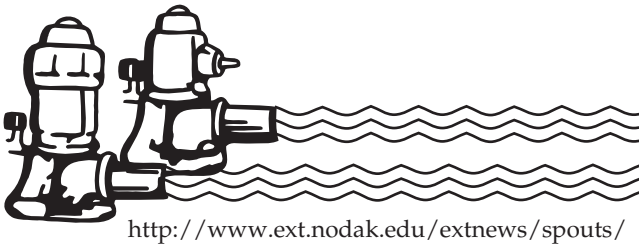

water spouts

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

No. 221 MAY 2006

The Beginning of a New Irrigation Season

Welcome to a new growing season.

As I look at the surface and subsurface soil moisture maps for North Dakota, almost all areas of the state appear to be starting out with a relatively good reserve of moisture stored in the root zone. Since soil in the root zone holds the water a plant needs for growth, a high amount of stored soil moisture is a good way to start the irrigation season. However, since rainfall amounts are spatially variable, now is a good time to check the amount of soil moisture in your fields. Most plants have a 3-foot-deep root zone, so check the soil moisture down to 3 feet.

I always am looking for announcements of irrigation-related events, so if you hear of any in the region, please send me a copy of the announcement and I will include it in future copies of *Water Spouts*. Here are some upcoming events for this summer.

Upcoming NDSU Field Days and other Crop-related Events

Streeter June 28 (701) 424-3606
Central Grasslands Research Extension Center

Minot – Canola Tour July 6 (701) 857-7677
North Central Research Extension Center

Williston – Pulse Crops Day July 7 (701) 774-4315
Research Extension Center

Minot – Pulse Crops Day July 11 (701) 857-7677
North Central Research Extension Center

Hettinger July 12 (701) 567-4323
Research Extension Center

Dickinson July 13 (701) 483-2348
Research Extension Center

Williston July 14 (701) 774-4315
Research Extension Center

Casselton July 17 (701) 347-4743
Agronomy Seed Farm

Carrington July 18 (701) 652-2951
Research Extension Center

Minot July 19 (701) 857-7677
North Central Research Extension Center

Langdon July 20 (701) 256-2582
Research Extension Center

Sidney, Mont. July 20 (406) 482-2208
USDA/ARS Northern Plains Ag Research Lab

Mandan July 20 (701) 663-6445
USDA/ARS Northern Great Plains Research Lab

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Irrigation of Malting Barley in the Northern Great Plains

The eastern Montana/western North Dakota (MonDak) area has rapidly become a major six-row malting barley production area, producing up to 50 percent of the six-rowed malt barley produced in the United States. The region is semiarid, with annual precipitation below the full water requirements of malting barley. Consequently, much of the most successful six-row malting barley production is grown under irrigated conditions. Rejection rates in the MonDak area may be as much as three to five times higher for dryland malting barley than for irrigated, primarily because of protein that is too high.

Soil moisture management and nitrogen (N) fertility are major, interacting factors impacting acceptance rates (protein, color and plumps) of six-rowed varieties, and need to be considered together to maximize yields and quality. The timing and severity of drought stresses, as well as the timing and availability of soil nitrogen, affect grain protein, a major quality component of malt barley.

NDSU Extension Service
North Dakota State University

Different varieties may react differently to these stresses. Barley can have an effective root zone 36 to 42 inches deep, but most of the crop's water and N use will be in the top 12 to 18 inches.

The high price of nitrogen fertilizer is causing many growers to look more closely at malting barley production because the N requirements are less for malting barley than for high-protein spring wheat. However, proper nutrient management is absolutely critical in satisfying yield and end-use quality requirements for spring barley. Inadequate N nutrient levels lower yields, whereas excess nitrogen can decrease yields and quality (e.g., protein) and cause significant economic loss if the malting barley doesn't meet contract specifications.

Excessive plant tissue nitrogen concentrations also tend to advance vegetative growth, which increases the potential for foliar diseases and promotes lodging. High soil nitrogen also increases the potential for environmental degradation from nitrate leaching. Research at Sidney, Mont., indicates malting barley requires about 1.2 pounds of N (applied and soil residual) per bushel of yield goal under irrigated conditions. Growers need to test the soil before applying fertilizers to manage the critical N properly and then fertilize for appropriate yield goals.

Total annual water use of malting barley varies with local environment and the timing of rainfall. Hot, dry locations will have higher daily and seasonal water use than cool areas. Malt barley requires an estimated 18 to 22 inches of water, including effective rain, stored soil water and irrigation, to produce a malting quality crop in the MonDak area. Peak maximum daily water use in eastern Montana and western North Dakota will be in the range of 0.30 to 0.35 inch per day, whereas the Red River Valley often will be in the range of 0.25 to 0.28 per day.

Grower experience provides us with most of what we know about managing six-row varieties because little research has been done on water management for this crop. Producers generally have the best results if they start the season with a nearly full (soil water) root zone before planting. Soil water in the plants' active root zone under center pivots should be maintained at fairly high levels and not allowed drop below about 20 percent to 25 percent from emergence until soft dough stage. That's because most machines lack the capacity to apply large enough amounts of water to refill the root zone. As a general rule for gravity (surface) irrigation methods and side-roll or solid-set sprinklers, effective root zone soil moisture should not be depleted by more than 50 percent of total available water from emergence until flag leaf. After that, depletions probably should not exceed 40 percent of the total available soil water until the soft dough stage.

Research and experience clearly has shown that water management should be based on growth stages and soil moisture, not calendar dates. The first critical stage to ensure good soil water availability is at tillering (two- to four-leaf stage), where the potential number of heads per plant (yield potential) is established. Another critical growth stage requiring high soil water levels is at boot through early seed fill, which determines kernels per head. Preserving the maximum kernels/head is very important for obtaining high yields from six-row varieties. Lastly, having relatively good soil moisture at soft dough will increase the percentage of plumps by providing enough water to finish the crop. Producers shouldn't irrigate after the soft dough stage regardless of the irrigation method due to potential lodging and staining problems.

Normally, border or flood irrigation of malt barley will require two to three irrigations on heavier soils corresponding with critical growth stages. Light, sandy soils may require more frequent irrigations. Center pivot irrigators need to build up the soil water profile to near field capacity (leaving a little room for rain) early in the season and then keep it at higher levels (more wet) until the soft dough stage, which often requires two or more applications each week during hot periods.

Because drought stresses greatly influences malting barley quality, producers should turn off end gun(s) under center pivots and not plant end-gun areas due to the highly variable water applications. If producers plant end-gun areas, they should harvest those areas separately and keep the barley in separate trucks or bins until the malting quality can be assessed.

Growers should implement soil water monitoring programs and some form of scientifically based irrigation scheduling to manage crop water status throughout the season. Soil water monitoring sites should be located to adequately represent the most dominant soil variability zones inherently present in any field. The monitoring should be on a minimum of two depths per site (e.g., 6 and 24 inches) that are read at least once a week.

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Roundup Ready Alfalfa is Here

Alfalfa joins a long list of crops with the Roundup-resistant gene incorporated, but alfalfa is the first perennial crop. The transformation was made shortly after soybean was transformed, but the crop was not developed and cleared until June 2005. Forage Genetics at New Salem, Wis., was the initial breeder of Roundup Ready alfalfa. Today, all major seed companies have Roundup Ready alfalfa available for producers. Table 1 presents many of the Roundup Ready varieties available with a fall dormancy of 3 to 4 and its brand.

Table 1. Roundup Ready varieties with 3 to 4 fall dormancy (FD) potentially available and its brand name.

FD	Variety name	Brand
3.0	Alfagraze 300 RR	America's Alfalfa
3.0	DKA34-17RR	DeKalb
3.5	AmeriStand 405T RR	America's Alfalfa
4.0	425RR	Allied/Southern States
4.0	4G418	Mycogen
4.0	6443RR	Garst Seed
4.0	Consistency 4.10RR	Croplan
4.0	DKA41-18RR	DeKalb
4.0	GH709RR	Golden Harvest
4.0	Liberator	NK/Syngenta
4.0	RRalph 4R100	Trelay/Eureka
4.0	V-45RR	Dairyland
4.0	WL355RR	W-L Research

Roundup Ready alfalfa varieties are fairly expensive. The technology fee is $2.50/pound. Add the normal cost of elite varieties of alfalfa of about $4/pound and you will find most Roundup Ready varieties selling in the range of $6.50/pound.

What are the advantages of the Roundup Ready alfalfa? First, Roundup Ready alfalfa will increase the success rate of establishing alfalfa by bringing on clear-seeded establishment of alfalfa. Presently, we estimate only about 25 percent of the alfalfa is established without a companion crop in North Dakota. With clear seeding, successful stand establishment will occur much more often than with a companion crop, such as oats, if the rest of the management is up to snuff. The only Roundup Ready alfalfa that will be seeded with a companion crop will be on very sandy soil areas where wind erosion threatens to eliminate emerging alfalfa seedlings. The Roundup will take out the companion crop and weeds after the alfalfa plants are more mature.

Second, Roundup Ready alfalfa will simplify weed control in establishment of clear-seeded alfalfa. Weed control for clear-seeded alfalfa is relatively limited at present and weeds resistance is taking out one of the commonly used herbicides (Pursuit and Raptor). Roundup is relatively cheap and has a very wide spectrum of weeds it controls.

Third, Roundup Ready alfalfa provides excellent perennial broadleaf control previously unavailable for an established alfalfa stand. Canada thistle, field bindweed and other perennial broadleaf weeds can be controlled with Roundup. A common question I receive is how to control dandelions in two- to three-year-old alfalfa stands. Roundup will do an excellent job on dandelion control, but remember what dandelion invasion is saying about the stand. When dandelions invade alfalfa, that is indicating the stand is weakening and probably needs to be replaced in the near future.

Fourth, Roundup Ready alfalfa will provide cheaper weed control for producers who have annual grass problems in the second and/or third harvest. We occasionally see this in North Dakota, but it is more common in other areas.

Fifth, the excellent weed control will allow producers to qualify more easily for the expanding certified weed-free alfalfa market.

Potential disadvantages of Roundup Ready alfalfa, besides the seed cost, include: 1) increased potential for weed resistance to Roundup, 2) a possible yield drag, and 3) unknown acceptance of Roundup Ready alfalfa in foreign hay markets.

Roundup Ready alfalfa varieties are not adequately tested to date to know their yield potential. The gene has been incorporated into elite material so the yield drag should be minimal. However, the forage yield of an experimental line of Roundup Ready alfalfa at Fargo in 2004 and 2005 was 88 percent to 92 percent of other varieties. This comparison was not direct and could be biased, but it indicates the possibility of a yield drag. More information on performance of Roundup Ready varieties will be available following the 2006 season.

Each producer will need to weigh the advantages and disadvantages of Roundup Ready alfalfa in his or her operation. The technology may have a real advantage in one situation and could be an expense alternative in another. However, I believe the Roundup Ready technology in alfalfa will cause the optimum seeding rate to decrease in many areas (reducing the seed cost) and may increase the number of years stands are left in production. I will elaborate on these in the next issue.

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Water Spouts: An Irrigation Newsletter Since 1973

Water Spouts is published once per month starting in May and ending with October. The purpose of this newsletter is to provide information to help you better manage irrigation systems and water resources. The NDSU Irrigation Task Force tries to select topics for each issue that provide current information you can use. The task force consists of the following individuals:

- Tom Scherer, Extension agricultural engineer
- Mike Liane, Extension area irrigation agent
- Duane Berglund, Extension agronomist
- Dwain Meyer, professor, forage management
- Bob Henson, assistant agronomist, Carrington Research Extension Center
- Blaine Schatz, director, Carrington Research Extension Center
- Paul Hendrickson, research specialist - irrigation, Carrington Research Extension Center
- Harlene Hatterman-Valenti, assistant professor, Plant Sciences Department
- Gary Secor, professor, Plant Pathology Department
- Walt Albus, supervisor, Oakes Irrigation Research Site
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At the end of each *Water Spouts* article, the author's name, telephone number and e-mail address are listed. If you have any questions about any article, please contact the author by whatever means is convenient. If you prefer, contact me for help. If you want to look at past issues of *Water Spouts*, they are available on the Internet at the address shown at the top of this newsletter (under the pumps).

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