Chapter 6: Water Management in Sunflower

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Sunflower are well-suited to the climate in South Dakota. Sunflower is a deep-rooted crop and can extract water from deeper in the soil profile than cool-season crops. Sunflowers are generally produced under dryland conditions but infrequently are used on irrigated land where late planting or very limited water supply favors their inclusion.

This crop has good drought tolerance due to the well-developed root systems and the ability to withstand temporary wilting. However, drought stress can limit crop productivity in certain years in South Dakota. The most critical growth stages of crop development relative to moisture stress are bud initiation, flowering and seed filling (R2 to R7 growth stages). Sunflowers are also produced in sub-humid areas, sometimes in areas with poor, sodic soils or as a warm-season alternative in fields where planting was significantly delayed. Positioning sunflower in the rotation the year following a cereal provides the opportunity for more soil moisture to accumulate in the inter-crop fallow period as compared to placing it in the rotation in the year after corn or sorghum. In all but the driest areas of South Dakota, producers find it most beneficial to plant sunflower after corn or sorghum due to sunflower's ability to extract water and nutrients from the deeper portions of the soil profile.

Irrigation Management in Sunflower

Each year South Dakota producers plant somewhere between 500,000 and 600,000 acres of sunflowers (USDA-FSA). Usually less than 1% of those acres are irrigated. Irrigation management is beneficial but not often used for sunflowers as they are considered drought tolerant. However, when soil moisture is not available from early flowering to seed filling, sunflower is not able to regulate leaf expansion and transpiration rates. As a result, the crop can be highly sensitive to drought stress and substantial yield reduction can be observed, particularly in those production areas that receive low precipitation. Yield losses vary depending on the duration and severity of the drought and can be greater than 30% during prolonged droughts.
The genetics of the sunflower cultivar planted also affects drought tolerance. Wild, native sunflowers have excellent drought tolerance, and this genetic reservoir has been used to enhance many commercial varieties. Considering that sunflower is susceptible to Sclerotinia head rot (white mold), irrigation should be avoided during flowering (R-5.1 to R-5.9) growth stages.

Conservation Practices for Enhancing Water Management in Sunflower

Sunflowers were re-introduced as a crop in South Dakota (they were grown by indigenous farmers before European settlement) in the 1960's and 1970's. At this

time, they were predominately grown in the cooler and more moist areas of the state. Concerns with drought and wind erosion in the year following a sunflower crop limited their utilization in drier and more fragile ecosystems. Widespread adoption of conservation tillage systems (especially no-till) facilitated the movement of sunflowers to areas along and west of the Missouri river where they are used as part of diverse, no-till rotations (Fig. 6.1). The heavy residue produced by small grain, corn, and sorghum, traps snow and protects soil moisture from evaporation. This increases available moisture for producing sunflowers and and helps to limit erosion after sunflowers.

Figure 6.1. Sunflowers are well adapted to production under no till management practices. Photo courtesy of Dakota Lakes Research Station.

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