

**V(A). Planned Program (Summary)**

**Program # 5**

**1. Name of the Planned Program**

Climate Change - Soil Science

**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	60%		60%	
205	Plant Management Systems	40%		40%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of professional FTE/SYs expended this Program

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	3.0	0.0
Actual	1.0	0.0	3.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
32000	0	113100	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
48000	0	169500	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

**V(D). Planned Program (Activity)**

1. Brief description of the Activity

- N rate calibration research projects
- Update producer-oriented resource materials to reflect research results of N rate studies
- Present research results at workshops, field days and conferences

- Evaluate nitrate levels in waterways

**2. Brief description of the target audience**

- Growers
- Soil testing laboratories
- Government agencies
- Federal land managers
- Consultants, agricultural industry staff, and the public

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	3000	100000	100	5
<b>Actual</b>	4000	150000	150	200

**2. Number of Patent Applications Submitted (Standard Research Output)**

**Patent Applications Submitted**

Year: 2010  
 Plan: 0  
 Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2010	Extension	Research	Total
<b>Plan</b>	2	3	
<b>Actual</b>	2	4	6

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- {No Data Entered}

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Number of individuals receiving individual assistance
2	Number of individuals decreasing excessive N use
3	Number of individuals using alternative N sources
4	Number of individuals implementing recommended action or practice
5	Continued decline of N in ground and surface water (%)
6	Estimated dollar value of adopted best management practices (\$)
7	Less commercial N is used (%)
8	Percent of spring wheat and durum wheat growers who adopted the use of the new NDSU nitrogen recommendations.

**Outcome #1**

**1. Outcome Measures**

Number of individuals receiving individual assistance

Not Reporting on this Outcome Measure

**Outcome #2**

**1. Outcome Measures**

Number of individuals decreasing excessive N use

Not Reporting on this Outcome Measure

**Outcome #3**

**1. Outcome Measures**

Number of individuals using alternative N sources

Not Reporting on this Outcome Measure

**Outcome #4**

**1. Outcome Measures**

Number of individuals implementing recommended action or practice

Not Reporting on this Outcome Measure

**Outcome #5**

**1. Outcome Measures**

Continued decline of N in ground and surface water (%)

Not Reporting on this Outcome Measure

### **Outcome #6**

#### **1. Outcome Measures**

Estimated dollar value of adopted best management practices (\$)

Not Reporting on this Outcome Measure

### **Outcome #7**

#### **1. Outcome Measures**

Less commercial N is used (%)

Not Reporting on this Outcome Measure

### **Outcome #8**

#### **1. Outcome Measures**

Percent of spring wheat and durum wheat growers who adopted the use of the new NDSU nitrogen recommendations.

#### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

#### **3a. Outcome Type:**

Change in Action Outcome Measure

#### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2010	{No Data Entered}	50

#### **3c. Qualitative Outcome or Impact Statement**

##### **Issue (Who cares and Why)**

Previous spring wheat and durum wheat recommendations were 30 years old, state-wide in scope, and relied on a grower prediction of yield in each year. This led to under fertilization in many years with dire economic consequences. The NDSU Extension service released new recommendations for 2010. These recommendations are based on the "return to nitrogen" concept that considers the relationship of wheat yield to nitrogen rate, soil test nitrogen, credits from previous crops, the relationships of wheat grain protein to nitrogen rate, and the cost of nitrogen. These recommendations will provide an economic optimum nitrogen rate

recommendation to growers.

### **What has been done**

The new recommendations recognize differences in nitrogen availability and historic yield in three unique areas of the state. The new recommendations provide a nitrogen credit for long-term (more than 6 years) continuous no-till crop production supported by the research data from over 100 site-years of experiments. The recommendations strongly support the continued use of soil testing for nitrate to a depth of 2-feet. The recommendations support an organic matter nitrogen credit if the soil levels are above 5.9%, but not below. The recommendations are available in paper copy, but also as an interactive web-based worksheet, which is available as the North Dakota Spring Wheat and Durum Nitrogen Calculator.

### **Results**

Consultants and growers responding to a presentation of the new recommendations expressed their understanding of the principles and data behind the new recommendations and their willingness to adopt the new method. The interactive calculator has been a huge success. Consultant and grower feedback has been universally positive. Growers continue to express willingness to adopt the new recommendations. Although a definitive percentage of growers who adopted the practice is not available, feedback from numerous consultants and growers indicate that the number is substantial and likely exceeds 50%. Acres soil tested due to the computer-based recommendation worksheet has increased. As a metric, North Dakota is the only state out of Montana and Minnesota that saw an increase in spring wheat and durum protein in 2010, which is most likely due to grower adoption of the new recommendations. Consultants with a suite of growers have related that their clients who used the new recommendations experienced high yields and protein, while growers that fertilized as they had in the past did not achieve both goals. Projections estimate that if half of North Dakota's wheat growers use the new recommendations, the result should be about 10% greater yield and 1% more protein than otherwise. This would equate to a net benefit of about \$148 million per year.

## **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems

## **V(H). Planned Program (External Factors)**

### **External factors which affected outcomes**

- Economy

### **Brief Explanation**

Growers continue to see the need for high yields and protein, and most realize that the previous nitrogen recommendations were not helpful to consistently achieve these goals. Hard red spring wheat price is docked at lower protein levels, which is a result of low nitrogen fertility.

## **V(I). Planned Program (Evaluation Studies and Data Collection)**

## **1. Evaluation Studies Planned**

- After Only (post program)

## **Evaluation Results**

Evaluations were completed in January 2010 at the Soil and Soil Water Workshop, the Extension Crop Production workshops in NW North Dakota in Dec/Jan 2009, the Devils Lake Roundup in 2011, the Best of the Best wheat programs in 2010 and the Minnesota Wheat Growers meeting in Grand Forks, 2011. The results express grower and consultant understanding of the new recommendations and the process used to formulate the recommendations. They also indicate a strong willingness by growers and their consultants to adopt the new recommendations.

## **Key Items of Evaluation**