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water spouts

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Upcoming Irrigation Workshops

Dec. 9, Thursday – *Best Western Ramkota Hotel, Bismarck*

This workshop is for experienced irrigators and will cover improved irrigation management options, as well as developments in irrigation. This workshop is in conjunction with the North Dakota Water Users annual convention scheduled for Dec. 8 and 9. The Missouri Slope Irrigation Development Association (MSIDA), NDSU Extension Service and North Dakota Water Users sponsor this workshop. The convention will include an exposition where irrigation suppliers demonstrate their products and services.

Dec. 21, Tuesday – *Grand Forks County Office Building*

This workshop is for experienced irrigators. Topics covered will include irrigated potatoes, the NRCS EQIP irrigation program and irrigation water management methods and applications. Contact person is Kendall Nichols, Grand Forks County Extension agent – cropping systems, (701) 780-8229.

Jan. 6, 2005, Thursday – *Ernie French Center, Williston Research Extension Center*

This workshop is for current irrigators. Topics covered may include conversion from surface irrigation to center pivots, irrigation financing options, chemigation, irrigation water management (scheduling/timing), irrigated crop rotations, irrigation economics, disease/weed/insect control, variety considerations and fertilization timing. Contact person is Chet Hill, Extension area value-added specialist, Williston, (701) 774-4315.

More information about the workshops will be mailed in November. If you have any suggestions for topics to cover at the workshops, please give me a call or send an e-mail or letter.

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Is Harvesting Wet Corn in the Spring an Option?

Corn development is two to three weeks behind normal in North Dakota this year because of unusually cool summer temperatures, and most corn will not reach full maturity before the first killing frost.

Though some loss in yield is inevitable, a more important consideration for farmers with immature corn now is how to handle the wet grain. Given the current stage of crop development, much of the corn likely will be in the 35 percent to 50 percent moisture range at the end of the growing season. We can expect some field drying of the grain in October, perhaps 10 percent to 15 percent if temperatures are favorable, but only minimal amounts in November as air temperatures drop. Corn with more than 25 percent moisture is difficult to combine and high-moisture grain should be dried or cooled to a safe storage temperature as soon as possible after harvest to avoid storage losses.

Given the high moisture levels and the high cost of drying grain this fall, many farmers are wondering if leaving the corn crop through the winter and harvesting it in the spring might be more economical. We have very little data from North Dakota on how much field loss likely will occur if corn is left through the winter. Factors such as eardrop, lodging and wildlife damage are difficult to predict and can have a major impact on losses.

Recent data from Wisconsin, however, reported field losses during the winter months were between 18 percent and 65 percent in a two-year study recently published (*http://corn.agronomy.wisc.edu/WCM/2004/W160.htm*). These data demonstrate the risk associated with leaving corn over the winter. This practice should be considered only if harvesting and drying the grain this fall will be uneconomical or impractical.

On a positive note, the stalk quality of most of the corn crop this fall is excellent, which may help reduce lodging-related losses in fields that are left over the winter. When making a decision on whether to leave a corn crop over the winter, farmers also should consider how harvesting corn would impact other plan management practices in the spring.

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Irrigated Soils: Salinity and Sodicity Problems

Water added through irrigation is used to enhance agricultural productivity through improved yields and diversification of economic crops. Irrigation inputs, however, include not only water, but also a certain amount of dissolved material. That dissolved material often is referred to as salt. Depending on the source of the irrigation water, the salt content or load may be high enough eventually to cause soil chemical and physical problems that will result in reduced crop yields.

How do we identify these problems and are there methods to safely irrigate without risking soil degradation? The first step in answering both of these questions is identifying the type of irrigation water and soil to be irrigated. The process that is responsible for salt deposition in soils is evapotranspiration. As water leaves the soil through either evaporation or transpiration through the plant, it leaves behind the salt. Eventually salts may build up to levels that affect plant growth. The interaction between the soil type and the quality of the irrigation water will determine whether the process of salt concentration becomes a significant problem.

For land that never has been irrigated, first determine the type of soil in the field proposed for irrigation and the salt content of the proposed water supply. Determine the soils in a given field by referring to the appropriate county soil survey report. The report will contain a soil map of the land in question. That map will show the delineations of the major soils according to the soil series category.

Analyze the water proposed for irrigation for total dissolved solids (TDS), and the major cations (calcium, magnesium and sodium) and anions (carbonate, sulfate and chloride). The total dissolved solids will be used to estimate the potential for soil salinization and often is expressed as milligrams of salt per liter of water (mg/l) or parts per million (ppm). The cations and anions are used for a more complex process that assesses the potential for sodification. The ratio among sodium, calcium and magnesium generally is expressed as the sodium adsorption ratio (SAR).

Once the soils and water information has been gathered, soil compatibility with irrigation can be predicted. All soil series in North Dakota have been rated on their ability to be irrigated. Three irrigability categories are used: irrigable, conditional and nonirrigable. Irrigation is recommended for all soils in the irrigable category as long as the irrigation water does not exceed certain levels of salt and sodium. These levels depend on soil texture and internal drainage. The maximum acceptable levels slide from 1,575 ppm TDS and an SAR of 6 for medium to moderately fine textured soils that are well or moderately well-drained (e.g. Heimdal soil series) to 2,100 ppm TDS and an SAR of 12 for medium to coarsely textured soils that are excessively or well-drained (e.g. Sioux soil series). If the salts and/or sodium concentrations are high enough in the irrigation water, irrigation isn't recommended even for soils in the irrigable category.

Soils in the conditional category may or may not be recommended for irrigation. As with irrigable soils, these soils shouldn't be irrigated when salt or sodium exceeds specific levels in the irrigation water; however, these limits usually are much lower than for the irrigable soil category. For some conditional soils, the limits may be as low as 700 ppm TDS and an SAR of 4 (e.g. Cresbard soil series).

If the quality of the irrigation water does not exceed the TDS and SAR limits, soils in the conditional category may be recommended for irrigation. However, certain conditions generally must be met to prevent soil degradation. All conditional soils that are irrigated should be monitored regularly for salinity and sodicity.

Special practices for salinity and sodicity control are recommended when irrigating conditional soils. These practices may include: application of additional water to leach salts downward (leaching requirement); installation of a subsurface drainage system; growth of deep-rooted crops to improve water percolation or salt-tolerant crops; and application of soil amendments to maintain the proper balance among sodium, calcium and magnesium.

Irrigation is not recommended for soils in the nonirrigable category (e.g. Rhoades soil series). Nonirrigable soils have severe limitations to irrigation in relief, depth, sodicity, salinity, permeability or restrictive substrata. These soils may be irrigated only when they occur as small inclusions in fields largely composed of soils that are recommended for irrigation.

After determining that the soils are compatible with the irrigation water and irrigation management has been initiated, there is no guarantee that salinization or sodification may not occur. Soil survey and water quality information has its limitations. Soil and water properties are extremely variable and subject to complex processes. Characterizing any field exactly is impossible. Therefore, the irrigator always should be aware of the signs that indicate potential salt and/or sodium problems.

Indicators of salinity and sodicity often are very similar. White crusts and crystals on soil surfaces that disappear when water is added are an indication that soluble salts are present. If the presence of soluble salt crystals has not been noted in the past, the white crusts and crystals are an indication that hydrologic conditions have changed and soil salinity is increasing. An observant irrigator may notice salt crystals before they cause significant effects on crop growth.

As salinity increases, plant indicators will begin to become apparent. Because salinity affects plants' uptake of water, the stress indicators essentially are the same as for drought. Germination is not uniform, seedlings do poorly and mature plants are stunted, with yellow and brown leaves.

Different plant species have more or less tolerance to the effects of salinity, which means some crops such as potatoes or beans are much more sensitive than other crops such as small grains and sunflowers. This also is true for weed species. Areas in fields dominated by foxtail or kochia often have higher levels of salinity than the surrounding soils. If allowed to increase, soil salinity eventually may reach levels that cause substantial decreases in yield and prevent any plant growth.

Sodicity problems are closely related to salinity because the source for the sodium is soluble sodium salts. Sodium adsorbs to the soil clay and organic matter, causing dispersion of these materials. Observable effects of this process are poor soil structure and surface crusting. If the process continues over a long period of time, a dense claypan will develop in the subsoil. The loss of soil organic matter and the physical stress from farm equipment or intense rainfall also affect the soil crusting process. As a result, the initial stages of crusting because of increased sodium may be difficult to separate from other causes of crusting.

As sodium levels become more pronounced, the effects on the crop will become easy to see. As with salinity, sodicity affects plant growth by limiting access to soil moisture. Therefore, plant indicators are much the same as discussed for salinity. Sodicity often expresses itself in highly variable extremes over just a few feet, which results in a hummocky appearance in crop growth across a field. Although high salinity also can cause this type of a crop growth pattern, generally the effects of salinity are much more gradual across the field.

When these types of indicators appear in an irrigated field, take soil samples to confirm the observations. The solution to initial soil salinity increases may be as simple as adjusting the leaching ratio of the irrigation water. In some cases, salinity problems may be confined to small knolls or micro-highs in the field. Land leveling that allows more uniform transfer of water through the soils may help solve this problem. These suggestions also may help reduce crusting problems resulting from sodicity; however, leaching actually may contribute to greater crusting in some situations.

The sodium in the soil must be replaced by calcium or magnesium; otherwise increased crusting will occur as the soluble salts are leached. Sodicity is the result of an imbalance between the dispersing ion, sodium and the flocculating ions, calcium and magnesium. To counteract the effects of sodium, replace it with calcium and magnesium by increasing the amounts of these ions in the soil solution. To improve some soils affected by sodium, increase calcium and magnesium by applying amendments or mobilizing natural sources through deep tillage. However, many soils cannot be improved using these techniques and actually may suffer greater damage. In addition, replacing sodium with calcium and magnesium requires adequate drainage to ensure that the sodium can be leached from the soil profile. Remediation of sodium-affected soils is neither a simple nor inexpensive process.

Most irrigated fields will contain several different soil series, some of which are not recommended for irrigation. Problems with salinity and sodicity most likely will occur first in these areas. Although probably not economically significant, the irrigator can use these soil inclusions as the first line of monitoring to gauge potential problems in the field as a whole.

Management decisions become complicated when salinity or sodicity problems develop in these areas. The irrigator must determine if continuing the present management system will be detrimental only to economically insignificant areas or if the salinization or sodification will expand to other parts of the field. The only way to predict this is through accurately monitoring both observable indicators and laboratory analyses of soil samples.

As mentioned in the discussion of conditional soils, many management options address salinity and sodicity. These options vary significantly and their effectiveness will depend on each situation. These options may or may not be practical in an economic sense. Management options designed for one part of a field may not be effective for all areas or might even be detrimental. Before implementing management practices to control salinity and sodicity, enlist a professional soil scientist to properly inventory and interpret soil conditions. Then irrigators can develop and implement a management strategy that accounts for economic realities of irrigated crop production and preservation of soil productivity.

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