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# Supplementary Materials for

## Right-Sizing Stem-Rust Research

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**Correction:** A typographical error was corrected. Brian Steffenson is from the Department of Plant Pathology, University of Minnesota.

## Materials and Methods

### *Data and software details*

For complete details of the data sources and methods used to produce the results referred to in this paper see J. M. Beddow, T. M. Hurley, D. J. Kriticos, P. G. Pardey, Measuring the worldwide spatial occurrence and probabilistic consequences of stem rust. (HarvestChoice, Saint Paul, MN, 2013) (*8*).

Data and additional calculation details are available in the files made available at

www.instepp.umn.edu (rust occurrence and probabilistic loss assessment details)
www.harvestchoice.org
www.faostat.fao.org (country level wheat production data)
www.ars.usda.gov/Main/docs.htm?docid=10123 (USDA stem rust–loss data)
www.ers.usda.gov/data/wheat/YBtable18.asp (wheat prices received by U.S. farmers)

The stem-rust occurrence and persistent estimates were developed by using the parameterizations reported in (*8*) using the CLIMEX software available at www.hearne.com.au/products/climex/edition/climex3.

The probabilistic loss assessments were made by using the information available at www.instepp.umn.edu and www.harvestchoice.org using Excel and the @RISK program available at www.palisade.com/risk.

### *Derivation of crop loss from Fisher et al.*

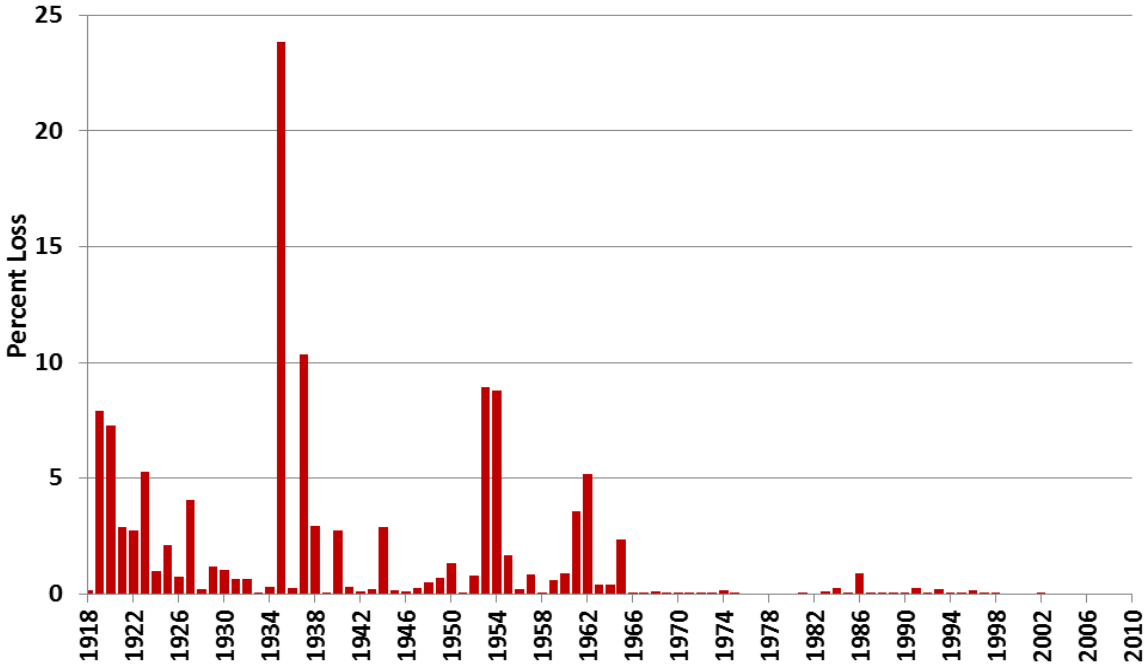
In their supplementary information, table 1, Fisher *et al*. (*7*) report that 432 MMT of wheat was used for food in 2009–2010 and that a potential 10 to 70% (43.2 to 302.4 MMT) of this production could be lost to *P. graminis.* On the basis of these values and the 2009 average U.S. price for all wheat of $4.85 per bushel (*17*), we calculate the potential value of global losses under the Fisher *et al*. (*7*) scenarios to be between $7.7 billion and $63.8 billion.

## Supplementary Text

### *Calibration of global wheat stem rust–research spending estimates*

Absent any formal estimates, we developed an informed sense of the amount of public annual R&D spending on wheat stem rust research worldwide by "triangulating" relevant R&D spending estimates gleaned from a thorough search of the literature with the judgments of knowledgeable individuals on the history and present state of active stem-rust researchers plus the amount of expenditures incurred on overall wheat research, wheat pathology research in general, and wheat (stem)–rust research in particular. The knowledge individuals consulted (in alphabetical order, and with no implication of responsibility for our estimates) were Hans-Joachim Braun (Director, Global Wheat Program, CIMMYT), Paul Heisey (Economic Research Service, U.S. Department of Agriculture), Robert Park (Plant Breeding Institute, University of Sydney), and Brian Steffenson (Department of Plant Pathology, University of Minnesota). The last of the references (*19–44*) list (in descending chronological order) publications that gave some empirical and conceptual support to forming an estimate of the investments in public wheat stem–rust research conducted worldwide over the past decade or so, which we put in the range of $20–$25 million per year, on average.

**Fig. S1. U.S. Wheat Losses Attributed to Stem Rust, 1918 to 2010.** Source: Authors' calculations based on data from (*18*).



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