



U.S. Wheat & Barley  
Scab Initiative

**FY18 USWBSI INDIVIDUAL PROJECT PROPOSAL(S)**

NOTE: This document will be retained in the USWBSI's NFO

**COVER PAGE**

**Instructions:** Update any contact information that is not correct and sign cover page before submitting full Individual Project Proposal(s).

<b>USWBSI Consolidated Funding Title:</b>	<i>Integrated Management and Prediction of Fusarium Head Blight and DON in Winter Wheat.</i>
<b>Principal Investigator (PI):</b>	Stephen Wegulo
<b>PI's Institution:</b>	University of Nebraska
<b>PI's Address:</b>	Department of Plant Pathology 448 Plant Science Hall Lincoln, NE 68583
<b>PI's E-mail:</b>	swegulo2@unl.edu
<b>PI's Phone:</b>	402-472-8735
<b>Fiscal Year (FY):</b>	2018
<b>Award Period:</b>	06/13/18 - 06/12/19
<b>ARS Agreement Number:</b>	59-0206-6-014
<b>Institution's Indirect Cost Rate for the USWBSI for FY18:</b>	5% DC
<b>USWBSI's FY18 Total Recommended Amount:</b>	<b>\$ 15,742</b>
<b>USDA-ARS FY18 Total Award Amount:</b>	<b>\$ 15,254</b>

USWBSI Project ID	USWBSI Research Category	USWBSI Project Title	PI Requested Amount	USWBSI's Recommended Amount	ARS Award Amount
FY18-IM-013	MGMT	Integrating Strategies to Mitigate Fusarium Head Blight and DON in Winter Wheat.	\$ 20,145	\$ 15,742	\$ 15,254
<b>FY18 USWBSI's Total Recommended/ARS Award Amount</b>				<b>\$ 15,742</b>	<b>\$ 15,254</b>

# FY18 USWBSI INDIVIDUAL PROJECT PROPOSAL

## PROJECT SUMMARY PAGE

### *Principal and Co- Investigator(s):*

**Principal Investigator:** Stephen Wegulo

**Institution:** University of Nebraska

**Co-Investigator #1:**

**Institution:**

**Co-Investigator #2:**

**Institution:**

**Co-Investigator #3:**

**Institution:**

**Project Title 1:** *Integrating Strategies to Mitigate Fusarium Head Blight and DON in Winter Wheat.*

### PROJECT SUMMARY

The overall goal of this research is to integrate cultivar resistance with fungicide application to effectively manage FHB and DON in winter wheat. The specific objectives are:

- 1) *Evaluate the integrated effects of fungicide treatment and genetic resistance on FHB and DON in winter wheat with emphasis on a new fungicide, Miravis Ace*
- 2) *Enhance communication and end user education/outreach on integrated management of FHB and DON*

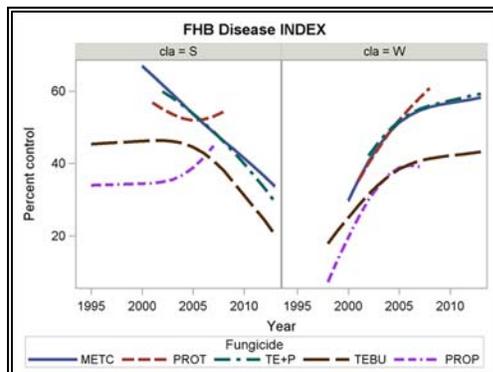
Plans to accomplish the project goal and objectives within the proposed time period are as follows: A field experiment will be conducted to investigate the effects of cultivar resistance and fungicide application on FHB and DON in winter wheat. The experiment will be located at the University of Nebraska Havelock Research Farm near Lincoln, Nebraska. The experimental design will be a split plot in randomized complete blocks with four replications, with cultivars as whole-plots and fungicide x inoculation treatments as sub-plots. Four cultivars adapted to Nebraska will be used: Overland (moderately resistant), Millennium (moderately resistant), Roubidoux (susceptible), and Wesley (susceptible). The fungicide x inoculation treatments will be 1) untreated, inoculated check; 2) Prosaro (6.5 fl. oz.) at anthesis, inoculated; 3) Miravis Ace (11.5 fl. oz.) at anthesis, inoculated; 4) Miravis Ace at Feekes 10.5, inoculated; 5) Prosaro at anthesis, non-inoculated; and 6) untreated, non-inoculated check. Fungicides will be applied with a CO<sub>2</sub>-powered backpack sprayer equipped with four Teejet 800-1 VS nozzles and calibrated to deliver 20 gallons of fungicide-water mixture per acre. In treatments 1 to 4, plots will be spray-inoculated with spores of *Fusarium graminearum* ( $1 \times 10^5$  spores/mL) 24 hours after fungicide application at anthesis. To enhance inoculum buildup in the plots as well as disease development, corn kernel inoculum will be spread weekly on the soil surface starting at three weeks before anthesis. FHB intensity will be assessed at the soft dough growth stage. At and following harvest, yield, test weight, *Fusarium*-damaged kernels (FDK), and DON concentration will be determined. A weather station at the experiment site will record weather data starting in mid-April through harvest. Results from the research will be disseminated to growers, crop consultants, stake-holders, and the public through mass media and presentations at state and national meetings. This education/outreach will result in reduced losses to FHB and DON, increased profits for growers, and high quality wheat grain.

PLAN OF WORK

Title: Integrating Strategies to Mitigate Fusarium Head Blight and DON in Winter Wheat

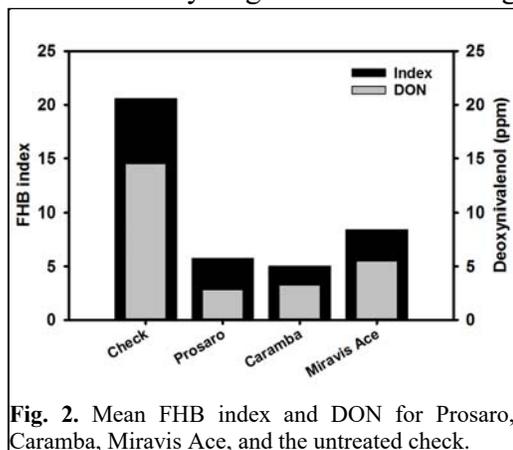
**Introduction and Rationale:** Data from previous management coordinated projects (MGMT\_CP) show that **i)** Demethylation Inhibitors (DMI) fungicides such as prothioconazole and metconazole are the most effective against Fusarium head blight (FHB) and deoxynivalenol (DON) (Paul et al. 2008); **ii)** when applied at or up to 6 days after anthesis to moderately resistant cultivars, these fungicides provide more than 70% reduction of both FHB index and DON, relative to the untreated, susceptible check (Willyerd et al. 2012, Salgado et al. 2017); **iii)** Quinone Outside Inhibitor (QoI) fungicides may result in an increase in DON accumulation in harvested grain, particularly when applied close to anthesis (Bradley et al. 2011); and **iv)** sequential applications or tank mixes of QoIs and DMIs do not negate the negative effects of the QoIs on DON (Bradley et al. 2011). Based on these findings, DMIs are the only, and consequently, most widely used fungicides for FHB and DON management. But the repeated use of this chemistry is not a good fungicide resistance management strategy.

Isolates of the FHB fungus, *Fusarium graminearum*, with resistance to tebuconazole have already been reported (Klix et al. 2007; Spolti et al. 2014), and a recent quantitative synthesis of 20 years of data from FHB uniform fungicide trials (Madden et al. *personal communication*) suggests that the efficacy of this and other DMIs may be declining, particularly in spring wheat areas (**Fig. 1**). A comprehensive population study is needed to determine whether reduced sensitivity or even resistance to DMIs is developing or already widespread among populations of *F. graminearum* across FHB-affected regions of the US. However, even if insensitivity to DMIs is not yet widespread, effective fungicides of other modes of action are still needed for application in rotation or combination with DMIs as a good resistance management strategy.



**Fig. 1.** Temporal change in the efficacy of DMI fungicides Caramba (METC), Proline (PROT), Prosaro (TE+P), Folicur (TEBU) and Tilt (PROP) against FHB: a preliminary analysis.

Preliminary results from a limited number of trials show that Miravis Ace (Adepidyn; Pydiflumetofen), a new Succinate Dehydrogenase Inhibitor fungicide that is being labeled for use in wheat, provides comparable levels of FHB and DON reduction to that of Prosaro and Caramba when applied at anthesis (Feekes 10.5.1) (**Fig. 2**). Moreover, this new fungicide is reported to be just as effective as the industry standards when applied at 50% heading (Feekes 10.3), providing options for an effective, early treatment for FHB and DON suppression.



**Fig. 2.** Mean FHB index and DON for Prosaro, Caramba, Miravis Ace, and the untreated check.

This research is proposed to test Miravis Ace in an integrated management trial in Nebraska as part of a coordinated effort to add this new chemistry to the FHB management toolbox. We hypothesize that **a)** this fungicide will provide comparable levels of FHB and DON suppression to those of Prosaro and Caramba; **b)** pre-anthesis applications of Miravis Ace will provide greater FHB and DON suppression than previously reported for Prosaro and Caramba; **c)** as previously reported for Prosaro and Caramba, the highest percent reduction of FHB index and DON, relative to the untreated, susceptible check will be observed when Miravis Ace is applied to moderately resistant cultivars; and **d)** the magnitude of the effect of this new fungicide will vary among grain market classes (winter wheat in Nebraska) and will be influenced by baseline disease and toxin levels.

This project will address the following **goals in the USWBSI Action Plan:** Goal # “1) Develop integrated management strategies for FHB and mycotoxins that are robust to conditions experienced in production fields and Goal # 2) Help develop and validate the next generation of management tools for FHB/DON control”. **The research needs in the USWBSI Action plan** addressed by the proposed research are: “1) Validate integrated strategies with the next generation of wheat varieties; 2) Evaluate the flexibility of fungicide application timing within the context of integrated management

## FY18 USWBSI INDIVIDUAL PROJECT PROPOSAL

strategies; 3) Enhance forecasting capabilities for FHB and continued development of FHB and DON models for wheat; and 4) Develop economic analyses of effective management strategies used alone or in combination”.

### **Research Materials and Methods**

**Description and sequence of proposed experiment – Evaluate the integrated effects of fungicide treatment and genetic resistance on FHB and DON in winter wheat, with emphasis on a new fungicide, Miravis Ace:** A field experiment will be conducted to investigate the effects of cultivar resistance and fungicide application on FHB and DON accumulation in winter wheat. Plots will be established at the University of Nebraska-Lincoln Havelock Research Farm near Lincoln, Nebraska. The experiment will be managed according to standard agronomic practices for Havelock Research Farm. The experimental design will be a randomized complete block (RCBD), with a split-plot arrangement of cultivar as the whole-plot and fungicide treatment (Table 1) as the sub-plot. There will be four replicate blocks. Four cultivars will be used: Overland, moderately resistant; Millennium, moderately resistant; Robidoux, susceptible; and Wesley, susceptible (Figure 1).

**Table 1.** The following fungicide treatments will be randomly assigned to experimental units:

Treatment <sup>a</sup>	Product	Rate	Timing
1	Untreated check	...	...
2	Prosaro	6.5 fl oz/A	Anthesis
3	Miravis Ace	11.5 fl oz/A	Anthesis
4	Miravis Ace	11.5 fl oz/A	Feekes 10.5
5	Prosaro, non-inoculated	6.5 fl oz/A	Anthesis
6	Untreated, non-inoculated	...	...

<sup>a</sup>All treatments will be applied with NIS @ 0.125 v/v

Applications will be made using a sprayer equipped with four Teejet 800-1 VS nozzles mounted at an angle of 30-45° from the horizontal, facing forward, and calibrated to deliver 20 gallons of fungicide-water mixture per acre. All but two plots of each cultivar will be inoculated 24 hours after the anthesis treatment is applied with a spore suspension (100,000 spores/mL) consisting of a mixture of isolates of *Fusarium graminearum* endemic to Nebraska. Corn kernel inoculum will be spread in plots starting three weeks before anthesis to enhance inoculum production and disease development.

FHB incidence and severity will be rated as described by Stack and McMullen (1998) on 50-100 spikes per plot at the soft dough growth stage (Feekes 11.2). Foliar diseases present will be noted. Plots will be harvested with a plot combine and yield and test weight determined. Two subsamples of grain from each plot will be pulled - one will be rated to determine the percentage of Fusarium damaged kernels (FDK), and the other will be sent to the Virginia Tech Deoxynivalenol (DON) Testing Lab for DON analysis.

A Spectrum Technologies weather station (Aurora, IL) will be used to collect temperature, relative humidity, surface wetness, rainfall, wind speed, and solar radiation data at regular intervals from Feekes GS 7 (stem elongation) to harvest.

**Results expected:** By performing inoculated experiments at multiple locations (multiple states are involved), we anticipate that different baseline levels of FHB will develop by virtue of differences in local weather and other FHB-influencing factors. We will be able to determine the degree to which baseline FHB and DON levels influence the efficacy of the tested fungicide treatments and treatment x cultivar combinations across locations and grain classes. We anticipate that all Miravis Ace treatments will provide comparable levels of FHB and DON reduction to standard anthesis applications of Prosaro and Caramba. However, due to interactions among cultivar maturity (time of anthesis), genetic resistance, time of fungicide application, and weather conditions at the time of application (the location effect), we expect to see variations in the absolute levels of efficacy for any given fungicide program. We anticipate that percent FHB/DON reduction for a given program may be comparable among cultivars

## FY18 USWBSI INDIVIDUAL PROJECT PROPOSAL

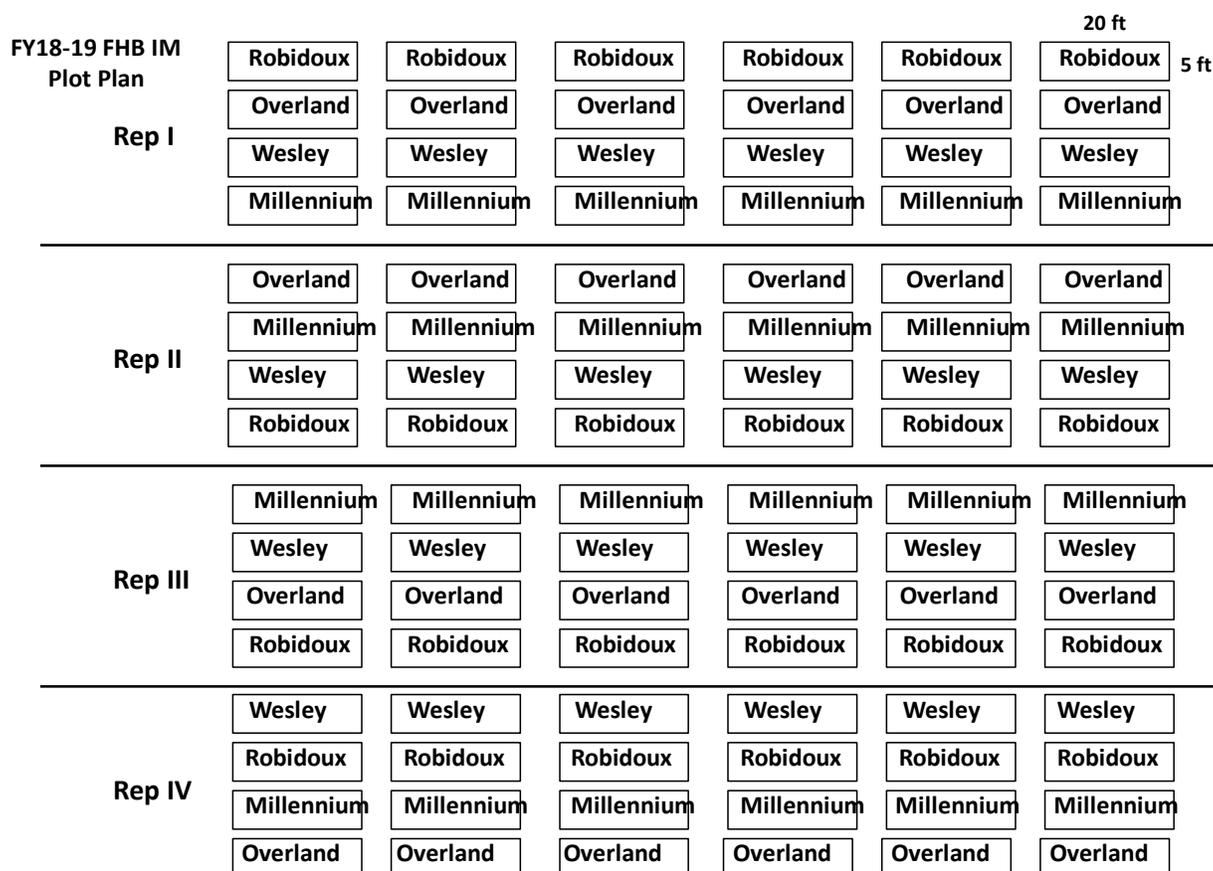
with different resistance classifications or different among cultivars in a similar resistance class in some situations. These are desired effects that would allow us to quantitatively evaluate different permutations in the associations among cultivar trials, fungicide programs, weather conditions, FHB, and DON.

**Analytic methods:** Mixed models (Littell et al. 2006; Schabenberger and Pierce 2002) will be used to evaluate treatments effects on FHB incidence, severity and index, yield, test weight, FDK, and DON content to demonstrate the value of fungicide treatment and integrated management programs on FHB and DON. In addition, data will be sent to Drs. Pierce Paul and Larry Madden at OSU who will compile data from all trials and use meta-analysis (Hedges et al. 1999; Madden and Paul 2011; Madden et al. 2016) or some other method of research synthesis to quantify the effects fungicide treatments and treatment x cultivar combinations on all measured response variables. Study-specific characteristics such as grain market class, date of anthesis, percent surface residue, and severity of foliar diseases will be used as moderator variables in the meta-analyses to evaluate their influence on the overall efficacy. Summary results will be used along with grain prices, price discounts, fungicide application costs, and estimates of yield loss due to wheel tracks to estimate and compare the economic benefit of fungicide programs, both alone and in combination with genetic resistance, for FHB/DON management.

**Application of results/technology transfer:** Results from these experiments will allow us to determine whether Miravis Ace is as effective as Prosaro and Caramba against FHB and DON, whether “early” application of Miravis Ace is just as or more effective than anthesis application, and whether the performance of this new fungicide is consistent across locations/environments and grain market classes. This will provide producers with additional options for managing FHB and DON. Summary results from these studies will be published as part of a national publication on integrated management guidelines for FHB and DON. Regionally, results will be delivered to growers, dealerships, county extension educators and others in the wheat and barley industry by extension specialists. In addition, data from these trials will be used to advance the development and validations of FHB and DON risk assessment models.

**Possible pitfalls and limitations:** The success of this project is heavily dependent on the weather. If weather is entirely unfavorable for FHB (hot and dry during anthesis and early grain fill), no disease will develop regardless of treatment. Conversely, if weather is extremely favorable for infection (e.g., prolonged rain before and during flowering), there may be no significant treatment effect. By conducting the experiments at multiple locations (weather conditions), with artificial inoculation and using cultivars with different maturities and resistance responses, the probabilities of either of these eventualities occurring at every location is minimized. Results from previous inoculated studies showed that even when weather conditions were unfavorable for natural infection, FHB still developed in inoculated plots, allowing for the comparison of treatments.

# FY18 USWBSI INDIVIDUAL PROJECT PROPOSAL



**Figure 1.** Plot layout for FY18-19 field experiment investigating the effect of cultivar, the fungicides Prosaro and Miravis Ace applied at anthesis, and inoculation with *Fusarium graminearum* on Fusarium head blight and deoxynivalenol in winter wheat.

**References to project description:**

1. Bradley, C.A., Adeel, E.A., Ebelhar, S.A., Bergstrom, G.C., Dill-Macky, R., Wiersma, J.J. Grybauskas, A.P., Kirk, W.W., McMullen, M.P., Halley, S., Milus, E.A., Osborne, L.E., Ruden, K.R. and Wise, K.A. 2011. Effects of Triazole, Strobilurin, and Triazole + Strobilurin fungicides on Fusarium head blight and associated mycotoxins. In: S. M. Canty, A. Clark, A. Anderson-Scully, D. Ellis and D. Van Sanford (Eds.), Proceedings of the National FHB Forum; 2011 Dec. 4-6; St. Louis, MO. East Lansing, MI/Lexington, KY: US Wheat and Barley Scab Initiative. pp. 125-126.
2. Hedges, L. V., Gurevitch, J., and Curtis, P. S. 1999. The meta-analysis of response ratios in experimental ecology. *Ecology* 80:1150-1156.
3. Klix, M. B., Verreet, J.-A., and Beyer, M. 2007. Comparison of the declining triazole sensitivity of *Gibberella zeae* and increased sensitivity achieved by advances in triazole fungicide development. *Crop Prot.* 26:683-690.
4. Littell, R. C., Milliken, G. A., Stroup, W. W., Wolfinger, R. D., and Schabenberger, O. 2006. SAS System for Mixed Models. SAS Institute, Cary, NC.
5. Madden, L. V., and Paul, P. A. 2011. Meta-analysis for evidence synthesis in plant pathology: An overview. *Phytopathology* 101:16-30.
6. Madden, L. V., Piepho, H.-P., and Paul, P. A. 2016. Statistical models and methods for network meta-analysis. *Phytopathology* 106:792-806.
7. Paul, P. A., Lipps, P. E., Hershman, D. E., McMullen, M. P., Draper, M. A., and Madden, L. V. 2008. Efficacy of triazole-based fungicides for Fusarium head blight and deoxynivalenol control in wheat: A multivariate meta-analysis. *Phytopathology* 98:999-1011.

## FY18 USWBSI INDIVIDUAL PROJECT PROPOSAL

8. Salgado, J. D., Ames, K., Bergstrom, G., et al. 2017. A Multi-state coordinated project to evaluate integrated management strategies for Fusarium head blight and deoxynivalenol in wheat. *Phytopathology* 107: Abstract.
9. Schabenberger, O., and Pierce, F. J. 2002. *Contemporary Statistical Models for the Plant and Soil Sciences*. CRC Press, New York.
10. Spolti, P., Del Ponte, E. M., Dong, Y., Cummings, J. A., and Bergstrom, G. C. 2014. Triazole sensitivity in a contemporary population of *Fusarium graminearum* from New York wheat and competitiveness of a tebuconazole-resistant isolate. *Plant Dis.* 98:607-613.
11. Stack, R. W., and McMullen, M. P. 1998. A visual Scale to estimate severity of Fusarium head blight in wheat. NDSU Extension Service: Small Grains Publications. Online Publication/PP-1095.
12. Willyerd, K. T., Li, C., Madden, L. V., Bradley, C. A., Bergstrom, G. C., Sweets, L. E., McMullen, M., Ransom, J. K., Grybauskas, A., Osborne, L., Wegulo, S. N., Hershman, D. E., Wise, K., Bockus, W. W., Groth, D., Dill-Macky, R., Milus, E., Esker, P. D., Waxman, K. D., Adee, E. A., Ebelhar, S. E., Young, B. G., and Paul, P. A. 2012. Efficacy and stability of integrating fungicide and cultivar resistance to manage Fusarium head blight and deoxynivalenol in wheat. *Plant Dis.* 96:957-967.

**FY18 USWBSI INDIVIDUAL PROJECT PROPOSAL**

**BUDGET JUSTIFICATION**

<b>Project Title 1: Integrating Strategies to Mitigate Fusarium Head Blight and DON in Winter Wheat.</b>	
<b>Principal Investigator: Stephen Wegulo</b>	
<b>Total USWBSI Recommended Amount for FY18:</b>	<b>\$ 15,742</b>
<b>ARS Award Amount for FY18:</b>	<b>\$ 15,254</b>

**Instructions:** Complete all applicable sections below where funds are being requested; description (left columns) and requested amount (right column). If budget category is not applicable, leave line item blank.

**NOTE:** All amounts **must be rounded** to the nearest whole number.

<b>A. SENIOR/KEY PERSON:</b> In fields below, add details for salary and fringe benefits associated with the Senior/Key Person (i.e. PI/PD). <b>Details should include PI's Base Salary (\$), the number of Calendar, Academic and/or Summer months/time to be devoted to the award agreement.</b> Provide subtotals for both 'Salary' and 'Fringe Benefits' to the right of the descriptive details. The total amount requested for the Senior/Key Person category should be included in the far right column.		<b><u>TOTAL \$ AMT. REQUESTED FOR SENIOR/KEY PERSON</u></b>
Salary:	\$	\$
Fringe Benefits:	\$	

<b>B. OTHER PERSONNEL:</b> For each sub category listed below, add details for salary and fringe benefits associated with that sub category. Details should include the percentage of time (months)/total hours to be devoted to the funding, rate of pay and fringe rate. Include the amounts requested for Salary, Fringe Benefits and number of personnel for each subcategory (Post Doc, Graduate Students, Undergraduate Students, etc.) as well as the total amount. The TOTAL amount requested for ALL 'Other Personnel' should be entered in the far right column.		<b><u>TOTAL \$ AMT. REQUESTED FOR OTHER PERSONNEL</u></b>
	Sub Total \$ Amts. Request for Salary and Fringe Benefits	Total \$Amt. Requested per Sub Category(ies)
<b>Post Doctoral Associates</b>		\$9,846
Salary:	\$	\$
Fringe Benefits:	\$	
Number of Post Doc Personnel:		
<b>Graduate Students. NOTE:</b> Graduate Student Tuition/Fees/Health Insurance should be included in section 'Participant/Trainee Support Costs' (E1).		\$
Salary:	\$	\$
Fringe Benefits:	\$	
Number of Graduate Student Personnel:		
<b>Undergraduate Students</b>		\$1,680
Salary: Hourly pay, \$10/hour, 150 hours total	\$1,500	\$
Fringe Benefits: 12% of \$1,500	\$180	
Number of Undergraduate Student Personnel:	1	
<b>Secretarial/Clerical</b>		\$
Salary:	\$	\$
Fringe Benefits:	\$	
Number of Secretarial/Clerical Personnel:		
<b>Other – Research Technician</b>		\$8,166
Salary: 25% of \$27,799	\$6,950	\$
Fringe Benefits: 17.5% of \$6,950	\$1,216	
Number of Other – Research Technician Personnel:	1 (25%)	

**FY18 USWBSI INDIVIDUAL PROJECT PROPOSAL**

<b>B. OTHER PERSONNEL</b> (cont.)	<b>Sub Total \$ Amts. Request for Salary and Fringe Benefits</b>	<b>Total \$Amt. Requested per Sub Category(ies)</b>
<b>Other – Temporary Labor</b>		\$
Salary:	\$	
Fringe Benefits:	\$	
Number of Other – Temporary Labor Personnel:		
<b>Other</b>		\$
Salary:	\$	
Fringe Benefits:	\$	
Number of Other Personnel:		

<b>C. EQUIPMENT:</b> List below any items whose total dollar amount exceeds \$5,000 and has a useful life of one year or more. Justification must include relevance to proposed research and dollar amounts. Include cost per item if more than one item will be purchased AND the total amount requested for this budget category in right column.	<b><u>TOTAL \$ REQUESTED FOR EQUIPMENT</u></b>
	\$

<b>D. TRAVEL:</b> Travel costs are the projected expenses for transportation, lodging, subsistence, and related items incurred by employees who are in travel status on official business related to the Federal award. This category is only for cooperator staff travel. Provide requested amount for domestic and foreign travel (middle \$ column) in addition to the ‘Total \$ Requested for Travel’ (left \$ column). The travel costs should be supported with the purpose of the travel, the estimated amount of the trip(s) and the destination(s) if known at the time of award. It is not necessary to identify traveler names and travel dates.	<b><u>TOTAL \$ REQUESTED FOR TRAVEL</u></b>
<b>D.1. Domestic Travel (DT):</b> List below proposed trips individually and describe their purpose in relation to the award. Also provide dates, destination, and number of travelers where known. Include total amount per sub category below next to ‘\$’ and total amount requested for DT in middle column. Enter the total for Travel (DT and FT) in far right column.	<b><u>Total \$ Requested for Domestic</u></b>
<b>Research Related</b> (e.g. travel to research plots): Car rental and travel to and from field plots	\$1,000
<b>Non-Research Related</b> (i.e. professional meetings): FHB Forum: Expense for attending FHB Forum	\$886
Other Conferences/Meetings:	\$
<b>D.2. Foreign Travel (FT):</b> List below proposed trips individually and describe their purpose in relation to the award. Also provide dates, destination, and number of travelers where known. Include total amount per sub category below and total amount requested for FT in column on the right.	<b><u>Total \$ Requested for Foreign</u></b>
<b>Research Related</b> (e.g. travel to research plots):	\$
<b>Non-Research Related</b> (i.e. professional meetings):	\$
	\$1,886

**FY18 USWBSI INDIVIDUAL PROJECT PROPOSAL**

<p><b><u>E. PARTICIPANT/TRAINEE SUPPORT COSTS (P/TSC):</u></b> <i>Participant support costs</i> means direct costs for items such as stipends or subsistence allowances, travel allowances, and registration fees paid to or on behalf of participants or trainees (but not employees) in connection with conferences, or training projects. The cost of training and education provided for employee (i.e. Graduate and Undergraduate Students) development is allowable. Include total amount per sub category below next to '\$' and total amount requested for 'Participant/Trainee Support Costs' in column on the right (i.e. Total \$ Requested).</p>		<p><b><u>TOTAL \$ REQUESTED FOR P/TSC</u></b></p>
1. Tuition/Fees/Health Insurance:	\$	\$
2. Stipends:	\$	
3. Travel:	\$	
4. Subsistence:	\$	
5. Other:	\$	

<p><b><u>F. OTHER DIRECT COSTS (ODC):</u></b> This section contain multiple sub categories. Totals per sub category are required in addition to the total requested for Other Direct Costs (far right column). If there are additional sub categories under the main sub categories (i.e. Materials and Supplies), provide a total as well.</p>			
<p><b><u>F.1. Materials and Supplies (M/S):</u></b> In the space below, provide as much detail and specificity as possible for all materials and supplies associated with proposed research. Materials and Supplies should be described in detail e.g., chemical reagents, printer/field paper and supplies, glassware, lumber, etc. under each sub category (Field, Greenhouse, Laboratory and Other). Include total amount per sub category below next to '\$' and total amount requested for M/S in the middle column (i.e. Total \$ Amt. Requested – M/S)</p>		<p><b><u>Total \$ Amt. Requested - M/S</u></b></p>	<p><b><u>TOTAL \$ AMT. REQUESTED - ODC</u></b></p>
<p><b>Field:</b> Materials and supplies needed for field work include wheat seed, backpack sprayers for applying fungicides, and bags for harvesting</p>	\$1,250	\$1,750	\$2,796
<p><b>Greenhouse:</b></p>	\$		
<p><b>Laboratory:</b> Materials needed for preparation of corn kernel inoculum: corn grain, potato dextrose agar to make PDA for growing <i>Fusarium graminearum</i> cultures</p>	\$500		
<p><b>Other:</b></p>	\$		
<p><b><u>F.2. Publications and Printing Costs (PPC):</u></b> Below, provide details for any publication costs for electronic and print media, including distribution, promotion, and general handling, for which funds are being requested. NOTE: Page charges for professional journal publications are allowable provided publications report research that was supported by USDA-ARS.</p>		<p><b><u>Total \$ Amt. Requested - PPC</u></b></p>	
		\$	

**FY18 USWBSI INDIVIDUAL PROJECT PROPOSAL**

<b>F. OTHER DIRECT COSTS (ODC) (cont.)</b>		
<b>F.3. Consulting Services (CS):</b> For each consultant, list below the services he/she will perform, total number of days, travel costs, and the total estimated costs. Please include names and organizational affiliations for all consultants, other than those involved in consortium/contractual arrangements.		<b><u>Total \$ Amt. Requested - CS</u></b>
<b>F.4. Automatic Data Processing /Computer Services (ADP/CS):</b> This section covers cost of computer services, including computer-based retrieval of scientific, technical, and education information. In the space below, list all ADP/CS and include the established computer service rates, if applicable.		<b><u>Total \$ Amt. Requested - ADP/CS</u></b>
		\$
<b>F.5. Subawards/Consortium/Contractual Costs (SCCC):</b> In the space below, provide details for all costs associated with subawards, consortium and contractual costs. The total requested amount for this sub-category should include both direct and indirect costs for all subaward/consortium organizations. A separate budget for the subaward should be included (i.e. attached to funding application).		<b><u>Total \$ Amt. Requested - SCCC</u></b>
		\$
<b>F.6. Equipment/Facility/Land Rental and User Fees (RUF):</b> List the total funds requested for equipment or facility rental/user fees. Justify each rental user fee by providing specific details (e.g. Land Rental Fees – number of acres/cost per acre).		<b><u>Total \$ Amt. Requested – RUF</u></b>
Land rental		\$1,046
<b>F.7. Alterations and Renovations (A&amp;R):</b> List the total funds requested for alterations and renovations (A&R). Justify (i.e. required in order to carry out research) the costs of alterations and renovations, including repairs, painting, and removal or installation of partitions, shielding, or air conditioning. Where applicable, provide the square footage and costs.		<b><u>Total \$ Amt. Requested – AR</u></b>
		\$
<b>F.8. Other - Miscellaneous Direct Costs (OMDC):</b> Under each relevant sub category below, enter a brief description, and basis for the estimate (i.e. individual fee rate/price). Include total amount per sub category below next to '\$' and total amount requested for ODC in column on the right.		<b><u>Total \$ Amt. Requested - OMDC</u></b>
<b>Laboratory Animal Fees:</b>	\$	\$
<b>U.S. based Winter Nurseries:</b>	\$	
<b>International Nurseries:</b>	\$	
<b>Double Haploids:</b>	\$	
<b>Other Analyses/Services:</b>	\$	
<b>Communication (postage, shipping, fax, long distance phone):</b>	\$	
<b>Photocopying:</b>	\$	
<b>Other MODC (describe):</b>	\$	

## FY18 USWBSI INDIVIDUAL PROJECT PROPOSAL

<p><b>H. INDIRECT COSTS (IDC):</b> Provide below your Institution's approved Indirect Cost (IDC) rate for USWBSI/USDA-ARS awards. 'Type' refers to Total Costs (TC), Direct Costs (DC), Modified Direct Costs (MDC). Rate and Type has been prefilled by NFO based on submitted FY18 Pre-Proposals.</p>	<p><b><u>TOTAL \$</u></b> <b><u>AMT.</u></b> <b><u>REQUESTED</u></b> <b><u>FOR IDC</u></b></p>
<p><b>IDC Rate and Type:</b> 5% DC <b>IDC Base Amount:</b> 14,528</p>	<p>\$726</p>

<p><b>J. FEE (Small Business Act – SBIR Fee):</b> The SBIR fee is a Congressional mandated fee charged to all ARS/USWBSI awards and is applicable to <u>all non-ARS PIs</u>. The rate for FY18 is 3.2% and will be deducted from the USWBSI's recommended amount prior to the processing of the award by ARS. The <b>Formula</b> for calculating the fee is below (prefilled by the NFO):  <u>Step 1</u> – USWBSI's Total Recommended Amount/1.032  <u>Step 2</u> - Result from Step 1 should be subtracted from USWBSI Recommended Amount to obtain the SBIR Fee).</p>	<p><b><u>TOTAL \$</u></b> <b><u>AMT FOR</u></b> <b><u>FEE-SBIR</u></b></p>
<p><b>Step 1:</b> 15,742 / 1.032 = 15,254 <b>Step 2:</b> 15,742 - 15,254 = 488</p>	<p>\$ 488</p>

**FY18 USWBSI INDIVIDUAL PROJECT PROPOSAL**

**PROJECT BUDGET PAGE**

**Instructions:** *Insert values from corresponding budget justification into this form.*

<b>PROJECT 1 TITLE:</b> Integrating Strategies to Mitigate Fusarium Head Blight and DON in Winter Wheat.		<b>PROJECT ID:</b> FY18-IM-013	<b>ARS AGREEMENT NO:</b> 59-0206-6-014
<b>PRINCIPAL INVESTIGATOR:</b> Stephen Wegulo			<b>Totals (\$)</b>
<b>ORGANIZATION:</b> University of Nebraska			
<b>A. Senior/Key Persons</b> (i.e. PI/PD) ..... →			
<b>B. Other Personnel</b> (Post-Docs, Graduate Students, Secretarial/Clerical, Research Technician, Temporary Labor, and Other) ..... →			\$9,846
Total Number of 'Other Personnel':		2	
<b>Total Salaries, Wages and Fringe Benefits</b> (A + B) ..... →			\$9,846
<b>C. Equipment</b> ..... →			
<b>D. Travel</b> (Insert total amount for D. Travel to left and totals for subsections (1 and 2) below) ..... →			\$1,886
1. Domestic ..... →		\$1,886	
2. Foreign ..... →			
<b>E. Participant/Trainee Support Costs</b> (Insert total for E to left and totals for sub sections below) ..... →			
1. Tuition/Fees/Health Insurance ..... →			
2. Stipends ..... →			
3. Travel ..... →			
4. Subsistence ..... →			
5. Other ..... →			
Total Number of Participants/Trainees:			
<b>F. Other Direct Costs</b> (Insert total amount for F) ..... →			\$2,796
1. Materials and Supplies ..... →		\$1,750	
2. Publication Costs ..... →			
3. Consultant Services ..... →			
4. ADP/Computer Services ..... →			
5. Subawards/Consortium/Contractual Costs ..... →			
6. Equipment or Facility Rental/User Fees ..... →		\$1,046	
7. Alterations and Renovations ..... →			
8. Other - Miscellaneous ..... →			
<b>G. Total Direct Costs</b> (Total Salaries, Wages and Fringe thru F) ..... →			\$14,528
<b>H. Indirect Costs</b> ..... →			\$726
Rate and Type: 5% DC			
Base: 14,528			
<b>I. Total Direct and Indirect Costs - ARS FY18 Award Amount</b> (G + H) ..... →			\$ 15,254
<b>J. FEE - Small Business Act – SBIR Fee (3.2%)</b> ..... →			\$ 488
<b>K. TOTAL COSTS - USWBSI FY18 Total Recommended Amount</b> (I + J) ..... →			<b>\$ 15,742</b>
<b>NAME AND TITLE</b>		<b>SIGNATURE</b> (Adobe E-Sign or insert image of signature)	<b>DATE</b>
Principal Investigator Stephen Wegulo			July 13, 2018

Budget based on OMB Number: 4040-0001

**FY18 USWBSI INDIVIDUAL PROJECT PROPOSAL  
ADJUSTMENT SUMMARY PAGE**

**USWBSI Consolidated Funding Title:** *Integrated Management and Prediction of Fusarium Head Blight and DON in Winter Wheat.*

**Principal Investigator:** Stephen Wegulo

**Institution:** University of Nebraska

**Fiscal Year:** 2018

**USWBSI's FY18 Total Recommended Amount:** \$ 15,742

**ARS Agreement Number:** 59-0206-6-014

**USDA-ARS FY18 Total Award Amount:**  
\$ 15,254

**Instructions:** Under each of the project titles listed below, please indicate the changes made to the pre-proposal that address the comments given by the Review Panel(s) and/or the Executive Committee (see table in "Letter of Instructions"). Use additional pages if necessary.

**Project Title 1:** *Integrating Strategies to Mitigate Fusarium Head Blight and DON in Winter Wheat.*

None changes required.

**FY18 USWBSI INDIVIDUAL PROJECT PROPOSAL  
COMMUNICATION PLAN**

**USWBSI Consolidated Funding Title:** *Integrated Management and Prediction of Fusarium Head Blight and DON in Winter Wheat.*

**Principal Investigator:** Stephen Wegulo

**Institution:** University of Nebraska

**Fiscal Year:** 2018

**USWBSI's FY18 Total Recommended Amount:**  
\$ 15,742

**ARS Agreement Number:** 59-0206-6-014

**USDA-ARS FY18 Total Award Amount:**  
\$ 15,254

**Instructions:** Using the space below, describe in detail how you plan to communicate the results from this research to your stake-holders in the most effective way. Please describe your target audience (i.e. USWBSI Administration/members, industry, private growers, interest groups etc.) and the methods (i.e. written, electronic, oral, etc.) of communication you will use to communicate your results to your audience.

I agree to send copies of any printed materials (e.g. brochures, extension publications, etc.) and/or electronic versions of communication materials or URL links to materials posted on the Web to the Networking & Facilitation Office of the U.S. Wheat & Barley Scab Initiative.



Principal Investigator

7/16/2018

Date