V(A). Planned Program (Summary)

Program # 17

1. Name of the Planned Program

Fusarium head blight of wheat

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
<th>%1862 Extension</th>
<th>%1890 Extension</th>
<th>%1862 Research</th>
<th>%1890 Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>212</td>
<td>Pathogens and Nematodes Affecting Plants</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

V(C). Planned Program (Inputs)

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

<table>
<thead>
<tr>
<th>Year: 2009</th>
<th>Extension</th>
<th>Research</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1862</td>
<td>1890</td>
</tr>
<tr>
<td>Plan</td>
<td>1.5</td>
<td>0.0</td>
</tr>
<tr>
<td>Actual</td>
<td>1.5</td>
<td>0.0</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Extension</th>
<th>Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smith-Lever 3b &amp; 3c</td>
<td>Hatch</td>
</tr>
<tr>
<td>46800</td>
<td>74400</td>
</tr>
<tr>
<td>1862 Matching</td>
<td>1862 Matching</td>
</tr>
<tr>
<td>70200</td>
<td>111600</td>
</tr>
<tr>
<td>1862 All Other</td>
<td>1890 All Other</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Research on fungicidal- and bio-control and application technology
- Field surveys on disease severity and losses to disease
- Develop resource material
- Provide presentations and workshops
- Translate scientific materials into lay materials

2. Brief description of the target audience

- Wheat and barley producers
- Crop consultants and ag advisors
- Research Extension Centers
- Extension personnel
- Agribusiness and agrifinance personnel
- Government agency personnel

V(E). Planned Program (Outputs)

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

Patent Applications Submitted

Year: 2009
Plan: 0
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

<table>
<thead>
<tr>
<th>2009</th>
<th>Extension</th>
<th>Research</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Actual</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- {No Data Entered}
### V. State Defined Outcomes Table of Content

<table>
<thead>
<tr>
<th>O. No.</th>
<th>OUTCOME NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Percent of acres planted to resistant varieties</td>
</tr>
<tr>
<td>2</td>
<td>Percent of acres treated with fungicides</td>
</tr>
<tr>
<td>3</td>
<td>Economic losses to disease ($)</td>
</tr>
<tr>
<td>4</td>
<td>Number of individuals demonstrating increased knowledge and skills</td>
</tr>
<tr>
<td>5</td>
<td>Number of individuals implementing recommended action or practice</td>
</tr>
<tr>
<td>6</td>
<td>Estimated dollar value of adopted best management practices ($)</td>
</tr>
<tr>
<td>7</td>
<td>Stable export market unaffected by quality issues ($)</td>
</tr>
<tr>
<td>8</td>
<td>Percentage of North Dakota producers who used a practice or combination of practices to reduce the potential threat of Fusarium head blight (FHB) disease and increase yield.</td>
</tr>
</tbody>
</table>
Outcome #1

1. Outcome Measures

Percent of acres planted to resistant varieties

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Percent of acres treated with fungicides

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Economic losses to disease ($)

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of individuals demonstrating increased knowledge and skills

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Number of individuals implementing recommended action or practice

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

Stable export market unaffected by quality issues ($)

Not Reporting on this Outcome Measure
Outcome #8

1. Outcome Measures

Percentage of North Dakota producers who used a practice or combination of practices to reduce the potential threat of Fusarium head blight (FHB) disease and increase yield.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

<table>
<thead>
<tr>
<th>Year</th>
<th>Quantitative Target</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>(No Data Entered)</td>
<td>73</td>
</tr>
</tbody>
</table>

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fusarium head blight is a crop disease that has the potential to cause severe yield and quality losses in ND wheat. Over past decade, over $2 billion was lost to this disease because of reduced wheat production, quality (fungus can produce a mycotoxin), and farm and small town business failures. Approximately 2/3 or 20,000 of ND's 30,000 farmers are at risk to this disease any given year, depending on if favorable weather for infection occurs. NDSU Research and Extension efforts are designed to test strategies, and then provide information and demonstration on the strategies that reduce this disease and how an integration of strategies is more beneficial than a single strategy.

What has been done
Applied research has shown the effects of cultivar resistance, crop rotation and appropriate fungicide use on the disease and subsequent crop yield and quality. Good FHB management strategies are available and when combined, provide the optimum in economic and grain quality returns. Based on this knowledge, NDSU extension IPM programs have held series of workshops across the state (including ones called "Best of the Best"), field days, provided news releases and extension newsletters, and updated management information on the internet.

Results
A survey of wheat producers attending the two annual Best of the Best Wheat Production workshops indicated that 80% of them use resistant varieties and fungicides for FHB management and 72% use crop rotation. Seventy percent of these same wheat producers indicated that extension meetings were the top source of their FHB management information. Another 34% of respondents indicated that Extension publications were among their most important source of FHB management information. An applied research trial indicated that a combination of three management strategies, rotation, use of resistant varieties and application of a fungicide, gave an economic return of $120/acre over no management strategy and $68 to $30 better economic return that a single or two strategies. Thus, NDSU IPM research has shown value of integrated strategies, and adoption of key FHB management practices is high among well informed wheat producers. As a consequence, the adoption of these practices has created in excess of $150M in additional annual returns to North Dakota wheat growers.

4. Associated Knowledge Areas

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>212</td>
<td>Pathogens and Nematodes Affecting Plants</td>
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</tbody>
</table>
V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Other (Farm Program)

Brief Explanation

Brief explanation of external factors which affected the outcomes. The weather plays a big factor in development of FHB disease; a late summer drought in 2008 and cold temperatures in 2009 limited disease and some adoption of practices; In 2008, high commodity prices resulted in high interest in management strategies because wheat producers wanted a healthy, high yielding crop to realize the gains from having high prices. In more marginally profitable years, producers will more likely adopt crop rotation and variety resistance than use of fungicides. And finally, changes in the farm program and price supports for oilseed crops such as soybean, often make wheat less of a profitable crop than soybean, so producers may choose not to grow wheat, regardless of disease threat and the good management strategies available.

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

1. Evaluation Studies Planned

- After Only (post program)
- Before-After (before and after program)

Evaluation Results

Current evaluation results are described in the outcomes section. Participant’s use of FHB management practices was determined by surveying participants in two large wheat production workshops. In 2010, a new, much broader survey will be conducted with the help of the ND Ag Statistical Reporting Service (ND NASS). The questionnaire will be mailed to approximately 5000 wheat producers who have 100 acres or more across 22 counties in ND, and make comparisons among participants based on their farm size, use of consultants and their use of the extension service, and determine their primary sources of FHB management information, and which practices they consider most important.

Key Items of Evaluation