V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Global Food Security and Hunger: Cereals

☑ 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%		15%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		20%	
202	Plant Genetic Resources	20%		20%	
205	Plant Management Systems	25%		5%	
211	Insects, Mites, and Other Arthropods Affecting Plants	5%		20%	
212	Diseases and Nematodes Affecting Plants	10%		10%	
213	Weeds Affecting Plants	10%		5%	
216	Integrated Pest Management Systems	15%		2%	
405	Drainage and Irrigation Systems and Facilities	0%		2%	
502	New and Improved Food Products	5%		1%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	4.5	0.0	10.0	0.0
Actual Paid	8.5	0.0	8.5	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**
185804	0	391846	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
185804	0	391846	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
102684	0	3354723	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

• Breeding, testing, evaluating wheat and barley varieties throughout Idaho that will evaluate agronomic performance, end-use quality, adaptability to an area or type of production, suitability for specialty markets, and production of seed for moving the varieties into commercial production
• Conducting cereal schools to interact with growers and provide technology transfer for new varieties, pest management practices and problems, management decisions, and integration of cereals in cropping systems
• Conduct field tours and field days to transfer technology as in cereal schools
• Meet with advisory committees, commodity commissions, processors, ag-support industries for feedback and to inform them of work in cereal production in Idaho
• Conduct off campus credit and continuing ed classes, stakeholder seminars, and applicator training/testing for education and technology transfer about cereals
• Write and publish newsletters, Extension publications, progress reports, scientific publications, and general media articles
• Conduct research into cereal production problems as identified in the plan of work
• Interact with other professionals at meetings to transfer knowledge, form alliances, and implement projects
• Document and report progress and accomplishments

2. Brief description of the target audience

Cereal growers in Idaho - will be provided with technology to enhance cereal production and profitability and provide feedback and suggestions of needs and areas of concern for profitable cereal production. They will also provide resources for the project through direct use of facilities, and through checkoff contributions to commodity commissions.

Agribusiness and support workers - will provide resources for technology development and delivery, be targets for information delivery, provide feedback and suggestions for directions of the program.

3. How was eXtension used?

use of eXtension was in this program was primarily as a resource for Extension professionals.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	10111	54278	12	287

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

Patent Applications Submitted

Year: 2014
Actual: 2

Patents listed
201400419 - UI Platinum Wheat Common
201400011 - UI Silver, Wheat Common

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	9	36	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Idaho Cereal Schools.

Year	Actual
2014	17

Output #2

Output Measure

- Release and adoption of new cereal varieties.

Year	Actual
2014	2

Output #3

Output Measure

- Publication of CIS, Progress reports, PNW, and other Ext. Pubs.

Year	Actual
2014	12

Output #4

Output Measure

- Develop pest control technology - project/experiments.

Year	Actual
2014	26

Output #5

Output Measure

- Research on management systems - projects/experiments.

Year	Actual
2014	33

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	O: Producers gain knowledge about improved cereals management at cereal schools, field days, seminars, and re-certification events. I: Number of participants attending cereal schools, field days, etc.
2	O: Producers are aware of cereal resource publications. I: Number of cereal extension publications distributed.
3	O: Producers adopt new cereal varieties. I: Increase in number of acres of new varieties (released within 5 years; greater than previously grown).
4	O: Adoption of new crop production methods. I: Number of growers who report adoption through surveys at educational events and meetings.
5	O: An increase in the number of trained graduate students prepared to enter the workforce. I: Number of M.S. and Ph.D. candidates relevant to this topic team.
6	Identify the best grain lines to grow in areas with high disease pressure, nematode and water stress.

Outcome #1

1. Outcome Measures

O: Producers gain knowledge about improved cereals management at cereal schools, field days, seminars, and re-certification events. I: Number of participants attending cereal schools, field days, etc.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1806

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Cereal producers and crop advisors need a continual flow of new information about varieties, pests, production practices, nutrient management, and a host of other areas of science that impact their businesses. They also need an opportunity to discuss the implications of new information with experts. Extension has the ability and credibility to provide new information that is free from commercial bias so that growers and consultants are willing to accept and adopt the information.

What has been done
Faculty in the cereals team hosted 12 producer schools, 17 workshops, 20 tours and field days, and made 58 other presentations about related topics to grower meetings and other events where clientele were gathered.

Results
More than 1,800 learners participated in cereal schools and workshops in 2014. Although adult learning preferences do not permit detailed evaluation at most of these kinds of events, pre- and post-tests using wireless audience response systems have allowed incorporation of evaluation for several of our events. In those cases, knowledge gained by clientele has been significant.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
202	Plant Genetic Resources

205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Diseases and Nematodes Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
405	Drainage and Irrigation Systems and Facilities
502	New and Improved Food Products

Outcome #2

1. Outcome Measures

O: Producers are aware of cereal resource publications. I: Number of cereal extension publications distributed.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	599

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Diseases and Nematodes Affecting Plants
213	Weeds Affecting Plants

216	Integrated Pest Management Systems
502	New and Improved Food Products

Outcome #3

1. Outcome Measures

O: Producers adopt new cereal varieties. I: Increase in number of acres of new varieties (released within 5 years; greater than previously grown).

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	610

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Every year, new wheat and barley varieties are developed by both private and public breeders. Often the new varieties have novel disease resistance and/or improved yield and end use quality. To help Idaho to continue being a leader in barley and wheat production it is vital to keep growers and the agriculture industry informed of these new varieties to result in a uniform, high quality product.

What has been done
Variety trials were conducted at various locations throughout Idaho, highlighting newly released varieties of winter and spring wheat and barley. Summaries of new varieties were presented in winter cereal schools and field days as well as an Research Bulletin.

Results
. Growers and industry regularly refer to the results generated by the Idaho variety testing program. Information on yield and other agronomic components is important to inform seed dealers and producers about new varieties, not only about which varieties performed best throughout Idaho, but also regional and local variation in variety performance based on dozens of locations for variety trial plots.

4. Associated Knowledge Areas

KA Code	Knowledge Area

202 Plant Genetic Resources

Outcome #4

1. Outcome Measures

O: Adoption of new crop production methods. I: Number of growers who report adoption through surveys at educational events and meetings.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	491

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Soil acidity is increasing in northern Idaho due to the long-term use of ammonium based fertilizers. Related to the soil acidity is an increase in aluminum toxicity and reduction in plant health and reduced yields. While not areas of northern Idaho are being equally impacted, this is a growing problem and needs to be considered by growers in the region.

What has been done
Field research is being conducted at three locations in northern Idaho and collaboratively at three additional locations in eastern Washington. In addition, a webinar on the topic was presented along with talks at three winter meetings and a field day. An article was written for the Idaho Grain magazine highlighting the potential impact of soil acidity and discussing potential solutions including liming.

Results
As a result of research and extension efforts, many growers have been experimenting with lime applications, evident by the numerous piles of lime observed in August and September of 2014 in northern Idaho as well as personal communication with northern Idaho growers. In some cases, growers are observing significant improvements in crop vigor and are reporting improvements in crop yield. Others are reporting no difference following lime application. Additional research is being planned to look at the feasibility and impact of making applications of higher rates of lime according to lime requirement tests.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

O: An increase in the number of trained graduate students prepared to enter the workforce. I: Number of M.S. and Ph.D. candidates relevant to this topic team.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fusarium Head Blight (FSB) is a disease of importance nationally and internationally and is likely to become and increasing problem for growers in Idaho and some areas of the Pacific Northwest because of increasing corn production, reduced tillage, and changing climate.

What has been done
A total of 2060 lines were genotyped with markers of FSB. Approximately 500 lines were selected based on marker genotype and agronomic performance in headrow test.

Results
An M.S. student completed a mapping study and identified two major Quantitative Trait Loci (QTL) and 2B and 3B associated with type II resistance in the cultivar resistance UI Stone. The two QTL are located in the flanking regions of the previously published ones. Under collaboration with genotyping center, the mapping population was genotyped by GBS. The GBS data are currently being integrated to the current linkage map and used in QTL analysis.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms

Outcome #6

1. Outcome Measures

Identify the best grain lines to grow in areas with high disease pressure, nematode and water stress.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A recognized barrier to grain production under dryland conditions is the water and nutrient-robbing fungi that infect stressed root and crown issue.

What has been done
The effect of inoculation on early spring stand, whitehead formation, yield and test weight was significant. Varieties were ranked according to yield under disease and drought stress. There were significant year, block, year by variety and block by variety effects for stand, test weight, whitehead formation, and yield. Block by variety effects were significant for stand, test weight and yield, indicating significant environmental effects typical of soil-borne disease. As is common in experiments examining the effects of soil-borne disease and nematodes, the coefficients of variation were relatively high.

Results
Improving economic conditions for growers to reduce disease losses, and reduced environmental impacts with less foliar fungicide treatments needed to control disease. Clarification on effectiveness of seed treatments for control of foot rot disease is critical, but results of the seed treatment trials indicate that in most years, seed treatments are ineffective in controlling foot rot diseases, especially when measured as impact on yield. Currently, host resistance continues to be the most effective method for reducing fungal and nematode damage.

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Diseases and Nematodes Affecting Plants

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)

Brief Explanation

Drought has had a significant impact on water available for irrigation in Southern Idaho, potentially impacting varietal trials and rates of varietal adoption.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

In winter of 2014, the Idaho cover crop research was presented at four UI Extension Cereal Schools in eastern Idaho where 332 participating producers were surveyed on current use and future adoption of cover crops. Currently, 16% of producers at the cereal schools use cover crops. After presenting Idaho cover crop research, 48-79% are willing to adopt cover crops with one-third of these producers planning to adopt by the 2015 growing season. The participating producers indicated they would adopt cover crops to achieve multiple management goals, such as to minimize soil wind erosion loss, supplement soil organic matter and nitrogen levels, and scavenge soil nutrients. If one-third of the participants implemented cover crops by 2015, an estimated 94,500 acres of cover crops would be planted in eastern Idaho.

Key Items of Evaluation

Field-scale irrigation scheduling case study sites were established at Osgood, Ririe, and Grace, ID. At each site paired fields were selected with malting barley as the crop, and irrigation system, soils and other factors as common as possible. Paired fields were pivot irrigated at Osgood and Ririe and set-system irrigated at Grace. Irrigation was scheduled on one field of each pair according to farmer practice and on the other by a web-based water budget program utilizing AgriMet ET from the new local AgriMet weather station. On each of the 6 fields, soil moisture sensors were placed at depths of 12, 18, 24 and 30 inches and a tipping bucket rain gage installed to monitor soil moisture status and verify water savings due to better irrigation scheduling.
Water savings due to improved irrigation scheduling in 2014 was for the 3 sites was 5, 15 and 15% for Osgood, Ririe and Grace, respectively. Analysis of soil moisture content with depth and time on both the control and treatment fields suggested that at least 10-15% additional water savings is possible if growers gain confidence in the scheduling procedure and use it more aggressively.