2013_002_RC

Proposal No. _____

The Andersons Research Grant Program

Project Title: Third Edition of the Grain Drying, Handling and Storage Handbook (MWPS-13) – Using NC-213 Multi-state Expertise for National Impact

Principal Investigator(s)

Name	**Institution/Agency/Other**
Dr. Dirk Maier	Kansas State University
Dr. Sam McNeill	University of Kentucky
Dr. Ken Hellevang	North Dakota State University

(Attach an additional sheet if more space is needed.)

Project Contact (list one person to act as the primary contact):

Name	Dr. Dirk E. Maier
Address	201 Shellenberger Hall
	Department of Grain Science and Industry
	Kansas State University, Manhattan, KS 66506
Phone	785-532-4052
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E-mail	dmaier@ksu.edu

Period of Proposed Project Dates:

Beginning: January 1, 2014 Ending: December 31, 2014

Amount requested (maximum $25,000 per year for two years):

Year 1: **$19,640** Year 2 _____

Problem identification and related research

Objective 3 of the current NC-213 plan calls for the development of a "multi-institutional framework for the creation of measurable impacts generated by improvements in the supply chain that maintain quality, increase value, and protect food safety/security". In support of this objective and as part of their responsibilities, NC-213 scientists and engineers conduct outreach activities for general training and for research transfer. Collaborative outreach activities include organizing short courses on grain and co-products handling, storage and processing; organizing the International Grain Quality and Technology Conference; expanding the offerings of the GEAPS/KSU Grain Operations Distance Education and Credentialing Program; and training FDA and FDA-contract personnel for food safety inspections of bulk grain and grain/feed processing facilities under the Food Safety Modernization Act.

Over the years, NC-213 has successfully engaged end-users to disseminate information throughout the grain industry. At the investigator level, most NC-213 participants have split appointments among research, teaching and extension/outreach lines. Traditional outlets for NC-213 scientists and engineers have been journal publications, conference proceedings, extension fact sheets, and relevant industry meetings. A new opportunity to enhance the NC-213 outreach plan and increase NC-213 impact is by enabling the proposed revision and updating of the Grain Drying, Handling and Storage Handbook which is commonly known as the "MWPS-13" publication among extension engineers, grain storage practitioners, grain handling equipment manufacturers and suppliers, farmers, university and community college professors and students.

The MWPS-13 handbook was first published in 1974 as a 70-page booklet under the title *Planning Grain-Feed Handling for Livestock and Cash-Grain Farms*. It was substantially revised in the early 1980s and published as a second edition in 1987 under the title ***Grain Drying, Handling and Storage Handbook***. The first printing was 10,000 copies which became available in early 1988. Since then, approximately 20,000 copies have been sold and distributed across the world. This 88-page softcover handbook provides instruction on constructing, maintaining, and operating optimum grain drying, handling and storage systems. It includes the key formulas needed to plan and design a complete on-farm grain system as well as the needed data on handling capacities, equipment sizing, conveying distances, and machinery flow sheets.

The 1987 edition was prepared under the direction of the storage subcommittee of the Midwest Plan Service which included nine agricultural engineers from eight Land Grant Universities all of which are NC-213 member stations (i.e., University of Minnesota, Iowa State University, North Dakota State University, Michigan State University, University of Wisconsin, Purdue University, University of Nebraska, and the University of Illinois). All but one of these engineers were credited for their contributions but only one is still an active faculty member (i.e., Ken Hellevang). Fortunately, he has agreed to serve as one of the lead authors of this current revision, is one of the co-PIs of this grant application, and is an active participant of NC-213. The current table of contents is included as an Addendum to this proposal (Anon. 1987).

The key problem with the second edition is that it has become outdated with respect to the on-farm grain facility size and equipment capacities that are now common on farms compared to 25 years ago. Many farms now have grain handling, drying and storage systems that were formerly considered "commercial size". Additionally, the handbook currently does not capture the critical link on-farm grain systems play in addressing and solving operational problems and regulatory challenges for the supply of grains and oilseeds into the farm-to-user supply chain in light of new regulations such as the Food Safety Modernization Act and OSHA Grain Safety Standards. The only other "like publication" is an agricultural engineering book entitled *Grain Handling and Storage* that was published in 1985, has been out of print for many years, and was aimed at commercial grain handling systems (Boumans, 1985). Thus, a third edition of MWPS-13 is overdue and will need to address the larger system capacities and supply chain context.

Objective

The sole objective of this project is to utilize NC-213 expertise to revise and update the contents of the MWPS-13 Grain Drying, Handling and Storage Handbook and enable its third edition publication.

Methods

Under the leadership of the three PIs, a group of qualified experts from academia, industry and government has been identified and contacted to solicit their interest in contributing to the long-overdue revision of the 1987 edition of the MWPS-13 handbook. This group of experts is willing to contribute content and/or serve as peer reviewers of the revised chapters. The list includes the following:

Name	Affiliation	Expertise	TOC Contribution
Kingsly Ambrose	Kansas State University	Grain handling	**2 – Handling**
Carl Bern	Iowa State University	Grain storage; Allowable storage time	4 – Storage
Jennifer Brinker	GDS Associates	Energy efficiency	3 – Drying
Carlos Campabadal	Kansas State University	Grain handling, aeration and storage	2 – Handling 4 – Storage
Tom Gettings	The GSI Group	Grain drying and aeration systems	3 – Drying 4 – Storage
Ken Hellevang	North Dakota State University	Grain drying, handling and storage systems	1 – Planning 2 – Handling 3 – Drying 4 – Storage **5 – Locating**
Brian Holmes	University of Wisconsin	Grain bin safety	4 – Storage
Raj Hulasare	Temp-Air	Stored grain pest control	4 – Storage

Klein Ileleji	Purdue University	Grain drying, storage and monitoring; Energy efficiency	**3 – Drying** 4 – Storage X - Automation
Carol Jones	Oklahoma State University	Grain aeration and storage	4 – Storage **X – Automation**
John Lawrence	IntelliAir	Grain aeration and storage	4 – Storage X – Automation
Dirk Maier	Kansas State University	Grain drying, handling and storage; Facilities planning and design	**1 – Planning** 2 – Handling 3 – Drying 4 – Storage 5 – Locating
Sam McNeill	University of Kentucky	Grain drying, handling and storage	2 – Handling 3 – Drying **4 – Storage**
Mike Montross	University of Kentucky	Grain drying, aeration and storage	3 – Drying 4 – Storage
Ron Noyes	Grain Storage Engineering LLC	Grain drying, handling, aeration and storage	2 – Handling 3 – Drying 4 – Storage
Scott Sanford	University of Wisconsin	Energy efficiency	3 – Drying
Jason Ward	Mississippi State University	Temporary storage	4 – Storage
Gary Woodruff	The GSI Group	Grain drying, aeration and storage	3 – Drying 4 – Storage
Darren Zink	CTB Brock	Grain handling, aeration and storage	2 – Handling 4 – Storage
Bold – Chapter lead authors; Underline – NC-213 members; *Italics* – Industry contributors.			

The six (6) identified chapter lead authors will form the primary writing team for this project. They will form smaller chapter writing teams by recruiting individuals from the above list and drawing on their subject matter expertise and willingness to contribute content and/or serve as a peer reviewer. In preparation for their first group meeting, the six chapter lead authors will update and finalize the table of contents for the third edition of the MWPS-13 handbook. For example, the chapter on planning (Ch 1) needs to include an expanded discussion on planning and site selection concepts for larger on-farm systems. The chapter on handling (Ch 2) needs to address safety topics related to dust control and explosion suppression. The chapter on drying (Ch 3) needs an expanded discussion on determining and improving energy efficiency of grain dryers. The chapter on storage (Ch 4) needs to address safety with respect to bin entry and the prevention of grain entrapments. The chapter on locating (Ch 5) needs to have an expanded discussion on machinery flow sheets. Given the advances in technology, an entirely new chapter is needed to address automation systems and control concepts. Last but not least, the

Addendum needs to be revised and expanded to include look up tables for larger capacity equipment. An electronic version of look up tables and spreadsheets with pre-2013_002_RC programmed equations needs to accompany the third edition handbook in the form of a CD or memory stick or through accessing a log-in protected webpage. Subsequently, the chapter lead authors will work on the chapter drafts based on the established timeline (see below) with the goal to have a final draft available for peer review by October 2014, and submit a finalized version of the handbook for publication by December 2014.

Anticipated results, products, and impacts

The chapter lead authors are all active members of NC-213. Thus, their collaboration on this publication will be a great reflection of a multi-state effort that will have national and global impact. NC-213 will be acknowledged in the third edition of MWPS-13 as having provided funding that enabled the authors to travel to a common location and work on the content revisions and finalization of this handbook.

The current version is widely used as a text for courses on post-harvest grain processing in several universities that offer a degree in agricultural engineering technology. The table below provides a summary of the number of handbooks sold in the past five years.

2009	2010	2011	2012	2013	Total
142	397	265	335	450	**1,589**

Institutions requiring this handbook as a text include the following: Black Hawk College (IL), Iowa State University, Muscatine Community College (IA), North Dakota State University, Ohio State University, Rigdewater College (MN), Southern Illinois University, and Texas A&M.

Additionally, this handbook is widely used by grain farmers throughout temperate climates in the world, as well as by extension educators, consultants, and service providers for the grain industry. A revised and expanded third edition would likely be utilized in the Materials Handling course (GRSC 310) required by all undergraduate students in the Department of Grain Science and Industry at Kansas State University (about 50 per year), and the three Materials Handling distance education courses (GEAPS 550, 551, 552) offered via the GEAPS/K-State Grain Operations Distance Education and Credentialing Program (about 25 per year).

Leveraging resources

The Department of Grain Science and Industry at Kansas State University will provide travel funds for the lead PI (Maier) as well as administrative support to facilitate the revision of the MWPS-13 handbook. Institutions of the chapter lead authors will also provide administrative/secretarial support to facilitate the revision of their respective chapters.

The Midwest Plan Service maintains a full-time employee to respond to orders and facilitate the development of new and revised publications. Ms. Kathy Walker currently serves in this capacity and has reported that MWPS-13 is their second-most frequently

requested publication, despite the fact that the last revision was over 25 years ago. MWPS will provide costs for the layout of the publication, CD's, and printing, which are valued at $1920, $1920, and $360, respectively (total of $4,200). However, budget constraints over the years have reduced their staff to her alone, so they must currently out-source necessary services such as editing and generation of illustrations, which are estimated to be $1,280 and $3,360, respectively, for the proposed revision (total of $4,640). Additionally, income from publication sales does not generate residual fees for future revision efforts. Thus, authors need to secure grant funds to undertake handbook revision efforts.

Timeline for proposed project

January – December 2014:

- January: Review and finalize the Table of Contents for the revised MWPS-13 handbook.
- February: First meeting of section leaders in conjunction with annual NC-213 meeting.
- March – May: Complete first draft of all chapters.
- June: Second meeting of section leaders to review first draft of all chapters and identify revisions, additions and deletions needed.
- July - August: Complete second draft revision of all chapters. (Section leaders in attendance at the ASABE meeting in Montreal may coordinate activities)
- September: Third meeting of section leaders to review second draft of all chapters and identify details of last revisions needed.
- October: Complete final draft revision of all chapters and submit for peer review.
- November: Receive feedback and incorporate peer-review suggestions.
- December: Submit finalized version of MWPS-13 handbook for publication to MWPS headquarters at Iowa State University.

Literature Cited

Anon. Grain Drying, Handling and Storage Handbook (MWPS-13). 1987. Midwest Plan Service, Iowa State University, Ames, Iowa.

Boumans, G. 1985. Grain Handling and Storage. Elsevier, Amsterdam, The Netherlands.

Dr. Dirk E. Maier 2013_002_RC
Kansas State University, Grain Science & Industry Department, Manhattan, KS

ACADEMIC CREDENTIALS

Ph.D., Agricultural Engineering, Michigan State University, East Lansing, MI. March 1992.
M.S., Agricultural Engineering, Michigan State University, East Lansing, MI. Dec. 1988.
B.S., Agricultural Engineering, Michigan State University, East Lansing, MI. June 1987.

FIELD OF SPECIALIZATION

Post-harvest engineering and value-added processing of agricultural crops and biological products including ecosystem modeling, stored products protection (IPM, fumigation), alternative crop storage systems, dehydration of biological products, bulk material (grain, feed) handling and segregation (IP), facilities design (including safety, entrapment rescue) and simulation, and feed manufacturing.

PROFESSIONAL EXPERIENCE

Food Systems Leadership Institute Fellow, Cohort #6, 2010-2012
Professor and Head. Department of Grain Science & Industry, Kansas State University, since April 2008.
Director. International Grains Program, Department of Grain Science & Industry, Kansas State University, March 2009-present.
Ancillary Food Science Graduate Faculty. Food Science Institute, Kansas State University, September 2008-present
Adjunct Professor. Department of Agricultural & Biological Engineering, Purdue University, April 2008-present.
Associate Head and Graduate Program Chair. Department of Agricultural & Biological Engineering, Purdue University, July 2005 – March 2008.
University Faculty Scholar. Purdue University, July 2005 – 2008.
ESCOP/ACOP Fellow. Class 14 Leadership Development Course, 2004-2005.
Professor and Extension Agricultural Engineer. Department of Agricultural & Biological Engineering, Purdue University, July 2002 – March 2008.
DAAD Guest Professor. University of Hohenheim, College of Agricultural Sciences and Institute of Agricultural Engineering in the Tropics and Subtropics, Stuttgart-Hohenheim, Germany, June 2004.
Guest Professor. University of Torino, College of Agriculture and Department of Agricultural Economics and Mechanization, Torino, Italy, October 2003.
Associate Professor and Extension Agricultural Engineer. Department of Agricultural & Biological Engineering, Purdue University, July 1997 - 2002.
Fulbright Scholar. Universidad Nacional de Mar del Plata, Facultad de Ciencias Agrarias and Instituto Nacional de Tecnologia Agropecuaria, Estacion Experimental Agropecuaria, Balcarce, Argentina, January - July 2000.
Assistant Professor and Extension Agricultural Engineer. Department of Agricultural & Biological Engineering, Purdue University, December 1991 - 1997.

LICENSES - Registered Professional Engineer, State of Indiana, PE10100369

GRANTS - Over $15 million in research, technology transfer, and extension education grants.

RESEARCH

Research program focuses on engineered technologies for the protection of stored products and the delivery of identity-preserved, traceable and biosecure quality grains to the food, biomaterials, biofuels and feed processing industries. Projects include: The development of non-chemical and other alternative preservation technologies (grain chilling, ozonation, modified atmosphere) for the storage of cereal grains, oilseeds and processed products. The modeling of the structural fumigation process including precision fumigation, automated monitoring and decision support. The modeling of stored-grain ecosystems, and the study of the effects of environmental conditions on stored-product pest management (IPM) in the field and laboratory. The determination of food-grade grain (incl. corn, popcorn, wheat, rice) quality as influenced by harvesting, handling, drying, storage and transportation. The evaluation of combining medium and low temperature drying with natural air conditioning using automatic fan and burner controllers, and the effects of stress cracks and non-uniform moistures on processing and end use. The modeling of segregated handling practices for the identity-preservation of value-added grains and oilseeds, and evaluation of facilities design and operation through system simulation. The optimization of grain and oilseed processing and feed manufacturing including quantification of thermal and physical properties, and flaking behavior of soybeans. The quantification of variability of the end use value of specialty grains and oilseeds based on composition (incl. protein, oil, starch, fiber). The study of optimal rescue procedures for grain entrapments in on-farm and commercial structures. Major professor for seventeen master of science and ten Ph.D. students. Supervisor of ten post-doctoral research engineers. Host to six overseas visiting scientists.

EXTENSION

Active technology transfer and continuing education program in post-harvest engineering, value-added processing and quality assurance of agricultural crops and biological products. Director of K-State's International Grains Program which aims to educate foreign business leaders, industry professionals and government officials about U.S. grains and oilseeds through technical training and assistance programs in storage, handling, milling, marketing, processing and utilization. Director of the GEAPS/K-State Grain and Biorefinery Operations Distance Education Program which provides continuing education and credentialing to grain industry professionals around the world. Host of international visitors and delegations from Argentina, Australia, Brazil, Canada, China, Germany, India, Italy, Mexico, New Zealand, Pakistan, Russia, Sweden, Thailand.

TEACHING

Grain Facilities Planning and Design I, II – GEAPS 510, 511; Quality Grain Management – GEAPS 520; Safety Management at Grain & Processing Facilities – GEAPS 540; Aeration System Design & Operation – GRSC 521; Grain Drying – GEAPS 524 (1 CEU credit each; distance teach); Undergraduate Internship Course – GRSC 591, 3 credits (co-teach); Introductory Graduate Seminar – GRSC 900, 1 credit (co-teach); Professional Development Seminar – GRSC 910, 2 credits (co-teach).

PUBLICATIONS

Authored or co-authored over 65 refereed journal papers, 130 published proceedings and conference papers and abstracts, 50 invited papers, 1 research station bulletin, 10 non-English technical publications, 1 book, 4 book chapters, and 140 extension and technology transfer publications including numerous articles in farm and grain industry journals. Member of the Editorial Board of the Journal of Stored Products Research. Editor of the Proceedings of the 2004 International Quality Grains Conference held in Indianapolis, Indiana July 12-22, 2004. Co-organizer of the 2008 International Grain Quality & Technology Conference held in Chicago, Illinois July 15-18, 2008.

PEER-REVIEWED PUBLICATIONS (within past four years) 2013_002_RC

1. Rigdon, A.R., Jumpponen, A., Vadlani, P.V., Maier, D.E. 2013. Impact of various storage conditions on enzymatic activity, biomass components and conversion to ethanol yields from sorghum biomass used as a bioenergy crop. Bioresource Technology. 132:269-275.
2. McClurkin, J.D., Maier, D.E., Ileleji, K.E. 2013. Half-life time of ozone as a function of air movement and conditions in a sealed container. Journal of Stored Products Research. 55:41-47.
3. Lawrence, J., Maier, D. E., Stroshine, R.L. 2013. Three-dimensional transient heat, mass, momentum and species transfer in the stored grain ecosystem: Part I: Model development and evaluation. Transactions of ASABE. 56(1):179-188.
4. Lawrence, J., Maier, D. E., Stroshine, R.L. 2013. Three-dimensional transient heat, mass, momentum and species transfer in the stored grain ecosystem: Part I: Model validation. Transactions of ASABE. 56(1):189-201.
5. Yigezu Y.A., Alexander, C.E., Preckel, P.V., Maier, D.E., Mason, L.J., Woloshuk, C.P., Lawrence, J., and Moog, D.J. 2013. Integrated joint pest management strategies in the presence of control spillovers. European Review of Agricultural Economics. Published online January 11, 2013.
6. Roberts, M. J.; Field, W. E.; Maier, D. E.; Stroshine, R. L. 2012. Determination of effort required to insert a rescue tube into various grain types. Journal of Agricultural Safety and Health. 18(4):293-308.
7. Chayaprasert, W.; Maier, D. E; Subramanyam, Bh.; Hartzer, M. 2012. Gas leakage and distribution characteristics of methyl bromide sulfuryl fluoride during fumigations in a pilot flour mill. Journal of Stored Product Research, 50:1-7.
8. Lawrence, J.; Maier, D. E. 2012. Prediction of temperature distributions in peaked, leveled and inverted cone grain mass configurations during aeration of corn. Applied Engineering in Agriculture, 28(4).
9. Lawrence, J.; Maier, D. E.; Hardin, J.; Jones, C. 2012. Development and validation of a headspace model for a stored grain silo filled to its eave. Journal of Stored Products Research, 49: P. 176-183.
10. Linton, R.H., Nutsch, A., McSwane, D., Kastner, J., Bhatt, T., Hodge, S., Getty, K., Maier, D., Kastner, C., Chaturvedi, A., and Woodley, C. 2011. Use of a stakeholder-driven DACUM process to define knowledge areas for food protection and defense. Journal of Homeland Security and Emergency Management. Published on-line July 2011. Vol. 8, Issue 2.
11. McDonough, M.X., Campabadal, C.A., Mason, L.J., Maier, D.E., Denvir, A., and Woloshuk, C. 2011. Ozone application in a modified screw conveyor to treat grain for insect pests, fungal contaminants, and mycotoxins. Journal of Stored Products Research. In press. Published on-line May 19, 2011.
12. Tsai, W.T., Mason, L.J., Chayaprasert, W., Maier, D.E., and Ileleji, K.E. 2011. Investigation of fumigant efficacy in flour mills under real-world fumigation conditions. Journal of Stored Products Research. 47(3):179-184.
13. Lawrence, J., and D. E. Maier. 2011. Three-dimensional airflow distribution in a maize silo with peaked, levelled and cored grain mass configurations. Biosystems Engineering. 110(3):321-329.
14. Lawrence, J. and D. E. Maier. 2011. Aeration strategies simulations for wheat storage in the sub-tropical region of North India. Transactions of ASABE 54(4):1395-1405.
15. Lawrence, J. and D. E. Maier. 2011. Development and validation of a model to predict air temperatures and humidities in the headspace of partially filled stored grain silos. Transactions of ASABE 54(5):1809-1817.
16. Takhar, P.S., Maier, D.E., Campanella, O.H., and Chen, G. 2011. Hybrid mixture theory

based moisture transport and stress development in corn kernels during drying. Validation and Simulation Results. Journal of Food Engineering. 106:275-282.

17. Roberts, M.J., Deboy, G.R., Field, W.E. and Maier. D.E. 2011. Summary of prior grain entrapment rescue strategies. Journal of Agricultural Safety and Health. 17(4):303-325.
18. Martinez-Kawas, A. and Maier. D.E. 2011. Quantifying feedstock availability using a geographical information system. Applied Engineering in Agriculture. 4(3):133-146.
19. Brijwani, K., Vadlani, P.V., Hohn, K.L., and Maier, D.E. 2011. Experimental and theoretical analysis of a novel deep-bed solid-state bioreactor for cellulosic enzyme production. Biochemical engineering Journal. 58-59:110-123.
20. Chayaprasert, W. and Maier, D.E. 2010. Evaluating the effects of sealing quality on gas leakage rates during structural fumigation by pressurization testing and CFD simulations. ASABE Transactions. 53(3):853-861.
21. Kingsly, A.R.P., Ileleji, K.E., Clementson, C.L., Garcia, A., Maier, D.E., Stroshine, R.L., Radcliff, S. 2010. The effect of process variables during drying on the physical and chemical characteristics of corn dried distillers drains with solubles (DDGS) - Plant Scale Experiments. Bioresource Technology. 101(1): 193-199.
22. Yigezu Y.A., Alexander, C.E., Preckel, P.V., Maier, D.E., Mason, L.J., Woloshuk, C.P., Lawrence, J., and Moog, D.J. 2010. Economics of integrated insect management in stored corn. Journal of Economic Entomology. 103(5):1896-1908.

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EDUCATION:

- Ph.D. in Agricultural Engineering. University of Tennessee, Knoxville, TN. Dec. 1996.
- M.S. in Agricultural Engineering. University of Kentucky, Lexington, KY. May 1979.
- *B.S. in Agricultural Engineering. University of Kentucky, Lexington, KY. Dec. 1974.*

EXPERIENCE:

- January 1, 2004 – present. Associate Extension Professor, Biosystems and Agricultural Engineering Department, University of Kentucky, Princeton, KY.
- January 1, 1998 – 2003. Assistant Extension Professor, Biosystems and Agricultural Engineering Department, University of Kentucky, Princeton, KY.
- January 28, 1979 – December 31, 1997. Extension Specialist, Agricultural Engineering Department, University of Kentucky, Princeton, KY.

CURRENT GRANTS:

- **McNeill, S.G.**, L Meyer, C. Lee, G. Halich, M. Bomford. Organic corn enterprise in Kentucky. Southern SARE. 7/12 – 5/13. Amount: $10,000.
- **McNeill, S.**, D. Overhults, M. Montross and S. Shearer. Energy audits for grain and poultry producers in Kentucky. USDA-NRCS-RCD. Project duration: 10/10 – 10/13. Amount: $100,000.
- Ileleji, K., **S. McNeill** and G. Opit. Nigeria commodity storage – technical assistance. USDA-FAS. Project duration: 2/10 – 12/13. Amount: $30,470.
- Montross, M. and **S. McNeill**. Laboratory and field data for establishing new grain packing factors. USDA-RMA. Project duration: 09/09 – 12/13. Amount: $370,000.

PROFESSIONAL ORGANIZATIONS:

- American Society of Agricultural and Biological Engineers (since 1979)
- Kentucky Association of State Extension Professionals (since 1979)

AWARDS:

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- American Society of Agronomy – 1998, 2000
- ASABE Blue Ribbon Award for Educational Aids…1997, 2002
- KASEP Extension Program Award – 2005
- UK Wethington Award – 2006, 2011, 2012, 2013
- USDA Service Award – 30 year – 2009

RECENT EXTENSION PUBLICATIONS:

- **McNeill, S.** and P. Vincelli. 2012. Harvesting and storing Kentucky's 2012 corn crop. UK CES Kentucky Pest News. No. 1214. http://www.uky.edu/Agriculture/kpn/kpnhome.htm
- Vincelli, P. and **S. McNeill**. 2012. Aflatoxin in stored corn. UK-CES Kentucky Pest News Alert. 24(5). http://www.uky.edu/Agriculture/kpn/kpnhome.htm
- C. Walters, **S. McNeill** and D. Johnson. 2012. Benefits and costs associated with the wheat storage hedge. UK Extension Pub. ID-198.
- McNeill, S.G. 2011. Drying the 2011 corn and soybean crops. UK-PPS Grain Crops Update. http://graincrops.blogspot.com/2011/09/drying-2011-corn-and-soybean-crops.html
- Opit, G., **S. McNeill** and K. Ileleji. 2011. Protecting stored grain with IPM to reduce post-harvest grain losses. OKSU Extension Publication L-352.
- Opit, G., **S. McNeill** and K. Ileleji. 2011. Protecting stored grain with proper fumigation. OKSU Extension Publication L-350.
- Ileleji, K., **S. McNeill** and G. Opit. 2011. Protecting stored grain with D.I.C.E. Purdue Extension Publication ABE-131.
- Vincelli, P. and **S. McNeill**. 2010. Aflatoxin in stored corn. UK-CES Kentucky Pest News Alert. 24(5). http://www.uky.edu/Agriculture/kpn/kpnhome.htm
- **McNeill, S**. 2010. Use decision tool to control wheat seed costs. UK CES Wheat Science News. Vol. 14. No. 1. http://www2.ca.uky.edu/wheatscience
- **McNeill, S.** and P. Vincelli. 2009. Harvesting and storing Kentucky's 2009 corn crop. UK CES Kentucky Pest News. No. 1214. http://www.uky.edu/Agriculture/kpn/kpnhome.htm
- **McNeill, S.G.**, D.G. Overhults and M.D. Montross. 2009. Harvesting, drying and storing wheat *in:* A comprehensive guide to wheat management in Kentucky. University of Kentucky Cooperative Extension Service Bulletin ID-125.
- Stombaugh, T., S. Shearer, J. Wilhoit and **S. McNeill**. 2008. Saving fuel in the field. University of Kentucky Cooperative Extension Service Bulletin AEN-94.
- **McNeill, S.G.**, G.S. Halich and K.H. Burdine. 2008. Mechanical drying versus air drying for corn. UK Cooperative Extension Service Economic and Policy Update. Vol. 8, no. 9.

REFEREED PUBLICATIONS:

- **McNeill, S.G.**, S.A. Thompson, M.D. Montross, I.J. Ross and T.C. Bridges. 2008. Packing factors of feed products in storage structures. Applied Engineering in Agriculture. 24(5):625-630.
- Prewitt, R.M., M.D. Montross, S.A. Shearer, T.S. Stombaugh, S.F. Higgins, **S.G. McNeill** and S. Sokhansanj. 2007. Corn stover availability and collection efficiency, using typical hay equipment. Transactions of the ASABE 50(3):705-711.
- Bridges, T.C., M.D. Montross and **S.G. McNeill**. 2005. Estimation of costs associated with aeration of wheat in the mid-South region of the United States. Applied Engineering in Agriculture. 21(1):115-124.
- **McNeill, S.G.**, M.D. Montross and S.A. Shearer. 2005. Spatial variation of protein, oil and starch in yellow corn. Applied Engineering for Agriculture. 21(4):619-625.
- Montross, M.D. and **S.G. McNeill**. 2005. Permeability of corn, soybeans, soft red and white wheat as affected by bulk density. Applied Engineering in Agriculture. 21(3): 479-484.
- Molenda, M., M.D. Montross, J. Horabik and **S.G. McNeill**. 2005. Airflow resistance of seeds at different bulk densities using Ergun's equation. Transactions of the ASAE. 48(3): 1137-1145.

Vita

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EDUCATION

Doctor of Philosophy Degree in Engineering — May 1989
North Dakota State University
Fargo, ND 58105

Master of Science Degree, Agricultural Engineering — December 1979

Bachelor of Science Degree, Agricultural Engineering — May 1978
South Dakota State University
Brookings, SD 57007

PROFESSIONAL REGISTRATION

Registered Professional Engineer (since January 1983) — North Dakota PE-2738

PROFESSIONAL AFFILIATION

The American Society of Agricultural and Biological Engineers (ASABE)
American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
Grain Elevator and Processing Society (GEAPS)

PROFESSIONAL COMMITTEES (Selected)

ASABE Board of Trustees ’06-08 (Manage the Society with 9,000 members in more than 100 countries)
ASABE Meetings Council (Manage all Meetings and Conferences, 9,000 members)
Past Chair ’06-08, Chair ’04-06, Vice Chair ‘02-04
ASAE E-10 International Meetings Committee (Execution of Annual Meeting, 1,700 participants) Chair ‘02-04
ASAE FPE-01 Food & Process Engineering Institute Executive Committee (800 members)
Past Chair 02-03, Chair 01-02, Program Chair 00-01, Secretary 99-00
ASAE FPE-702 Crop and Feed Processing and Storage Committee
Past Chair ‘01-03, Chair '99-01, Vice Chair & Secretary '97-99, Program Chairman '95-97
ASAE SE-304 Environment of Stored Products Committee
Past Chair ‘86, Chair '85, Vice-Chair '84, Secretary '83
ASAE P-208 Extension Engineering
Chair '96-97, Vice-Chair '95-96 (Organize Educational Aids Competition), Secretary '94-95
ASABE FPE-712 Fruit & Vegetable Post Harvest Committee
Midwest Plan Service (MWPS) 1988-2006, Executive Committee 1990-1994
MWPS Post Harvest Technology Section Committee - Chairman 1989-01

PROFESSIONAL AWARDS

2013_002_RC

2013 Grade of Fellow, American Society of Agricultural & Biological Engineers
Fellow is ASABE's highest honor granted to a member of unusual professional distinction, with outstanding and extraordinary qualifications and experience in, or related to, the field of agricultural, food, or biological systems engineering.
2012 North Central Region Distinguished Team Award, Epsilon Sigma Phi, espnational.org
Flooding Preparation and Recovery Education and Assistance
2011 NDSU AGSCO Excellence in Extension Award
2008 Inducted into the agricultural honor society Gamma Sigma Delta
2006 ASABE Outstanding Leadership Recognition: Meetings Council Chair
2006 ASABE President's Citation
2005 Priester Multi-State Award for Outstanding Extension Health Programming
2003 ASAE Outstanding Leadership Recognition: International Meeting Chair
2001 Communicator of the Year - ND Agricultural Communicators in Education
2001 Honor Award: United States Department of Agriculture (Flood Recovery Education)
1998 Honor Award: United States Department of Agriculture (Flood Education Team)
1997 State Mid-Career Award: Epsilon Sigma Phi
1996 Senior Career Commendation: NDSU Agriculture
1995 ASAE International Engineering Achievement Award: Extension
1994 ASAE Section Chair Achievement Award
1992 ASAE Red River Valley Section Member of the Year
1990 State Early Career Award - Epsilon Sigma Phi
10 ASAE/ASABE Educational Aids Blue Ribbons

MAJOR CONSULTING PROJECTS

Grain Drying and Storage Engineering Consultant Internationally
Potato, Carrot & Onion Storage Engineering Consultant Internationally
Sugar Beet Storage Ventilation System Designs

EDUCATIONAL ACTIVITIES

Engineering assistance provided to people across the United States and internationally:
Consultations - 14,000+
Educational Presentations – 1,000+
Numerous news articles, magazine articles, newsletter articles, radio programs, and television programs.

EXPERIENCE & EXPERTISE

Engineering Professor and Extension Agricultural Engineer 1980-Present
Responsibilities: State program leadership, education and technical assistance in crop post harvest, structures, and indoor environmental engineering.
Academic Rank: Professor in the College of Agriculture, Food Systems and Natural Resources and in the College of Engineering and Architecture at North Dakota State University.

PUBLICATIONS

Dr. Hellevang has authored or co-authored more than 200 publications. These include technical papers, proceedings, professional standards, chapters in handbooks, and peer reviewed Extension circulars and bulletins, videos and other electronic educational materials. More than 200,000 of these publications have been distributed by private business, professional societies, and universities internationally. For a list of publications go to
http://www.ndsu.edu/aben/personnel/hellevang/

2013_002_RC

CURRENT & PENDING SUPPORT

Name: Dirk E. Maier

Instructions:
Who completes this template: Each project director/principal investigator (PD/PI) and other senior personnel that the Request for Applications (RFA) specifies
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Note: Concurrent submission of a proposal to other organizations will not prejudice its review by CSREES.

NAME (List/PD #1 first)	SUPPORTING AGENCY AND AGENCY ACTIVE AWARD/PENDING PROPOSAL NUMBER	TOTAL $ AMOUNT	EFFECTIVE AND EXPIRATION DATES	% OF TIME COMMITTED	TITLE OF PROJECT
Dirk Maier Mark Fowler Jay O'Neil Carlos Campabadal	Active: Kansas Grain Sorghum Commission Oct2012-19	$60,000	3/1/11 – 9/30/13	2%	Market Development Grant – International Grains Program
Kingsly Ambrose C. Campabadal Dirk Maier Leland McKinney Brandi Miller	US Department of Labor SH-23539-12-60-F-20	$120,000	9/30/12 – 9/30/13	2%	Combustible Dust Hazards in Grain Handling Facilities: Preventive Precaution, Awareness Creation
Carlos Campabadal Dirk Maier	USDA FAS CO-CR-13-020	$39,230	8/22/13 – 3/6/14	5%	Cochran Program on Grain Management and Storage Africa and Middle East Region
Carlos Campabadal Dirk Maier	USDA FAS CO-CR-13-018	$38,618	8/22/13 – 4/26/14	2%	Cochran Program on Animal Production and Management
Dirk Maier S. Bhadriraju Mary L. Higgins Nina Lilja Shannon Washburn	USAID	$5,000,000	10/1/13 – 9/30/18	5%	Alliance for Food security through Reduction of Postharvest Loss and Food Waste
Dirk Maier	ADM Institute for the Prevention of Postharvest Loss	$390,000	10/1/13 – 9/30/16	2%	Alliance for Food Security Supplemental Funding

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	Active:				
Leland McKinney Dirk Maier	American Feed Industry Association	$7,000	7/15/09 – 7/14/14	1%	Memorandum of Understanding between American Feed Industry Association and Kansas State University: AFIA 501
Dirk Maier	US Dept. of Labor 4107-51619	$28,000	9/30/11 – 9/30/13	1%	Grain Safety Education and Training
Dirk Maier Kingsly Ambrose S. Bhadriraju	CRC Plant Biosecurity PBCRC3040	$273,360	4/1/13 – 3/31/15	20%	Modeling VaporPhos and ProFume Distribution in Bulk Storages to Improve Efficacy against Insects
S. Bhadriraju L. Channaiah Dirk Maier Kingsly Ambrose	CRC Plant Biosecurity PBCRC3038	$274,380	4/1/13 – 3/31/15	5%	Evaluating Chlorine Dioxide and Ozone as Alternative Methods for Controlling Phosphine-resistant Insects in On-farm and Commercial Bulk Storages
	Pending:				
Dirk Maier Kingsly Ambrose S. Bhadriraju	CRC Plant Biosecurity	$138,019	1/1/13 – 3/31/17	2%	Modeling VaporPhos and ProFume Distribution in Bulk Storages to Improve Efficacy against Insects – PhD Student
S. Bhadriraju L. Channaiah Dirk Maier Kingsly Ambrose	CRC Plant Biosecurity	$117,619	1/1/13 – 12/31/16	2%	Evaluating Chlorine Dioxide and Ozone as Alternative Methods for Controlling Phosphine-resistant Insects in On-farm and Commercial Bulk Storages – Linked PhD Proposal
Carlos Campabadal Kingsly Ambrose Dirk Maier Jay O'Neil	USDA FAS	$19,800	8/1/13 – 12/31/13	2%	Cochran Program on Grain and Oilseeds Storage and Handling Asia Region

CURRENT & PENDING SUPPORT 2013_002_RC

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	Active:				
Dirk Maier Mark Fowler Jay O'Neil	Kansas Soybean Commission 1311	$773,200	7/1/00 – 6/30/14	2%	Market Development Grant - International Grains Program
Dirk Maier Mark Fowler Jay O'Neil	Kansas Corn Commission 0003	$706,800	7/1/00 – 6/30/14	2%	Market Development Grant – International Grains Program
Dirk Maier Mark Fowler Jay O'Neil	Kansas Wheat Commission KWC/KSU (2013-IGP)	$2,199,820	7/1/00 – 6/30/14	2%	Market Development Grant – International Grains Program
Dirk Maier	USDA 58-3148-1-228	$458,342	8/17/11 – 9/30/14	3%	KSU Pakistan Fish Feed Project
Dirk Maier Jay O'Neil	USDA 12-25-A-5640	$20,000	9/16/12 – 12/31/13	1%	US – South America Ocean Grain Freight Spreads
Dirk Maier Carlos Campabadal Mark Fowler Jay O'Neil	US Soybean Export Council, Inc. 13KA04M54B	$47,500	8/1/13 – 10/31/13	1%	Latin America Animal Production Training Program, Part 2
Dirk Maier Carlos Campabadal Mark Fowler Jay O'Neil	US Soybean Export Council, Inc. 13KA04M54A	$47,500	8/1/13 – 9/30/13	1%	Latin America Animal Production Training Program
	Pending:				
Kingsly Ambrose Carlos Campabadal Dirk Maier Brandi Miller	US Department of Labor	$110,000	9/30/13 – 9/30/14	2%	Training on Advanced Methods of Grain Dust Control within the Grain Handling and Processing Industry

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Bhadriraju Subramanyam, Channaiah. Lakshmikantha, Dirk E. Maier and Corinne Alexander	Pending: Anderson Grant Program	$150,000	06/01/2013 to 05/31/2013	20%	Evaluating chlorine dioxide gas for managing stored-product insects in flour mills
Maier, D. E. McNeill, S.G. Hellevang, K.H.	Anderson Grant Program	$19,640	1/1/2014 - 5/31/2015	2%	Revision of MWPS-13

2013_002_RC

CURRENT & PENDING SUPPORT

Name: SAMUEL G. McNEILL

Instructions:
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	Active:				
McNeill, S.G.	USDA-FAS	$56,474	2/22/2010-12/31/2013	5%	Nigeria: Commodity Storage -- Technical Assistance
McNeill, S.G.	USDA-RD	$100,000	10/1/2010-10/31/2013	2%	Energy Audits for Grain and Poultry Producers in Kentucky
McNeill, S.G.	Southern SARE	$10,000	7/1/2012-9/31/2013	2%	Developing an Organic Corn Enterprise in Kentucky
Casads, M.E. Montross,M.D. Thompson, S.A. McNeill, S.G. Maghirang, R. Boac, J. Bhadra, R.	USDA-RMA	$370,000	9/1/2009-12/31/2013	2%	Laboratory and Field Data for Establishing New Grain Packing Factors
Maier, D. E. Opit, G. McNeill, S.G.	USAID (Pending)	$ 67,628	1/1/2014 - 12/31/2018	3%	Providing Food Security by Reducing of Post-harvest Losses of Grains in Ghana
Maier, D. E. McNeill, S.G. Hellevang, K.H.	Anderson Grant Program (Pending)	$19,640	1/1/2014 - 5/31/2015	3%	Revision of MWPS-13

2013_002_RC

CURRENT & PENDING SUPPORT

Name: Kenneth J. Hellevang

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Kenneth Hellevang Beverly Samuel Virginia White	Active: USDA-NIFA 2012-41210-20168	$50,000	9/1/12 – 8/31/14	10%	National EDEN Issue Leaders: Flooding Educational Support
Kenneth Hellevang	North Dakota Department of Commerce	$13,200	7/1/13-6/30/14	5%	Energy Efficiency Education and Technical Assistance
Kenneth Hellevang Thomas Scherer John Nowatzki	North Dakota Department of Commerce	$36,600	7/1/13-6/30/14	5%	Agricultural Energy Efficiency Education Program
Sreekala Bajwa Kenneth Hellevang	North Dakota Department of Commerce	$15,000	7/1/13-6/30/14	5%	Conference: Creating North Dakota's Bio-Industry
Maier, D. E. McNeill, S.G. Hellevang, K.H.	Anderson Grant Program (Pending)	$19,640	1/1/2014 - 5/31/2015	3%	Revision of MWPS-13

ANDERSONS RESEARCH FUND - RESEARCH PROPOSAL BUDGET

2013_002_RC

Category	Year 1 Amt. requested from Andersons	Year 2 Amt. requested from Andersons	Total
Salaries and Wages*			
Post-Ph.D. research associate(s)			
Graduate assistant (0.5FTE)			
Stipend			
Tuition and fees			
Hourly wage (undergrad technician)			
Other (specify in Budget Narrative)	*$4,640*		
Total			
Fringe Benefits			
Post-Ph.D. research associate(s) (@ 35%)			
Graduate assistant (@ 5.7%)			
Hourly wage (undergrad technician)			
Other			
Total			
Materials and Supplies			
Equipment (List individual pieces of equipment that are essential to the project in the Budget Narrative.)			
Travel	*$15,000.00*		*$15,000.00*
Publication charges			
Indirect costs**			
Total (Max. $25,000/yr from Andersons Research Grant Program)	*$19,640.00*		*$15,000.00*

*Andersons funds cannot be used for faculty salaries, departmental space, or facilities.

** The Andersons Research Grant Program policy specifies that no indirect costs can be charged to this project.

Budget Narrative

Travel

The requested funds would be used to support travel expenses for the five (5) chapter lead authors(excluding the lead PI Maier) to get together at a central location (e.g., Kansas City) three (3) times during the project year, spend 2-3 days together and focus on

reviewing, revising and finalizing the chapters of the new MWPS-13 edition. One of those three meetings (perhaps the first one) would be scheduled ahead or immediately after the February 2014 NC-213 meeting in order to make sure the project was off to a successful start. Travel funds would be disbursed by Kansas State University's Grain Science and Industry department on a cost reimbursement basis upon submission of receipts by each of the chapter lead authors.

Third-party expenses incurred by MWPS for a graphic designer to generate needed illustrations ($3,360) and an editor of the final manuscript ($1,280) are requested to meet the desired time schedule (total expenses of $4,640). This expense would be paid from this grant by Kansas State University's Grain Science and Industry department to MWPS upon receiving an invoice for services rendered.

Addendum 2013_002_RC

Grain Drying, Handling and Storage Handbook
MWPS-13 – Second Edition 1987

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Feed Processing
Electrical Service
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