variable rainfall events it can be difficult to determine when to irrigate and how much water to apply. A system for scheduling irrigation events must be followed.

Scheduling using the "checkbook" method requires the irrigator to measure rainfall amounts, record irrigation amounts, and obtain an estimate of daily crop water use. Using these data, a soil moisture balance sheet is used to determine the daily soil moisture deficit. This method is called the checkbook method because it is very similar to how you balance your bank checkbook. If you think of rain and irrigation amounts as deposits and crop water use as withdrawals from the "soil water bank," then you have the idea. The procedure is outlined in NDSU Extension circular AE-792, Irrigation Scheduling by the Checkbook Method, available from your county extension office. A computerized version of the Checkbook method, which can be used in both North Dakota and Minnesota, is available from my office for $30.

The most difficult part of scheduling irrigation is obtaining the daily crop water use values. Fortunately, there are two relatively easy ways to obtain these numbers. AE-792 contains tables that provide estimates of the daily crop water use for the most common irrigated crops in North Dakota. All you need is a record of the daily maximum temperature and the number of weeks past emergence. If you have an Internet account, more accurate estimates of daily crop water can be obtained at:

http://www.ext.nodak.edu/weather/ndawn

At this site you can obtain crop water use in numerical tables or maps for alfalfa, turf grass, corn, drybean, wheat, barley, potato, sugarbeets, sunflowers and soybean. The crop water use estimates from the website are more accurate than the values in the crop water use tables of AE-792 because local daily weather is used to calculate the crop water use. At the website, you can either select crop water use tables for any of the 59 NDAWN weather stations and a particular crop or you can view maps of North Dakota with crop water use values superimposed at the location of each weather station. All you need to do is select the nearest emergence date of the crop of interest and a color-coded map will appear. Summary maps for the previous 2,3,4,5,7 and 10 days are available.

Knowing crop water use, using the checkbook method and monitoring soil moisture on a regular basis (every two weeks) will help you optimize your irrigation water management and provide the best yield possible.

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Mon-Dak Potato Project

In northwestern North Dakota and northeastern Montana (a.k.a. the Mon-Dak region), almost unlimited potential exists to produce and process high value crops through development of center pivot irrigation systems. The irrigated production of high value crops would promote use of the region's water and agricultural land resources to improve its economy and population growth. Considerable interest has been created for commercial potato and potato seed production under center pivot irrigation in the region.

Potatoes were first grown in the region for frozen French fry potato production in 1997 when one farmer contracted 80 acres with J.R. Simplot. No on-site storage existed, so the potatoes were hauled directly to the processor upon harvest. In 2000, two storage buildings were built in the region, allowing on-site storage until processing the following spring. By 2002, acreage had increased to 1500 acres with three farmers growing potatoes under contract with both J.R. Simplot and Cavendish Farms (formerly Aviko-USA).

Currently, potato production is concentrated in two areas of the Mon-Dak region. The Nesson Valley fields are about 25 miles east of Williston, and the 29-mile corner fields are about 26 miles north of Williston. All the fields have center-pivot irrigation systems. The water source for irrigation has been groundwater except a few fields at Nesson Valley use Lake Sakakawea as a water source. The soil texture of the Nesson Valley fields is predominantly loamy fine sand, but ranges from sandy to silty clay. The soil texture of the 29-mile corner fields is predominantly sandy loam to loamy sand with some areas of silty clay loam and loam.

Beginning in 1998, measurements of soil moisture, rainfall, and irrigation have been taken at two to four locations within each field several times a week. This information is providing a baseline of data for irrigation management of potatoes in the region and is also used for training the farmer-cooperators in irrigation water management of potatoes. Future efforts will concentrate on collection of additional data to develop ET curves for potatoes growers in the Mon-Dak region.

The development of ET crop curves for potatoes specific to the region is important because it provides a rational basis for recommending whether current irrigation scheduling algorithms are sufficient, or whether new algorithms are needed for the area. For example, the NDSU Checkbook Method is based on an ET crop curve for potatoes grown in southeastern North Dakota. Based on three years of field data collection and analysis, this curve appears to underestimate crop water use early in the season for the Mon-Dak region. Collection of more field data, especially early in the growing season, is needed to substantiate this conclusion.

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Stand Age Effects in Irrigated Alfalfa

A prime reason to establish a new alfalfa field on dryland after three to four years of production is utilization of subsoil water by the deep-rooted plant. However, irrigation can supply the necessary water for sustained production of alfalfa stands, so is there any reason to re-establish alfalfa stands under irrigation?

We have had 12 irrigated alfalfa experiments at Carrington over the past 30 years. Forage yields in these experiments have averaged 5.9, 5.1, and 4.3 tons dry matter/acre in the first, second, and third year of production (seeding year not included), respectively. Forage yield decreased 0.8 tons/acre for each additional year of stand age. Forage yield in the third year of production would have been substantially less (3.5 tons/acre) if the zero yields of two winter kill years were added. Rarely have we taken the stand into the fourth year due to weed encroachment and thinning stands, although, we could have in about half the experiments.

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I have had several producers tell me that their third or fourth year of production was the highest yielding year of their stand, which is most likely correct. For example, forage yields in the 1996 to 1998 variety trial at Carrington was 4.7, 5.2, and 6.5 tons/acre in the first, second, and third year of production, respectively. These data are included in the average presented earlier; without this year, the drop off in yield with stand age would have been much greater. This reversal with stand age is caused by environmental conditions. This year, for example, will be a lower yielding year due to the very cool spring.

What causes the lower productivity with stand age? A major contributor is winter injury that lowers the vigor of the plant and increases disease pressure, especially Fusarium root rot. Young alfalfa plants overwinter better than old plants. For example, a stand that was coming into its third year of production was nearly totally winter killed in 1996-97 while a stand that was coming into its first year of production had minimal stand loss, but was lower in production than normal for a first-year stand.

We have obtained about 3.0 tons/acre in the seeding year with two harvests. That's a total of 18.3 tons/acre during the seeding and three years of production or 4.6 tons/acre/year. A slightly higher yield of 4.7 tons/acre is produced with the seeding year and two years of production, but the additional seed cost would favor maintaining stands for three years. If an additional harvest was taken in the first and second year of production (four vs. three cuts), the yield would be about 0.2 tons/acre/year higher and offset the seed cost. In addition, a late harvest of alfalfa removes the residue that lowers the forage quality of the first harvest.

The long-term data suggest that re-establishing irrigate alfalfa stands should occur after two to three productivity years for irrigated cash hay producers. Loss yield and forage quality help pay to re-establish the stand. Longer-term stands are possible, but producers must accept lower yields as a result.

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