

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Climate Change

Reporting on this Program

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	10%		10%	
103	Management of Saline and Sodic Soils and Salinity	15%		15%	
205	Plant Management Systems	7%		7%	
211	Insects, Mites, and Other Arthropods Affecting Plants	8%		8%	
212	Pathogens and Nematodes Affecting Plants	15%		15%	
213	Weeds Affecting Plants	15%		15%	
216	Integrated Pest Management Systems	10%		10%	
405	Drainage and Irrigation Systems and Facilities	20%		20%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	17.2	0.0	15.2	0.0
Actual Paid Professional	22.0	0.0	24.0	0.0
Actual Volunteer	0.0	0.0	0.0	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
823000	0	940000	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1235000	0	1415000	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

- 1) Establish best water management practices for North Dakota
- 2) Create systems to reclaim saline and sodic areas within farm fields
- 3) Calibrate fertilizer application under higher moisture environments
- 4) Adjust disease management for all the major crops due to increased rainfall and higher humidity
- 5) Survey and improve management recommendations for insect pests on the major crops
- 6) Adapt weed management strategies to changing cropping systems, including resistance management
- 7) Investigate agronomic systems that are adapted to the change in rainfall and longer growing season
- 8) Translate scientific findings into practical producer applications and provide transformational education through workshops, field days and conferences, and resource materials

2. Brief description of the target audience

- 1) Crop producers in both North Dakota and adjacent states
- 2) Crop consultants and agricultural advisors
- 3) County Extension personnel
- 4) Agribusiness and agricultural finance personnel
- 5) Government agency staff

3. How was eXtension used?

The Ask an Expert feature of eXtension was used in this program.

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	10937	139000	6560	50015

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

Patent Applications Submitted

Year: 2012

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	4	2	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 farmers adopting new practices to achieve highly productive crops in a changing environment.
2	Number of farmers adopting new practices to improve pest management in a changing environment.
3	Number of farmers adopting improved soil and water management practices in response to a changing environment.
4	Number of acres impacted by producers adopting new practices to improve pest management in a changing environment.

Outcome #1

1. Outcome Measures

Number of farmers adopting new practices to achieve highly productive crops in a changing environment.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	110

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Each year, insects and diseases attack North Dakota's crops, potentially causing large losses in yield and quality. Crop producers need up-to-date data on pest occurrence, distribution and severity, so that they can make informed and timely management decisions. Correct and timely management decisions can make the difference between profit and loss for a crop that year.

What has been done

NDSU trained field scouts help producers stay informed about pest problems by surveying fields of major crops for insect and disease occurrence and severity. The survey has been titled the Integrated Pest Management (IPM) Survey, with the intent that once pests are found, they may need to be managed using IPM strategies. Field scouts are trained each year in late May and are provided with scouting protocols and equipment for accurate field scouting. In 2012, five field scouts surveyed five major crops (wheat, barley, soybean, sunflower and dry bean) across the state.

Results

Short term impacts relate to immediate information about pest problems. For example, in 2012 producers learned that wheat stripe rust developed early and reports of its occurrence allowed producers to make timely fungicide use decisions, resulting in improved yield. Information delivery was timely, either immediate or on a weekly basis via: NDSU Extension Crop and Pest Report; County Ag Alerts & Ag News releases; AgDakota list serve; and IPM maps posted on IPM website www.ag.ndsu.nodak.edu/aginfo/ndipm/. Long-term benefits of the IPM Survey includes: insect and disease occurrence or absence helps validate pest forecasting models; supports export of agricultural commodities as free of regulatory pests; shifts in disease presence and severity may indicate a race change, necessitating new management strategies; detection of pest resistance to pesticides; educational and research program needs identified; and improved

economic profitability of farms and reduced environmental impacts from pesticides.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

Outcome #2

1. Outcome Measures

Number of farmers adopting new practices to improve pest management in a changing environment.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	114

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Example 1:

Glyphosate-resistant weeds, such as waterhemp, common ragweed, horseweed (marestail) and kochia continue to increase in North Dakota, especially in the eastern half. Based upon current greenhouse testing 30% of 22 kochia samples from 2012 have been confirmed glyphosate-resistant and potentially 60% of the eastern half of North Dakota crop acreage may now have some frequency of glyphosate-resistant kochia.

Example 2:

In 2012 nearly 97% of sugarbeet grown in Minnesota and North Dakota were planted to Roundup Ready® sugarbeet. Since the introduction of Roundup Ready sugarbeet in 2008, glyphosate-resistant weeds have continued to increase in both states due to the near exclusive use of glyphosate and near exclusive planting of Roundup Ready corn and soybean. According to the 2012 (44th Annual) sugarbeet grower survey, 20% of survey respondents planting Roundup

Ready sugarbeet reported suspecting the presence of glyphosate-resistant weeds in sugarbeet encompassing 10% of the reported sugarbeet acreage reported by growers planting Roundup Ready sugarbeet. In 2008, only 7% of Roundup Ready sugarbeet growers responding to the survey suspected having glyphosate-resistant weeds.

What has been done

Example 1:

Research is being conducted at NDSU by several Extension and research personnel in Fargo and Research Extension Centers across the state to reduce glyphosate-resistant weeds in North Dakota cropping systems and maximize herbicide activity through the use of adjuvants. The adoption of preemergence herbicides in North Dakota has been slow. In 2009, preemergence herbicides were applied to only 4 percent of soybean acreage.

Example 2:

Sugarbeet grower winter seminars, workshops for sugarbeet cooperative agriculturalists, field days, and field and greenhouse research have been conducted to educate growers and the industry about the growth in glyphosate-resistant weeds and how to properly manage these weeds in sugarbeet and other crops in the rotation. In addition extension publications and a video entitled "Scouting for Glyphosate Resistance" have been developed over time and made available to growers and the sugarbeet industry. Recommendations to sugarbeet growers have been to apply glyphosate at maximum legal rates within each application to small annual weeds, include herbicides having alternative sites of action with glyphosate, hand-weed and row-cultivate fields and manage weeds properly in other crops within the rotation.

Results

Example 1:

A recent field trial showed the use of a preemergence herbicide followed by two glyphosate applications in Roundup Ready soybean improved glyphosate-resistant common ragweed control and soybean yield by 20 and 25%, respectively, however weed control was only 78%. This same trial showed the use of a preemergence herbicide followed by two Liberty applications improved weed control by 41% to 99% and LibertyLink soybean yield by 25%. This herbicide program in Roundup Ready soybean and LibertyLink soybean increased profits \$14.00/A and \$7.00/A, respectively. At 4.7 million acres of soybean in North Dakota and \$14.00/bu soybean, growers could potentially improve cash receipts for the state by \$32.9 million by planting LibertyLink soybean and maintain near 100% weed control.

Example 2:

To reduce the risk of developing herbicide resistance or manage resistance, more growers are using diverse weed management practices. Initially nearly 100% of sugarbeet growers only used glyphosate on glyphosate-tolerant sugarbeets. However, after training programs, growers used glyphosate tank mixtures on 24% of their acres in 2012 and soil residual herbicides on over 4% of the acres. Sugarbeet growers have even increased their use of hand weeding as an option. In 2012, 5% of glyphosate-tolerant sugarbeet acres were hand weeded. These improved practices will prevent future yield losses from herbicide resistant weeds.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
213	Weeds Affecting Plants

Outcome #3

1. Outcome Measures

Number of farmers adopting improved soil and water management practices in response to a changing environment.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	110

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Since 1993, above average annual precipitation has created excess water on the landscape and this has impacted crop production significantly in North Dakota.

What has been done

During 2012 presentations about tile drainage were given at 60 meetings throughout North Dakota and the Red River basin area of Minnesota. Eight different counties conducted tile drainage seminars. Training was provided for government agencies such as the Farm Service Agency, the Red River Basin Technical Scientific Advisory Council and the Fargo-Moorhead Diversion Ag Policy subcommittee. Seminars were given to several businesses and industries. Subsurface drainage educational presentations were given at state events such as crop advisor workshops, crop association and professional organization meetings. Also, NDSU ES cooperated with South Dakota State University ES and the University of Minnesota ES to organized five, 2-day tile drainage design workshops. Two were held in North Dakota, two in South Dakota and one in Minnesota.

Results

Tile drainage education was provided to over 3,000 educational seminar participants in 2012. Each of the five tile design workshops was evaluated with an 'end of the course' survey. One question asked was "If you were to place a dollar value on the information you received (when you apply the knowledge you learned in your business and not the price you paid today) what would it be?" Responding participants indicated the perceived value was well over 2 million dollars.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
103	Management of Saline and Sodic Soils and Salinity
405	Drainage and Irrigation Systems and Facilities

Outcome #4

1. Outcome Measures

Number of acres impacted by producers adopting new practices to improve pest management in a changing environment.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	151924

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

From 2000 through 2012, harvested soybean acreage in North Dakota increased from 1.8 to 4.7 million acres. Due to the increased interest in soybean production in North Dakota, there is a need to educate newer growers about all production aspects of growing soybean in the different regions of the state. The meetings educated soybean growers on variety selection, soybean diseases, intensive crop management, and the new pest in North Dakota, soybean cyst nematode.

What has been done

The NDSU ES state and area specialist with responsibility for soybean and county agents developed a training program called "Getting it Right in Soybean Production." Meetings were conducted in 2012. Many other local events including plot tours were conducted throughout the state.

Results

After attending the educational events, producers were asked the question: If you were to place a dollar value on the information you received (when you apply the knowledge you learned today in your business), what would it be per acre? The average of those who answered (26% of attendees) was \$9.53 per acre. The growers reported they, on average, managed 450, 1,070 and 1,338 soybean acres in Langdon, Oakes and Jamestown, respectively. The total perceived value

across the three locations for "Getting it Right" locations was in excess of 1.27 million dollars. This excludes impacts from the other educational events. Producers indicated that they had obtained useful information to make their farming operation more profitable.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
216	Integrated Pest Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Public Policy changes
- Government Regulations

Brief Explanation

Even though North Dakota suffered a drought in 2012, Climate Change goals for 2012 were met.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluation results are explained in each Outcome Target Results section.

Key Items of Evaluation

Integrated Pest Management (IPM) is an integral part of North Dakota's agriculture. IPM is a program to manage pests that combines a number of strategies to reduce pest risks, while improving economic profitability of farms and reducing environmental impacts from pesticides. Benefits of IPM include: reduced crop loss and improved crop quality; judicious use of pesticides in combination with non-chemical strategies, which results in improved protection of environment and health; reduced pest resistance; increased partnerships among growers, commodity groups, universities, consultants, industry and agencies, to improve pest management; and implementation of improved strategies and products through research.