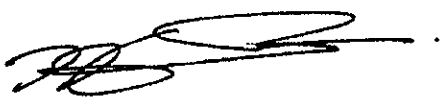
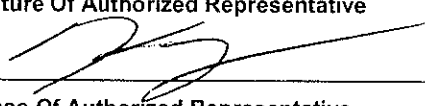


FOR ADMINISTRATIVE USE
 Program Area Code Proposal Code

Minnesota Wheat Research and Promotion Council

RESEARCH PROPOSAL GRANT APPLICATION

1. NAME AND ADDRESS OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE Name: Regents of the University of Minnesota Address: Sponsored Projects Administration 450 454 McNamara Alumni Center, 200 Oak Street SE Minneapolis, MN 55455-2070		
2. TITLE OF PROPOSAL A Pilot Project for Determining the Optimum Seeding Rate for Individual HRSW Cultivars		
3. PRINCIPAL INVESTIGATOR(S) Jochum J. Wiersma PI# 2 Name: PI# 3 Name:	4. PI #1 BUSINESS ADDRESS Northwest Research & Outreach Center 2900 University Avenue Crookston, MN 56716	
5. PROPOSED PROJECT DATES (calendar years) 2012 <small>Note: Research Reports are Due November 15th of Each Year</small>	6. TOTAL PROJECT COST \$ 5,000.-	7. PI #1 PHONE NO. +1 (218) 281-8629
8. RESEARCH OBJECTIVES: (List objectives to be accomplished by research grant) 1) To determine whether the current HRSW varieties differ for the day length sensitivity, vernalization, tiller inhibition genes, and quantitative trait loci associated with tillering that have been reported in the literature. <small>Attach a 2-page detailed discussion of importance of the proposal to wheat profitability; how study complements previous research in area; procedures to be used; and competency of the research group in achieving research objectives. (Please keep the proposal concise, only 2 pages will be provided reviewers).</small>		
Signature Of Principal Investigator 	Date 12/20/11	Phone Number +1 (218) 281-8629
Signature Of Authorized Representative 	Title Senior Associate Director	Date December 28, 2011
Address Of Authorized Representative Kevin McKoskey, Senior Associate Director, Office of Sponsored Projects Administration, University of Minnesota 450 McNamara Alumni Center, 200 Oak Street SE, Minneapolis, MN 55455-2070		Phone Number 612.624.5599

Minnesota Wheat Research and Promotion Council

RESEARCH PROJECT PROPOSAL

(2-pages maximum)

Project Title: A Pilot Project for Determining the Optimum Seeding Rate for Individual HRSW Cultivars

Importance: An optimum seeding rate is a first important step towards maximizing grain yield. Information about the optimum seeding rate of HRSW cultivars at the time of release is highly desirable. Unfortunately, the high turn-over in cultivars makes it challenging to conduct the needed field research in a timely manner. This project is a first step to possibly simplify and accelerate this research and provide growers with timely and robust seeding rate recommendations in the future.

Background: In wheat, the seeding rate for maximum grain yield can be derived from the parabolic response curve of grain yield versus number of plants per unit area, which increases quickly to a maximum and slowly decreases at higher plant densities (Donald, 1963; Holliday, 1960; Kirby, 1967, Willey and Heath, 1969). Grafius (1956) described grain yield as a function of yield components: namely, the number of tillers per unit area, the number of kernels per spike, and the weight per kernel. Subsequent research showed that cultivars differ in these genetically determined yield components.

Significant interactions between cultivars, seeding rates, and planting dates for grain yield have been reported (Donald, 1963). Briggs and Aytenfisu (1979) and Faris and De Pauw (1981) both suggested that new wheat cultivars, particularly if they differed from existing cultivars, should be tested at a wide range of seeding rates to determine their optimum seeding rate. Delayed planting past the optimum time reduced grain yield and increasing the seeding rate only partially compensated for the loss of grain yield (Briggs and Aytenfisu, 1979; Ciha, 1983). Based on the significant interaction between cultivars and seeding date for grain yield, Ciha (1983) also suggested that new cultivars should be tested at different seeding dates to determine the optimum seeding rate. Previous research has shown that the aforementioned is true for HRSW in Minnesota (Wiersma, 2002).

Maintaining a continuous seeding rate trial for existing and new public and private HRSW varieties is cumbersome and will generally lag behind the producers information needs as a minimum of 3 years and 2 locations are needed to develop robust seeding rate recommendations.

Advances in molecular genetics have yielded insight in the genetic control of tillering and day length sensitivity. A single gene on chromosome arm 1AS is responsible for tiller inhibition (Richards 1988, and Spielmeyer and Richards 2004). Most of the variation, however, is controlled by a number of QTL. Li et al. 2002 has shown that two of these QTL are located on chromosome on 6AS and 1DS. Likewise, day length sensitivity and vernalization requirements are controlled by relative few genes and can readily be assessed by raising seedlings in the greenhouse and subjecting the genotypes to molecular marker analyses.

Relationship to Past Projects: Wiersma, J.J. 2002. Determining an Optimum Seeding Rate for Spring Wheat in Northwest Minnesota. Online. Crop Management doi:10.1094/CM-2002-0510-01-RS

Procedures: I propose to screen the current pool of HRSW cultivars for absence or presence of the different loci and QTLs associated with tillering, vernalization, and day length sensitivity that have been reported in the literature. Finding differences among varieties is a prerequisite to the second step in this research in which varieties that differ for loci and QTL for tillering are seeded at different seeding rates following the method described in Wiersma (2002). The ultimate goal is to link the molecular information to the agronomic responses of different varieties to seeding rates such that the absence/presence of certain QTLs or alleles can predict an optimum seeding rate for any HRSW cultivar with a similar genetic make-up with a reasonable amount of accuracy.

Research Group: Jochum J. Wiersma, Shiaoman Chao (USDA-ARS)

Regional Linkages to Other Research Activities:

Additional Sources of Funding: Dr. Shiaoman Chao of the Wheat Genotyping Center at the USDA-ARS Cereal Crops Research Units in Fargo, ND will conduct the marker analysis for the routine markers such as the plant stature and day length sensitivity genes gratis as their mandate stipulates. For uncommon and/or more complex traits, such as the tillering QTLs, the center asks that the PI buy the reagents and primers.

References:

1. Briggs, K. G., and Aytenfisu, A. 1979. The effects of seeding rate, seeding date and location on grain yield, maturity, protein percentage and protein yield of some spring wheats in central Alberta. *Can. J. Plant Sci.* 59:1139-1145.
2. Ciha, A. J. 1983. Seeding rate and seeding date effects on spring seeded small grain cultivars. *Agron. J.* 75:795-799.
3. Donald, C. M. 1963. Competition among crop and pasture plants. *Adv. Agron.* 15:1-118.
4. Faris, D. G., and De Pauw, R. M. 1981. Effect of seeding rate on growth and yield of three spring wheat cultivars. *Field Crops Res.* 3:289-301.
5. Grafius, J. E. 1956. Components of yield in oats: a geometrical interpretation. *Agron. J.* 48:419-423.
6. Holliday, R. 1960. Plant population and crop yield: Part I. *Field Crop Abstr.* 13:159-167.
7. Kirby, E. J. M. 1967. The effect of plant density upon growth and yield of barley. *J. of Agron. Sci., Cambridge.* 68:317-324.
8. Li W.L., Nelson J.C., Chu C.Y., Shi L.H., Huang S.H., Liu D.J. 2002. Chromosomal locations and genetic relationships of tiller and spike characters in wheat. *Euphytica* 125:357-366
9. Richards R.A. .1988. A tiller inhibition gene in wheat and its effect on plant growth. *Austr J Agric Res* 39:749-757
10. Spielmeyer W., and R.A. Richards 2004 Comparative mapping of wheat chromosome 1AS which contains the tiller inhibition gene (*tin*) with rice chromosome 5S. *Theor Appl Genet* 109:1303-1310
11. Wiersma, J.J. 2002. Determining an Optimum Seeding Rate for Spring Wheat in Northwest Minnesota. Online. *Crop Management* doi:10.1094/CM-2002-0510-01-RS
12. Willey, R. W., and Heath, S. B. 1969. The quantitative relationships between plant population and crop yield. *Adv. Agron.* 21:281-321.

Minnesota Wheat Research and Promotion Council

RESEARCH PROJECT PROPOSAL BUDGET

Project Title: A Pilot Project for Determining Optimum Seeding Rate for Individual HRSW Cultivars			
Principal Investigator(s) / Project Directors(s)	Funds Requested For		
	Year 1 (2012)	Year 2 (2013)	Year 3 (2014)
Jochum J. Wiersma			
A. Salaries and Wages			
1. Co-principal Investigator(s)			
2. Senior Associates			
3. Research Associates - Post Doctorate			
4. Other Professionals			
5. Graduate Students			
6. Pre-baccalaureate Students			
7. Secretarial - Clerical			
8. Technical, Shop and Other			
B. Fringe Benefits			
C. Nonexpendable Equipment			
D. Materials and Supplies	5,000.00		
E. Travel			
F. Postage Costs			
G. Computer Costs			
H. All Other Direct Costs (Attach supporting data)			
TOTAL AMOUNT OF THIS REQUEST (per year)	\$ 5,000.00		