

***Proposal for 2008-2009
Northwest Columbia Plateau PM₁₀ Project***

Objective 7 & 8: Develop Awareness and Acceptance of BMPs by Considering Economic and Social Benefits

Title: Chemical Summer Fallow to Reduce Dust Emissions in the Horse Heaven Hills

Personnel: Co-principal investigators: William Schillinger, WSU; Brenton Sharratt, USDA-ARS; Douglas Young, WSU; David Pearson, and Mike Nichols, Farmers.

Objective

Conduct on-farm testing at two farms in the Horse Heaven Hills region in Benton County, Washington to determine the effects of chemical summer fallow, conservation tillage summer fallow, and traditional tillage summer fallow on: i) dust emissions, ii) seed-zone moisture in late August, iii) wheat plant establishment, iv) wheat grain yield, and v) farm economics.

Recent Accomplishments

We have completed two years of this planned 5-year project. Brenton Sharratt has completed the dust emission data collection at both the Pearson and Nichols sites. There have not yet been any publications from this project.

Planned Research

Blowing dust from excessively tilled summer-fallowed fields in the Horse Heaven Hills is a major air quality concern in the Tri-cities, Washington. Beginning in March 2006, replicated on-farm tests were established on the David Pearson and Mike Nichols farms in the Horse Heaven Hills. The Pearson farm is located in the Central Horse Heavens on deep Ritzville silt loam soil. Annual precipitation at the Pearson site averages 8.0 inches. The Nichols farm is located in the Western Horse Heavens on deep Warden silt loam soil and annual precipitation averages 6.0 inches. Both sites are representative of the wind-erosion prone wheat – summer fallow Horse Heaven region.

All aspects of field operations for the on-farm tests are managed by wheat farmers Pearson and Nichols. The experimental design at both sites is a split plot with four replications in randomized complete block arrangement. Main plots are tillage practice and subplots are planting date. Each plot is 200 ft long and 60 ft wide. Total plot area at each site is 9.5 acres. The on-farm test will be conducted for five years at both farms.

Tillage treatments are:

1. Traditional tillage summer fallow. Primary tillage in March is with a tandem disk to a depth of five inches. Plots are fertilized with aqua NH₃-N in May with a shank

applicator in May. Two to three rodweedings will be conducted in late spring and summer to control Russian thistle and other weeds as needed.

2. Conservation tillage summer fallow. Primary tillage in March is with a Noble sweep operated at a depth of five inches. The implement is equipped with overlapping sweep blades that are 36-inches wide to cause minimum surface soil disturbance. Aqua NH₃-N will be delivered with the Noble sweep during primary spring tillage. Two to three rodweedings will be conducted in late spring and summer to control Russian thistle and other weeds as needed.
3. Chemical summer fallow. No tillage will take place and weeds will be controlled throughout the summer fallow period with glyphosate and other herbicides as selected by Pearson and Nichols. Nitrogen fertilizer will be delivered at the time of planting with a no-till drill.

The planting dates for subplots are:

1. If possible, plant hard red winter wheat in mid-to-late August into carryover seed-zone moisture with deep furrow drills.
2. Plant hard red winter wheat in late October or early November after the onset of fall rains.
3. Plant hard red spring wheat in March

We estimate that seed-zone moisture will be adequate for August planting about 50% of the time for the traditional tillage and conservation tillage treatments and likely never possible for the chemical fallow treatment. Thus, each tillage treatment will have two planting dates. For example, if planting is successful in August, the second planting will occur in late October or early November. If seed-zone water is not adequate for planting in August, the two planting dates will be late October/early November and in March.

Measurements

Dust emissions (Sharratt). Dust emissions were measured from all treatments at both sites during the summer of 2006 and 2007 using the USDA-ARS wind tunnel.

Seed-zone moisture, grain yield, and agronomy (Schillinger). Seed-zone moisture in late August is determined from the three tillage treatments at both sites in one-inch increments to a depth of twelve inches using an incremental soil sampler. Surface residue is also quantified in late August using the line point method. Grain yield is determined from each 200-ft-long plot in July using a Hege 140 plot combine. Precipitation is recorded at each site with a computerized weather station. Precise records of all field operations and rates of fertilizer and herbicide are collected from Pearson and Nichols each year.

Economics (Young). At the end of the five-year study period, all farm records and grain yield data from both sites will be evaluated to compare the farm economics of each site. Standard enterprise budgets will be constructed based on the actual sequence of operations conducted on the plots. The ultimate purpose of the economic analysis will be to provide the research-based information needed for USDA-NRCS to implement farm programs to entice wheat farmers to switch from traditional tillage fallow to conservation tillage fallow or chemical fallow in the Horse Heaven Hills.