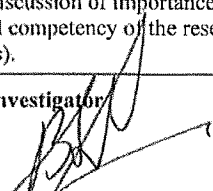
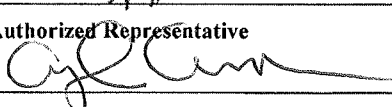


Minnesota Wheat Research and Promotion Council

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 454 McNamara Alumni Center, 200 Oak Street SE Minneapolis, MN 55455-2070		
2. TITLE OF PROPOSAL		
Optimum Use of Nitrogen Fertilizers To Maximize Spring Wheat Grain Yield and Protein Concentration		
3. PRINCIPAL INVESTIGATOR(S)	4. PI #1 BUSINESS ADDRESS	
Dr. Bhupinder Singh Farmaha	Northwest Research & Outreach Center University of Minnesota 2900 University Ave., Crookston, MN	
PI# 2 Name: Dr. Albert L. Sims		
5. PROPOSED PROJECT DATES (calendar years)	6. TOTAL PROJECT COST	7. PI #1 PHONE NO.
Jan 1, 2014 – Dec 31, 2014	\$19,668	218-281-8619
Note: Research Reports are Due November 15th of Each Year		
8. RESEARCH OBJECTIVES: (List objectives to be accomplished by research grant)		
<p>The objective of this project is to identify optimum nitrogen (N) fertilizer management practices that can maximize hard red spring wheat (HRSW) grain yield and protein concentration; and subsequently net economical profits to producers.</p>		
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).		
Signature Of Principal Investigator	Date	Phone Number
	11/14/13	218.281.8619
Signature Of Authorized Representative	Title	Date
	April Coon, Assistant Director Sponsored Projects Administration	11/15/13
Address Of Authorized Representative		Phone Number
Office of Sponsored Projects Administration McNamara Alumni Center, 200 Oak Street SE, Minneapolis, MN 55455-2070 450		612.624.5599

Minnesota Wheat Research and Promotion Council
RESEARCH PROJECT PROPOSAL
(2-pages maximum)

- A. **Project Title:** Optimum Use of Nitrogen Fertilizers To Maximize Spring Wheat Grain Yield and Protein Concentration
- B. **Importance of this project to the profitability of wheat producers:** Nitrogen fertilizer management practices that can enhance grain protein concentration of high-yielding HRSW cultivars, which tend to have lower or moderate protein concentration, can provide additional net economic profits to producers. Being new cultivars are released and availability of controlled-release N fertilizers (PCU), it's important to re-evaluate N management strategies (Dai et al., 2012). In previous work, Farmaha and Sims (2012a and 2012b) demonstrated that PCU always increased protein concentration but also decreased grain yields in environments that experienced cool and dry springs. The proposed project is designed to reduce the probability of decreasing grain yield using PCU thus, increasing economic profitability of using PCU for HRSW rainfed producer systems.
- C. **Procedures:** The proposed research project is in continuation of Drs. Farmaha and Sims's earlier work on nitrogen fertilizer use to enhance agronomic and economic production of HRSW. An experiment will be conducted in 2014 at Northwest Research and Outreach Center (NWROC), Crookston, MN field to identify optimum nitrogen (N) fertilizer management practices that can maximize hard red spring wheat (HRSW) grain yield and protein concentration; and subsequently net economical profits to producers. This experiment will help answer multiple questions. First, is there any agronomic and economic loss associated with delayed planting if conditions become too wet in the spring, but fertilizer N has already been applied? Second, if there is any loss, would that loss be similar if PCU was used as the N source instead of urea. The third and most critical question, if there is agronomic and economic loss associated with delayed planting either with PCU or urea or both, can we recover that loss through foliar N applications during the growing season? Treatments include two N fertilizer sources- PCU and urea; two N application times at normal early spring and a second about 30 days later, two N rates- optimum N rate (for grain yield) or optimum N rate + 30 lbs. N ac⁻¹, planting at normal early spring and at delayed time (probably 30 days later); and either no foliar N or 30 lbs N ac⁻¹ foliar applied at tillering or at anthesis growth stage. There will also be a 0 N control plots. Albany, a high-yielding and low protein cultivar will be seeded on 36 plots at normal planting time and on 72 plots at delayed time (probably 30 days later). There will be 10 seed rows spaced 6 inches apart in each plot measuring 5 ft. by 18 ft. Fertilizer treatments will be hand broadcasted and will be incorporated in the soil to a 10 cm depth using the field cultivator. Whole plant samples will be collected from each plot (four rows, 3ft. in length) at anthesis or soft dough growth stage to measure dry biomass accumulation and N concentration in head and stem. Whole plant data will be used as a basis to explain treatment differences or lack of differences in grain yield and/or protein concentration. At physiological maturity, plots will be harvested using small plot combine to measure grain yield and protein concentration.
- D. **Regional linkage to other research activities:** N/A
- E. **List current or potential other funding sources for this project:** NWROC, Crookston, MN soils project funded the preliminary trials in 2012 and 2013.
- F. **Research Group:** Soil group (Dr. Albert Sims), Northwest Research & Outreach Center, Crookston, MN
- G. **Relationship to past projects:** The current project addresses questions that were raised based on the findings from previously conducted experiments (Farmaha and Sims, 2012a and 2012b). We had two separate experiments in 2013 that do show that delayed planting due to the wet spring can significantly reduce grain yield but the amount of loss depends upon how late the crop was planted. 2013 was an abnormal growing season so data from this year alone won't be sufficient enough to comment whether the effect of treatments on grain yield and protein concentration was stand alone or was confounded with the environmental issues. Therefore, we are going to repeat the trial next year but with few modifications in the treatments. We also think there is a relationship between the proposed work and the on-farm research currently being conducted by the Minnesota Wheat Growers.
- H. **Estimate the budget requirements:** We request funds to partially support (15% time) an Assistant Scientist (\$8,000 salary plus \$3,168 fringe) and one summer student (\$5,000 salary plus \$500 fringe). Assistant scientist and student will help in managing plots, collect data, and implement the proposed work. We have allocated \$1500 to purchase materials and

supplies (flags, stakes, fertilizer, sample bags, labels, stationary, etc.). We also seek \$1,000 for analyzing plant samples. We also seek \$500 for statistical analysis. In total, \$19,668 is requested for the completion of work of this project.

I. **References:**

- Bly, A.G., and H.J. Woodard. 2003. Foliar nitrogen application timing influence on grain yield and protein concentration of hard red winter and spring wheat. *Agron. J.* 95:335–338.
- Farmaha, B.S., and A.L. Sims. 2013a. Yield and protein response of wheat cultivars to polymer-coated urea and urea. *Agron. J.* 105:229–236. Erratum (2013) 105:555–555.
- Farmaha, B.S., and A.L. Sims. 2013b. The influence of PCU and urea fertilizer mixtures on spring wheat protein concentrations and economic returns. *Agron. J.* 105:1328–1334.
- Franzen, D.W. 2009. Fertilizing hard red spring wheat and durum. *Exten. Publ. SF-712. Rev. ed.* North Dakota State Univ. Ext. Serv., Fargo.
- Kratochvil, R.J., M.R. Harrison Jr., J.T. Pearce, K.J. Conover, and M. Sultenfuss. 2005. Nitrogen management for mid-Atlantic hard red winter wheat production. *Agron. J.* 97:257–264.
- Wiersma, J.J., and J.K. Ransom, editors. 2005. *Small grains field guide.* Exten. Serv. Publ. 07488-S. Univ. Minnesota Exten. Serv., St. Paul and North Dakota State Univ. Exten. Serv., Fargo.
- Woolfolk, C.W., W.R. Raun, G.V. Johnson, W.E. Thomason, R.W. Mullen, K.J. Wynn, and K.W. Freeman. 2002. Influence of late-season foliar nitrogen applications on yield and grain nitrogen in winter wheat. *Agron. J.* 94:429–434.

Minnesota Wheat Research and Promotion Council

RESEARCH PROJECT PROPOSAL BUDGET

PROJECT TITLE Optimum Use of Nitrogen Fertilizers To Maximize Spring Wheat Grain Yield and Protein Concentration			
Principal Investigator(s) / Project Directors(s)	Funds Requested For		
Dr. Bhupinder Singh Farmaha University of Minnesota, Northwest Research and Outreach Center, 2900 University Ave., Crookston, MN 56716 bfarmaha@umn.edu, 218-281-8619	Year 2 (2015)	Year 3 (2016)	Year 1 (2014)
A. Salaries and Wages	\$	\$	\$
1. Co-principal Investigator(s)			
2. Senior Associates			
3. Research Associates - Post Doctorate			
4. Other Professionals (<i>Assistant Scientist</i>)	\$8,000		
5. Graduate Students			
6. Prebaccalaureate Students	\$5,000		
7. Secretarial - Clerical			
8. Technical, Shop and Other			
B. Fringe Benefits	\$3,668		
C. Nonexpendable Equipment (Planting and harvesting equipment use)			
D. Materials and Supplies	\$2,500		
E. Travel			
F. Publication Costs (including <i>Statistical Analysis</i>)	\$500		
G. Computer Costs			
H. All Other Direct Costs (Attach supporting data)			
TOTAL AMOUNT OF THIS REQUEST (per year)	\$19,668	\$	\$