NDSU EXTENSION SERVICE

water spouts

No. 194 APRIL 2002

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

Greetings

A milestone has been reached for this newsletter. This is the beginning of Water Spouts 30th year. After talking to my colleagues in other states, I think it is the longest running university published irrigation newsletter in the country. Irrigation technology has changed dramatically during the tenure of this newsletter, but the mission of Water Spouts hasn't changed. To quote the introduction from issue number 1, "This newsletter will come to you throughout the year and will contain timely information and news which you can use to increase your profits." The NDSU Irrigation Task Force continues to try to fulfill this mission with every issue.

When this newsletter began in 1973, there was about 73,000 acres of irrigation in North Dakota. About half of those acres were irrigated with some form of sprinkler and the other half used surface (some call it gravity) irrigation methods. The major irrigated crops by acreage were pasture, corn, sugarbeets, small grains, and beans. During the 2001 growing season there was about 245,000 irrigated acres with over 80% using center pivots. The major irrigated crops by acreage were corn, potatoes, small grains, alfalfa/hay, sugarbeets and beans. In 1973 a center pivot cost about $30,000, which included installation in the field. In 2001 a center pivot cost about $46,000; that also included field installation.

The NDSU Irrigation Task Force of which I am chairman selects the topics for articles in Water Spouts. We try to select topics to help better manage your irrigation systems. The Task Force comprises the following individuals:

Tom Scherer, Extension Agricultural Engineer

Aung Hla, Extension Area Irrigation Specialist

Duane Berglund, Extension Agronomist

Dwain Meyer, Professor, Forage Management

Bob Henson, Assistant Agronomist, Carrington R/E Center

Blaine Schatz, Director, Carrington R/E Center

Paul Hendrickson, Research Specialist - Irrigation, Carrington R/E Center

Harlene Hatterman-Valenti, Assistant Professor, Plant Sciences

Gary Secor, Professor, Plant Pathology

Richard Greenland, Supervisor, Oakes Irrigation Research Site

Dean Steele, Assistant Professor, Agricultural and Biosystems Engineering

Dave Kirkpatrick, Research Specialist, Agricultural and Biosystems Engineering

Dwight Aakre, Extension Agricultural Economist

Dave Franzen, Extension Soils Specialist

Bruce Seelig, Extension Water Quality Specialist

Kevin Sedivec, Extension Rangeland Management Specialist

Rudy Radke, Extension Area Agriculture Diversification Specialist

Frank Casey, Assistant Professor, Soil Science Department

Chet Hill, Extension Area Value-Added Specialist, Williston R/E Center

Jim Staricka, Soil Scientist, Williston R/E Center

Larry Cihacek, Associate Professor, Soil Science Department

Dale Siebert, Extension Agent, Richland County

At the end of each Water Spouts article, the author's name, telephone number and e-mail address (if the author has one) are listed. If you have any questions about any article, please contact the author by whichever 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).

Tom Scherer

Tom Scherer (701) 231-7239
Extension Agricultural Engineer
tscherer@ndsuext.nodak.edu

Allelopathy In Alfalfa

Allelopathy is a condition where a plant gives off a chemical that affects another plant. Plants like oats and rye are known to give off chemicals that reduce or prevent the growth of weeds in the community. Alfalfa is known to have an allelopathic chemical also, but the chemical is not known to affect other plants. The chemical, believed to be ethylene and possibly medicarpin (not known for sure), affects alfalfa germination and seedling growth. Therefore, it is said to be autotoxic or toxic to itself.

Autotoxicity in alfalfa was demonstrated in the field in the mid 1980s by researchers at the University of Illinois. They seeded alfalfa in the spring without a companion crop, took two harvests in the seeding year, plowed out the stand in the fall, and reseeded the stand the next spring for seven years. The first couple of years stands were very good and yielded greater than 4 tons/acre. By the third year, plant establishment was less and productivity was decreasing. By the seventh year, very poor stands were established and forage yields were less than 1.1 tons/acre. These data suggest that the autotoxin was accumulating in the soil.

Jennings in Arkansas seeded alfalfa in a wagon-wheel design with an old plant at the hub. Alfalfa seedlings rarely emerged in the 0 to 8 inches of the hub and plants that did were generally weak and spindly. Seedlings generally emerged in the next 8 inches but productivity was about 75% of maximum. These data suggest that even if alfalfa seedlings established, productivity may be reduced greatly.

In 2001, we evaluated autotoxic effects in alfalfa. Alfalfa established in 1996 was tilled during the 2000 fall and again as early as possible in spring 2001. Alfalfa was seeded the same day as spring tillage and one, two and three weeks latter. Nearly 1.2 inches of rain occurred two days after the first seeding date, which created a good seedbed and removed concerns about a poor seedbed, especially for the one week after seeding. Plant density was about 10 plants per square foot for the first and second seeding date in the spring- tilled plots but greater than 40 plants per square foot in fall-tilled plots. Plant density in spring-tilled plots improved with delay in seeding but never obtained the level in fall-tilled plots. The lower plant density in spring vs. fall-tilled plots was due to the autotoxic chemical found in alfalfa.

Forage yield at 10% bloom was only 0.4 tons/acre for the spring-tilled first seeding date but 0.9 tons/acre for the fall seeding. Forage yield increased as the seeding date was delayed in both tillage treatments, but the spring-tillage increased more. Obviously, the first-harvest forage yield was impacted by the autotoxic chemical. Forage yield in the second harvest was the same for both the spring and fall tillage and all seeding dates. To have equal productivity from 10 to 40 plants per square foot in the second harvest of the seeding year is similar to earlier work at Fargo.

Seasonal forage yield in this experiment was 2.3 tons/acre in the fall-tilled plots. What is not clear is how much the yield was lowered by seeding on the fall-tilled area, since we did not have an area without alfalfa to be used as a check. However, the seeding-year yield of a new variety trial seeded on fallow was greater than 3.5 tons/acre. Was the lower yield in the fall-tilled plots due to allelopathic effects? An experiment was initiated last year to test this, but it will take at least four years before we have a complete answer. Stay tuned.

At present, the best recommendation is to **NEVER** seed alfalfa on alfalfa! We know that adequate stands can be obtained by waiting at least three to four weeks after tillage, but we don't know if the chemical persists in the soil. Remember the early Illinois data where the autotoxin was accumulating in the soil and reducing productivity. Does seeding alfalfa one year after alfalfa also decrease yield?

If winterkill occurs, which is a possibility with the past open winter, I would not reseed alfalfa on the field without at least one grass crop intervening. Seed the alfalfa on a new field to stay away from the possibility of reduced yield due to the autotoxic effect.

Dwain Meyer (701) 231-8154
NDSU Professor, Forage Management
dmeyer@ndsuext.nodak.edu

Irrigation Finance Programs through the Bank of North Dakota

The Bank of North Dakota has two reduced interest rate financing programs to help irrigators improve and/or expand their irrigation systems. The AgPACE and the Irrigation Loan programs are two separate and distinctly different lending mechanisms with different requirements.

AgPACE – Agriculture Partnership in Assisting Community Expansion

The AgPACE program provides low interest financing to on-farm businesses. The program funds are used to buy down the interest rate on loans that have been approved by a local lender and the Bank of North Dakota (BND).

This program is available to North Dakota farm families for business ventures that are conducted on real estate which is operated and owned or leased by a farmer or other organization permitted to engage in the business of farming. The farmer shall have as his principal occupation, prior to applying for the program, the production of agricultural commodities or livestock.

Qualified businesses include any activity conducted by the farmer or the farmer's family that is integrated into the farm operation. These businesses include nontraditional agriculture, manufacturing, processing, value-added processing, and targeted services industries. Eligible uses also include the purchase of equity shares in a new or expanding value added agricultural processing facility, **the purchase of irrigation equipment**, and purchase of feedlot improvements. Traditional production agriculture will not qualify for this program.

Program parameters

The AgPACE program is an interest rate buy down program. Monies in the fund are used to reduce the borrower's interest rate on loans made by a local lender and BND. The loan is handled through a local lending institution, which will request the participation of BND. A local lending institution may be a bank, savings and loan, credit union, or Farm Credit Services. Together with the borrower, the lenders establish the terms and conditions of the loan, including the interest rate. The lead lender then requests that the AgPACE fund be used to buy down the interest rate.

Application process

A lead lender makes an application for this program and is responsible for servicing the loan.

Interest rate

If the project qualifies as an AgPACE project, the borrower receives an interest rate equal to 5% below the yield rate with a minimum rate of 1%. The total buy down amount per borrower from the AgPACE fund may not exceed a lifetime cap of $20,000. **State Water Commission Funds may be used to supplement AgPACE funds for the purchase of irrigation equipment on new irrigated acreage. Total buy down per borrower between the funds cannot exceed $40,000.** The lead financial institution and BND set the interest rate to be yielded by the lenders. The difference between the interest charged by the lenders (yield rate) and that paid by the borrower is provided to the lenders by one of the funds.

Qualified projects

The program may be used to reduce the interest rate on loans for the purchase of real property or equipment, equity shares, working capital and the purchase of inventory. The program will not reduce the interest rate on loans that are a refinancing of existing debt.

Lending criteria

Once a project has been determined to qualify, BND will use its normal credit standards in reviewing the loan. These standards are a factor of the loan size and the type of project. BND is required to take at least 50 percent, and not more than 80 percent, of the loan.

Default by the borrower

If the borrower goes into default under the loan agreements, the AG PACE fund will no longer buy down the interest rate. The borrower will then have to pay the full amount of interest due to the lenders. If the farmer wishes to reinstate the AG PACE buy down, he must first bring the loan current or cure the default. Unless otherwise approved by BND, the AgPACE program will also consider the relocation of the business from the on-farm location as a possible event of default.

Irrigation Loan Program

For this program, an eligible borrower is any irrigator in North Dakota. The funding limit on direct BND loans is $600,000. There is no funding limit on participation loans. However, under a special program, BND will utilize the State Revolving Loan Fund (SRF) to finance irrigation projects. The SRF allows up to $50,000 per borrower, if the applicant incorporates best management practices (BMP) into an integrated crop management plan that meets State Health Department requirements. Contact Greg Sandness of the Health Department at (701) 328-5232 for more information about these requirements. The loan may be used to finance the purchase, development or repair of irrigation systems. SRF funds cannot be used to refinance debt or purchase land.

Interest rate

For a direct BND loan, when SRF funds are used, the first $50,000 will be at 5.50%. The remaining balance will be at BND farm real estate rates minus 0.25%. For a participation loan, when SRF funds are used, the first $50,000 will be at 5.50%. Any BND amount over $50,000 will be at BND Farm Real Estate rates minus 0.25%. The lead lender's share will be at market rates.

The lead lender makes an application for this program and is responsible for servicing the loan. The loan term can be up to 25 years if secured by real estate, up to 10 years if secured by chattels and up to 10 years for SRF funds. Payment options can be monthly, quarterly or annually. Adequate collateral is required.

Equity requirements – each loan will be reviewed on its own merits

The loan must meet bank's standard credit criteria including demonstrated repayability of all debt. Appraisal requirements will be evaluated on a case-by-case basis.

The costs and fees for a participation loan is the $250 BND commitment fee and for a direct loan, there is a 0.5% origination fee.

A loan may be funded from the following sources: directly from BND (real estate loans only), in participation with the SRF or in participation with other lenders (chattel and/or REM). For more information, call 1-800-472-2166 ext. 85624

Bruce Schumacher (701) 328-5624
Loan Officer, Bank of North Dakota
bschumac@state.nd.us

Potato Planting Configuration Research

Potatoes are universally planted in a hilled configuration for reasons that include avoiding seed piece decay in heavy textured soils, management of wheel traffic, and making the harvesting operations easier. For example, heavy spring rains on fine-textured soils in the Red River Valley can temporarily leave standing water in the midrow or furrow area because the water does not quickly infiltrate and drain through the soil profile. Placing the seed piece in a hill reduces this waterlogging problem because excess water drains off the hill, away from the seed, and into the furrow or midrow area. As potato production has expanded into irrigated areas, the practice of planting potatoes in a hill has moved with it for reasons that include familiarity, equipment considerations, and relative ease of harvesting.

However, for sprinkler irrigated potato production on coarse-textured, well-drained soils, planting in a hilled configuration may be counterproductive because the plants are hindered in their capture of water and nutrients. The hindrance is caused by the water-shedding effect of the hill — water runs off the hill toward the inter-row area, away from the primary rooting zone. In soils with low water-holding capacity, this pattern of water movement may place unnecessary stress on the plants, adversely affecting yield and tuber quality. We are conducting research to determine whether a furrow-planting configuration is more productive than the hilled configuration for irrigated potatoes on well-drained soils.

Comparisons of conventional hilled and furrow planting configurations were made during the 2000 season near Oakes (southeastern North Dakota) and during the 2001 season near Oakes and near Dawson (east central North Dakota) for sprinkler irrigated potatoes on well drained soils. The research involves small plots (each 12-ft wide by 40 ft long), the Russet Burbank variety, a row spacing of 36 inches, and a plant spacing of approximately 12 inches. At each site, all the furrow and hill planted plots were identically irrigated, fertilized, etc., using production practices typical of those for potatoes grown in the conventional or hilled configuration. Soil temperature and soil moisture tensions were measured hourly at 6- and 12-inch depths in the crop row and between crop rows. For the 2001 season, measurements were also made at the depth of the seed piece.

NDSU Extension Service
Agricultural and Biosystems Engineering
P.O. Box 5626
Fargo, ND 58105-5626

Non-Profit Org.
U.S. Postage
Paid
Permit No. 818
Fargo, N.D.

During 2000 at Oakes, measurements indicated that at the 6-inch depth in the crop row, the furrow configuration was generally warmer during the days and cooler during the nights. The furrow configuration also had a slightly larger accumulation of growing degree units for the first 15 days after planting, suggesting that a faster crop emergence may be possible with furrow planting. Both the hilled and furrow configurations exhibited similar patterns and magnitudes of soil drying at the 6-inch depth in the crop row. However, at the 12-inch depth in the row for the furrow configuration, the soil moisture tension remained in a wetter and more uniform range than for similar measurements in the hilled configuration. In other words, the furrow configuration had more favorable moisture conditions than the hilled configuration. The depth of tubers below the soil surface was similar for both the hilled and furrow configurations, suggesting similar power requirements for harvesting operations in each planting configuration.

For the 2001 study at Dawson, we compared north-south and east-west row orientations and found that row orientation did not significantly affect either total yields or US #1 yield. We also compared shallow and deep seed piece placement depths for both furrow and hilled configurations. When averaged across shallow and deep seed placement, furrow planting produced average US#1 yields of 352 cwt/ac and average total yields of 448 cwt/ac, compared with averages of 270 and 350 cwt/ac, respectively, for the conventional (hilled) planting method. These values represent a 30% advantage for US#1 yield and a 28% advantage for total yield for the furrow configuration. Plots at Oakes in 2001 were affected by a chemical drift or fertilizer burn problem so yields were greatly reduced and no yield differences were found between furrow and hilled configurations.

The first question people usually ask is, “How are you going to dig (harvest) the potatoes in the furrow?” The engineering questions are whether equipment modifications are needed for harvesting and whether the drawbar power requirement for lifting the potatoes in the furrow configuration is significantly greater than that for the hilled configuration. We expect that no equipment modifications will be needed, but field tests will be needed to verify this. We began to address the drawbar power issue during the 2001 season but did not obtain satisfactory results. The procedure involves measurement of drawbar pulling force and implement ground speed. Drawbar horsepower equals force times velocity, so we can measure and compare the power requirements for harvesting test strips in each planting configuration.

While it is too early to make production recommendations, these preliminary results suggest that the furrow planting configuration merits further study and we are planning to continue the research. In addition to the harvesting issues discussed above, we have identified other factors that need to be studied to improve the efficiency of sprinkler irrigated potato production on well-drained soils. Comments and questions about the research are welcome.

Dean Steele (701) 231-7268
Agricultural & Biosystems Engineering Department
Dean.Steele@ndsu.nodak.edu