Objective 5: Wind Erosion and PM$_{10}$ Emission Control Methods

Title: Integrated Crop Production of Spring Cereals in Semiarid Regions

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Specific Objectives
1. Determine and develop Best Management Practices (BMP's) for spring crops, specifically - weed and disease management; fertility timing; varietal selection, and environmental and economic evaluation of the cropping systems.
2. Quantify the incidence and impact of weeds and diseases in the no-till spring cropping systems and compare to traditional winter wheat/fallow.
3. Determine carbon storage and sequestration, compare C and N cycling and relative N use efficiencies and achieve economic yields and quality.
4. Use standard crop production budgets to estimate the cost of production for the spring oat/spring triticale system.
5. Accelerate grower evaluation and adaptation of profitable conservation farming systems and conduct field days and presentations to disseminate information.

Recent Accomplishments
Crop rotations for the next phase of research were initiated in the fall of 2002 based on field research data from 1996-2002 and a grower survey, which evaluated the first five years of the project. During this past growing season, precipitation was approximately 10" (1.5 in. below average) with essentially no moisture received from April 20 until harvest. Winter wheat planted into conservation tillage fallow yielded 35 bu/A while no-till facultative spring wheat planted in November in chemical fallow yielded 42 bu/A. No-till spring wheat planted after no-till spring wheat yielded 23 bu/A. Hard red spring wheat planted no-till yielded 16 bu/A and protein was >15%. No-till hard white spring wheat yielded 18 bu/A and barley yielded 1250 lbs/A and 1365 lbs/A for light-till and no-till spring barley, respectively. In March 2002 and September 2003, water infiltration was more rapid in no-till spring wheat than in winter wheat stubble. In March of 2002, infiltration rates were twice as fast in spring wheat stubble compared to winter wheat stubble. Rhizoctonia root rot was again the most damaging disease in the annual spring cereals while prickly lettuce and Russian thistle were the major weeds infesting spring crops and chemical fallow.
Planned Research

Because of funding reductions this coming year, the scope of the research project has been reduced as well as the amount of data collected. Main plot treatments will include: 1) winter wheat - winter canola/reduced tillage fallow; 2) facultative spring wheat (planted in November or December/continuous spring wheat - chemical fallow; 3) no-till spring triticale/no-till spring oats (harvested for either grain or forage (depending on soil moisture), and 4) no-till or a single light tillage in the spring prior to planting (to control Rhizoctonia). All crops will be grown each year.

An agricultural statistician was consulted prior to the establishment of the new phase of research initiated in the fall of 2002. The experimental field design is statistically sound and will not effect data interpretation. Data will be analyzed using up-to-date methods. Under the current field design, researchers will be able to compare plots within each of the four treatments as well as among all the treatments. As an example, spring wheat yield (treatment 2) will be compared to winter wheat yield (treatment 1) as well as facultative spring wheat yield following chemical fallow or normal-planted spring wheat (subplot treatment within treatment 2).

Grain yield, quality, and test weights will be measured at harvest for each crop. Carbon and nitrogen cycling analysis will continue in all plots over all cropping systems. Three 6-ft field cores will be taken twice (February - preplant and August - postharvest) from each subplot for nitrogen and carbon analysis. Cores will be separated into 1-ft increments to determine movement of nitrogen through the soil profile. At harvest, crop grain and straw will be collected to determine recovery of nitrogen fertilizer equivalents by the crops. Collection of these data will establish nutrient use-efficiency and carbon cycling for carbon credit determination.

Weed species richness and shifts will be determined for each cropping system. Weeds will be identified and counted three times each year - preplant, in-crop, and preharvest. In-crop sampling will also be used to determine the chemical combinations and rates for herbicide applications. Herbicides will be rotated from the previous year to reduce resistance in weeds to particular categories of herbicides.