Proposal for 2004 - 2005
Northwest Columbia Plateau Wind Erosion / Air Quality Project

Objective 5: Wind Erosion and PM₁₀ Emission Control Methods

Title: Cover Crop Management and Assessment Strategies in Irrigated Systems of the Columbia Plateau

Personnel: Principal Investigators: William Pan, soil scientist, WSU, Pullman; Bob Stevens, soil scientist, WSU, Prosser; Mark Stannard, USDA/NRCS Plant Materials Center; Jim Dobrowolski, NRS, WSU, Pullman; Andy McGuire, WSU, Ephrata;
Co-investigators: Bill McKea, UW, Seattle; Rick Rupp, Ron Bolton, Eric Harwood, WSU research technologists;
Cooperators: Webber Farms; Dale Gies; Hal Collins, USDA-ARS, Prosser.

Objectives
1. Quantify and promote N recovery and soil aggregating benefits of cover crops
2. Develop growing degree day/GIS models for cover crop prediction and planning
3. Evaluate late-season options in cover crop selection and management.
4. Determine straw-based soil amendment and green manure effects on soil physical, chemical, biological properties and wind erodibility.

1. Quantify reductions in nitrate leaching and potential reductions in N fertilizer requirements by using different winter cover crops.

Recent Research Accomplishments: An Agron. J. paper on N recovery and release from brassica and cereal cover crops was published in 2002. A second manuscript on biomass, cover, N recovery by early seeded cereal cover crops is drafted and will be submitted for review for publication in Agronomy Journal this year. A web site on cover cropping was developed off of the NCRE research website.

Planned Research: New N accumulation data were collected from replicated field plots of late-seeded grass cover crops (see subobjective 4). These new data will be integrated with six site-years of data were collected between 1994 and 1998 on cover crop N accumulation by Weinert (1996) and Brunty (1998) in replicated, small plot field experiments conducted on WSU experiment stations and growers fields throughout the Columbia and Quincy Basins. In addition, on-farm data were collected to document N recovery of cover crops in commercial operations (Brunty, 1998). These data provide a solid foundation of information on N recovery by Brassica (white mustard, rapeseed), cereal crops (rye, wheat, triticale) and sorghum sudangrass.

2. Develop growing degree-day models to predict stage of development, canopy cover, N and biomass accumulation.

Recent Accomplishments: Kunch (2001) organized the GDD and soil cover models into a GIS model using ARClInfo which we presented at the national ASA meetings. More recent data from late-seeded cover crops in 2002-2003 have been added to the database. Preliminary updated
models were provided for tabular presentation of cover crop growth for the Farming with the Wind II publication and will be drafted for publication in Agronomy Journal.

Growing degree days were calculated from station weather data at each experimental location, and GDD growth and cover models were constructed for individual cover crops, using base temperatures obtained from the scientific literature. Regional weather data was compiled from the National Climatic Data Center using MS Access to organize daily maximum-minimum temperatures at 19 weather stations that have complete temperature data over the 29 year period between 1965 and 1994. Growth and cover models for individual cover crops (rapeseed, mustard, rye, triticale, winter wheat) were integrated with GIS weather maps to generate predicted growth and cover variations over the Columbia Basin and variations with seasonal weather patterns.

**Planned Research:** Complete updated GDD models by combining early season with late season plantings, and publish integrated growing degree models and projected biomass, cover development for different planting windows and growing regions in the Columbia Basin. A manuscript on growing degree day models will be published in Agronomy Journal.

3. **Evaluate late-season options in cover crop selection and management.**

**Recent Accomplishments:** Data from year 2 is summarized and is being incorporated into our previously established growing degree day models.

**Planned research:** Data will be summarized for publication on late season cover cropping. Late season planting research will be terminated due to budget cuts.

4. **Determine straw-based soil amendment and green manure effects on soil physical, chemical, biological properties and wind erodibility.**

**Recent Accomplishments:** Five sets of replicated side-by-side +/- mustard green manure plots were established in grower fields in fall 2002 near Moses Lake, Quincy WA by A. McGuire. Separate replicated plots were established in a grower field with the application of straw pulping black-liquor generated by UW Pulp and Paper Science/Engineering. Surface soil samples were taken in Feb/Mar 2003 for evaluation and a determination of wind erodibility with a portable wind simulator was conducted in collaboration with J. Dobrowolski. Lab/growth chamber/field studies are being conducted to further characterize impacts of black liquor on soil aggregation. A first year field experiment with pulping black liquor was conducted in the Horse Heaven Hills on an irrigated circle. Preliminary results suggest cover crop plowdown appeared to have residual effects on soil resistance to wind erosion. Furthermore, pulping black liquor was shown to increase soil microbial activity and soil aggregate stability.

**Planned research:** The above studies will be continued in their second year.