COVER SHEET

Enrichment of Course Offerings from the Department of Biological Systems Engineering to Address Bioenergy Science & Technology

NAME, POSITION
Jeyamkondan Subbiah, Assistant Professor
Curtis Weller, Professor
Jack Schinstock, Professor
David Jones, Professor
Michael Kocher, Associate Professor

AFFILIATION
Department of Biological Systems Engineering,
College of Agricultural Sciences and Natural Resources & College of Engineering,
University of Nebraska-Lincoln.

SIGNATURES OF PIs
and their chairs/heads, deans/directors

Jeyamkondan Subbiah: [Signature]
Curtis Weller: [Signature]
Jack Schinstock: [Signature]
David Jones: [Signature]
Michael Kocher: [Signature]
Department head: [Signature]
Dean: [Signature]

NAME, ADDRESS AND PHONE NUMBER AND E-MAIL ADDRESS
of lead PI(s) or contact persons

Jeyamkondan Subbiah,
207 L.W. Chase Hall, Biological Systems Engineering,
472-4944, jsubbiah2@unl.edu
ABSTRACT

Nebraska is one of the leading states in biofuels production, ranking third in ethanol production in the nation. Biofuel plants are being built so quickly that it has become increasingly difficult to find skilled workers.

A significant contributor to success in harnessing biorenewable energy is the availability of properly trained and educated professionals. Because it has academic programs in both the College of Engineering and the College of Agricultural Sciences and Natural Resources, the Department of Biological Systems Engineering at the University of Nebraska-Lincoln is in a unique position to offer courses in the area of biofuels technology.

The goal of this project is to prepare 4 one-credit hour modules in the areas of bioenergy science and technology that can be incorporated into several course offerings in the department of Biological Systems Engineering. Modules will be prepared in the areas of ethanol production from grain, ethanol production from cellulose, biodiesel production, and gasification and biogas production. Two sets of four modules will be produced. One module set that includes design calculations and process simulations will be intended for engineers. The other set that focuses on technology will be intended for agricultural students.

This project will have an impact on students by preparing them for careers in energy-related professions and by contributing to increased student awareness of energy issues. By serving students in both of the Colleges of Engineering and Agriculture, this proposal will achieve the second program goal of the Energy Science Education RFA.
PROJECT DESCRIPTION (total length not to exceed 4 pages)

On August 8, 2005, President Bush signed the Energy Policy Act of 2005 (H.R. 6) into law. The comprehensive energy legislation includes a nationwide renewable fuels standard that will double the use of ethanol and biodiesel by 2012. Growth in biofuel production is explosive, to say the least. Nebraska is one of the leading states in biofuels production, ranking third in ethanol production in the nation.

Biofuel plants are being built so quickly that it has become increasingly difficult to find skilled workers. Employees obtain a quick run-through training and it is not uncommon for incumbent workers to lack an overall understanding of the process.

Goals and objectives

The goal of this project is to prepare 4 one-credit hour modules in the areas of bioenergy science and technology that can be incorporated into several course offerings in the department of Biological Systems Engineering.

Modules will be prepared in the areas of
1. Ethanol production from grain
2. Ethanol production from cellulose
3. Biodiesel production
4. Gasification and biogas production

Two sets of four modules will be produced. One module set that includes design calculations and process simulations will be intended for engineers. The other set that focuses on technology will be intended for agricultural students.

The courses that will benefit immediately are:

1. MSYM 364 (Agricultural Products Processing and Handling) with 3 credit hours for students in Mechanized Systems Management and other CASNR programs,
2. AGEN/BSEN 303 (Principles in Process Engineering) with 3 credit hours, for students in Agricultural Engineering or Biological systems Engineering, and other College of Engineering students, and
3. BSEN 446 (Unit Operations of Biological Processing) with 3 credit hours for students in Agricultural Engineering or Biological Systems Engineering, and other College of Engineering students.

Project Justification

A significant contributor for success in harnessing biorenewable energy is the availability of properly trained and educated professionals. As the leading educational institution and a land-grant institution in the state of Nebraska, the University of Nebraska has the responsibility of training a workforce for the needs of the biofuels industry. Engineers
are the logical professionals that will impact the development, adaptation, and implementation of new technologies. The Department of Biological Systems Engineering is in a unique position to offer courses in the area of biofuels technology, because it has academic programs in both the College of Engineering and the College of Agricultural Sciences and Natural Resources. Students in the Agricultural Engineering and Biological Systems Engineering programs have backgrounds in agriculture and biology in addition to the necessary engineering practicum. Thus, we are in an excellent position to teach a bioenergy curriculum to engineering students.

With increasing energy prices, students realize the importance of renewable energy sources. There is a strong interest in the student community to learn more about biofuels processing and technology. Thus, we propose to develop course modules to cater to the needs of students. These modules will be developed so that they can either be easily incorporated into existing courses or offered as stand-alone 1-credit hour courses. Both engineering and agricultural students are interested in biofuels. Since engineering and agricultural students have diverse backgrounds, it is not possible to offer the same module to both. Thus, we propose to prepare two sets of modules to cater to the needs of both the engineering and the agricultural students.

**Work required to develop the course or educational program, teaching/educational methods to be used**

Dr. Jeyamkondan Subbiah, PI, has been teaching AGEN/BSEN 303 in the Spring semester for the past two years. In Spring 2005, he introduced renewable energy topics for one-third of the course. Based on positive feedback from students, he expanded renewable energy topics to cover half of the course in Spring 2006. He was co-principal investigator on an NSF Advanced Technological Education Proposal to establish a National Biofuel Education Consortium comprised of 6 community colleges and 7 universities in the Midwest region.

Dr. Curtis Weller, Co-PI, has a gasification research program. His research group has already built a gasifier, which can be used in conducting a lab. The doctoral graduate student, Ajay Kumar, will develop the Gasification module. Eric Newgard, a doctoral student in our department, will develop the Ethanol production from grain and cellulose modules. Dr. Weller also teaches BSEN 446 every Spring semester. The developed modules will be used to enrich the BSEN 446 course.

The Industrial Agriculture Products Center (IAPC) in the Department of Biological Systems Engineering has been conducting outreach activities in the area of biodiesel production. Expertise and facilities available in the IAPC will be used to develop the biodiesel module.

Dr. Jack Schinstock, Co-PI, will incorporate these modules to enrich the courses MSYM 364 and MSYM 312, Engine Power System. The tractor test lab in the Biological Systems Engineering will be an excellent resource to test engines when biofuels are used. Labs will be developed to do emissions testing. Dr. Schinstock will provide a leadership
role on how to effectively integrate these modules into the Mechanized Systems Management curriculum. Dr. David Jones, Co-PI, and Dr. Mike Kocher, Co-PI, will provide leadership roles on how to effectively integrate these modules in the Biological Systems Engineering and the Agricultural Engineering curriculum.

The doctoral graduate students in the Biological Systems Engineering Department will be primarily responsible for developing the modules under the direct supervision of the investigators. Because their dissertation research is related to Biofuels, they are in an excellent position to develop these teaching modules. In addition, they will be receiving good experience in curriculum development and delivery.

Assignments and lab procedures will be developed for each module. For space constraint, a detailed description of the first module, ethanol production from grain, is given. The first lecture will provide an overview and process flow chart of ethanol processing. The second lecture will be on size reduction of grains. The student will conduct a lab on hammer mill and sieve analysis for particle size distribution. The next few lectures will cover various processing operations such as cooking, liquefaction, fermentation, distillation, centrifugation, evaporator, and drying. Student will also conduct labs on distillation, centrifugation, and drying. Hands-on lab exercises will be developed for thorough understanding. In addition, a field trip to an ethanol processing plant will be scheduled. The course will be concluded with the summary and discussion of the energy balance debate in ethanol industry.

The course outline will be discussed with biofuel industry personal to get suggestions on the course material and their expectations for jobs requirement. Based on their feedback, the course modules will be improved.

For demonstration purposes during classes, most of the lab-scale instruments and facilities are available in the Biological Systems Engineering department. A few more instruments and biodiesel production kits will be purchased for lab demonstrations.

**Expected educational outcomes, course materials, outputs, and impact vis a vis selection criteria**

The outcomes of the project will be 4 course modules. These modules can be offered as a stand-alone 1-credit hour courses or be incorporated into existing courses to enrich the knowledge of bioenergy production and technology to students. Two sets of four modules will be developed for Engineering students and Agricultural students. Thus, the outcome of this project will enrich the knowledge of biofuels in students from two colleges. The course modules will be launched in the 2007-2008 academic year. The final modules will be following:

- Module 1- Ethanol production from grain
- Module 2- Ethanol production from cellulose
- Module 3- Biodiesel production
- Module 4- Gasification and biogas production
This project will have an impact on students by preparing them for careers in energy-related professions and by contributing to increased student awareness of energy issues. Students in both the College of Engineering and the College of Agriculture will benefit from the outcomes of this proposal. This proposal will achieve the second program goal of the Energy Science Education RFA.

**Timeline for activities and accomplishments**

<table>
<thead>
<tr>
<th>Period</th>
<th>Activities &amp; Accomplishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-Feb, 2007</td>
<td>Develop preliminary course outline for lectures and labs for each module.</td>
</tr>
<tr>
<td>Mar, 2007</td>
<td>Discussion with biofuels industry to refine course outline</td>
</tr>
<tr>
<td>Apr – Aug, 2007</td>
<td>Develop course materials for each module</td>
</tr>
<tr>
<td>Sept, 2007</td>
<td>Discussion with biofuels industry to refine course materials</td>
</tr>
<tr>
<td>Oct – Dec, 2007</td>
<td>Prepare Assignments, and lab procedures, sample exams, PowerPoint slides for each module</td>
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</tbody>
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## Budget Request and Justification (one page)

### NCESR Research Grant Budget Request

<table>
<thead>
<tr>
<th>Item</th>
<th>FY2006/07</th>
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</thead>
<tbody>
<tr>
<td>Salaries</td>
<td></td>
</tr>
<tr>
<td>Research Professors</td>
<td></td>
</tr>
<tr>
<td>Postdoctoral</td>
<td></td>
</tr>
<tr>
<td>Graduate Student (2)</td>
<td>6,000</td>
</tr>
<tr>
<td>Technical support positions</td>
<td></td>
</tr>
<tr>
<td>Hourly help</td>
<td></td>
</tr>
<tr>
<td>Benefits (32%)</td>
<td>1,920</td>
</tr>
<tr>
<td>Equipment, instrumentation, supplied for lab</td>
<td>3,000</td>
</tr>
<tr>
<td>Travel to biofuels plants</td>
<td>1,080</td>
</tr>
<tr>
<td><strong>Total Request</strong></td>
<td><strong>12,000</strong></td>
</tr>
</tbody>
</table>

### Budget Justification

Two doctoral graduate students in our department will be putting together all the materials for the course modules. The stipend for each student is requested at $3000 each. Tuition benefits for each graduate student is 32% of funding. Most of the equipments are available in our laboratories for demonstrations. However, we need some instrumentation, biodiesel lab kits, materials and supplied to develop labs. The fund requested for instrumentation is $3000. We will be visiting biofuels energy industries in Nebraska and universities for their suggestion on the course materials. We are requesting $1080 for travel expenses.
Jeyamkondan (Jeyam) Subbiah, Ph.D., P.E.
Assistant Professor
Biological Systems Engineering, Food Science & Technology
207 L.W. Chase Hall, University of Nebraska
Lincoln, NE 68583-0726
Ph/Fax: (402) 472-4944/6338
Email: jsubbiah2@unl.edu

PROFESSIONAL PREPARATION

Oklahoma State University, Stillwater, OK, USA. GPA: 4.00/4.00

University of Manitoba, Winnipeg, Canada. GPA: 4.08/4.50

Tamil Nadu Agricultural University, India. GPA: 8.98/10.00

APPOINTMENTS

Assistant Professor, 80% Research and 20% Teaching, Joint appointment with
Biological Systems Engineering (55%) and Food Science & Technology (45%) Departments, Institute of Agricultural and natural Resources, University of Nebraska, Lincoln, NE. July 2004 to present.

Research Engineer, 50% Research and 50% Extension, Biosystems and Agricultural Engineering Department, Oklahoma State University, Stillwater, OK. 2000-2004.

Graduate Research Assistant, Biosystems Engineering Department, University of Manitoba, Winnipeg, Canada. 1997-1999.

PROFESSIONAL REGISTRATION

Professional Engineer

• Nebraska, USA (2005 – present)
• Manitoba, Canada (2003 – 2005)

TEACHING

Fall: AGEN/BSEN 225, Engineering Properties of Biological Materials.

Spring: AGEN/BSEN 303, Principles of Bioprocess Engineering.
RESEARCH EXPERTISE:

- Instrumentation for Food Quality
- Predictive Microbiology and Heat Transfer Modeling for Food Safety
- Nonthermal Processing

GRANTS


REFEREED PUBLICATIONS


TEACHING/ADVISING ENHANCEMENT ACTIVITIES

- Peer Review of Teaching Project. UNL.
- Training in Professoriate Seminars, Oklahoma State University.
- Instructional Effectiveness Training Program, Oklahoma State University.
- Certificate in Higher Education Teaching, University of Manitoba.
Curtis L. Weller  
Professor  
Department of Biological Systems Engineering  
University of Nebraska  
210 LW Chase Hall  
Lincoln, NE 68583-0726  
402-472-9337 or cweller1@unl.edu

Description of Duties

Responsible for teaching and developing courses in engineering properties of biological materials, food and process engineering principles and unit operations for biological processes. Research responsibilities are in the broad area of food engineering with particular attention on value-added processing of agricultural commodities and physical properties determination. Concentration of research effort has been on property evaluation and modification of biopolymeric films, and refining of grain sorghum to recover co-products. Recipient of over $2,500,000 in research grants and author or co-author on 86 refereed journal articles or book chapters. Chair of departmental curriculum committee and coordinator for International Agriculture and Natural Resources Minor.

Earned Degrees

<table>
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<tr>
<th>Degree</th>
<th>Institution</th>
<th>Year</th>
<th>Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ph.D.</td>
<td>University of Illinois-UC</td>
<td>1987</td>
<td>Agricultural Engineering</td>
</tr>
<tr>
<td>M.S.</td>
<td>University of Illinois-UC</td>
<td>1983</td>
<td>Food Science</td>
</tr>
<tr>
<td>B.S.</td>
<td>University of Illinois-UC</td>
<td>1977</td>
<td>Food Science</td>
</tr>
</tbody>
</table>

Professional Licensure

Licensed South Carolina Professional Engineer No. 14553 and Nebraska Professional Engineer No. E-8042.

Other Relevant Employment

<table>
<thead>
<tr>
<th>Institution</th>
<th>Position</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Nebraska-Lincoln</td>
<td>Assistant/Associate Professor</td>
<td>1992 - 2000</td>
</tr>
<tr>
<td>(Department of Biological Systems Engineering)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clemson University</td>
<td>Assistant/Associate Professor</td>
<td>1986 - 1992</td>
</tr>
<tr>
<td>(Department of Agricultural and Biological Engineering)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eisner Food Stores</td>
<td>Sanitation Supervisor</td>
<td>1979 - 1981</td>
</tr>
<tr>
<td>(Division of Jewel Companies, Inc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muller-Pinehurst Dairy, Inc.</td>
<td>Quality Control Lab Tech.</td>
<td>1977 - 1979</td>
</tr>
</tbody>
</table>

Society Memberships
American Society of Agricultural and Biological Engineers  
Institute of Food Technologists  
AACC International

Honors and Awards

Alpha Zeta (1975)  
55th Collegiate Dairy Products Evaluation Contest - Atlantic City, NJ (1976)  
   1st in Milk Competition and 5th in Overall Competition  
Gamma Sigma Delta (1977)  
Sigma Xi (1982)  
Alpha Epsilon (1985)  
Phi Tau Sigma (1993)  
ASAE Paper Award, Honorable Mention (1994)  
Faculty Research Award (Associate Professor) - College of Engineering and Technology, University of Nebraska-Lincoln (1995)  
Certificate of Recognition for Contributions to Students - Parents’ Association, University of Nebraska-Lincoln (1999, 2001)  
Engineer of the Year Award - Nebraska Section of the ASAE (2001)  
President’s Citation - ASAE, The Society for engineering in agricultural, food and biological systems (2002)

International Activities

Republic of Korea - Collaborative Research  
Colombia, Brazil, Chile and Venezuela - Consulting  
Tajikistan and Uzbekistan - Teaching Exchange  
France, Ireland, The Netherlands, Denmark and Sweden - Student Study Tour
JACK L. SCHINSTOCK

Business Address: Biological Systems Engineering
University of Nebraska - Lincoln
201 L. W. Chase Hall
Lincoln, Nebraska 68583-0726
(402) 472-1629
Email: jschinstock1@unl.edu

Current Position:
Professor, Department of Biological Systems Engineering and Associate Dean, College of Agricultural Sciences and Natural Resources, University of Nebraska - Lincoln, 2000 to present. Also courtesy appointment in the Department of Agricultural Leadership, Education and Communications.

Educational Background:
Ed.D. Virginia Polytechnic Institute & State University, July 1977
   Major: Vocational & Technical Education (Ag Ed)
   Cognate: Agricultural Engineering
M. Ag. University of Florida, December 1974
   Major: Mechanized Agriculture
   Minor: Agriculture & Extension Education
B.A. State University of New York College at Brockport, August 1970
   Major: Biology Education
   Minor: Spanish

Professional Experience:
Professor, Department of Biological Systems Engineering and Assistant Dean, College of Agricultural Sciences and Natural Resources, University of Nebraska - Lincoln, 1991 through 2000. Also courtesy appointment in the Department of Agricultural Leadership, Education and Communications.

Professor, Department of Biological Systems Engineering, University of Nebraska - Lincoln, 1990 through 1991. Also courtesy appointment in Agricultural Education Department.

Associate Professor, Department of Agricultural Engineering, University of Nebraska - Lincoln, 1982 through 1990. Also courtesy appointment in Agricultural Education Department.

Assistant Professor, Department of Agricultural Engineering, University of Nebraska - Lincoln, 1977 through 1982. Also courtesy appointment in Agricultural Education Department.

Instructor (full-time), Peace Corps Volunteer, Department of Mathematics and Agricultural Engineering, National School of Agriculture, El Salvador, Central America, September, 1970 through June, 1973.

Professional Societies:
American Society of Agricultural and Biological engineers
North American Colleges and Teachers of Agriculture
American Association of Teacher Educators in Agriculture
Council on Agricultural Science and Technology

Languages: Speak and read Spanish

International Experience:
February 3 through February 9, 1991, Costa Rica, Central America. Purpose of the assignment was to offer assistance in the area of mechanized systems to instructors in agricultural mechanization at the Escuela de Agricultura de la Region Tropical Humeda (E.A.R.T.H.) as they developed courses and laboratories to meet the integrated curriculum needs of students in the humid tropics.

May 12 through May 26, 1990, Moscow, Russia. Purpose of the visit was to observe the academic structure and experience the curriculum process of the Moscow Institute of Agricultural Engineering.
September 1970 through May 1973, El Salvador, Central America. Worked as an instructor of agricultural mechanization at the National School of Agriculture and assisted with a World Bank/U.S. A.I.D. project to improve instruction in agriculture throughout the country.

Honors and Awards Received:

- Alpha Zeta (1974)
- Phi Kappa Phi (1974)
- Alpha Tau Alpha (1975)
- Phi Delta Kappa (1975)
- Gamma Sigma Delta (1977)
- AMOCO Foundation Distinguished Teaching Award, University of Nebraska (1985)
- Teacher Fellow, National Association of Colleges and Teachers of Agriculture (1986)
- Honorary American Farmer, Future Farmers of America (1986)
- Blue Ribbon Award from the American Society of Agricultural Engineers for bulletins and circular category entitled “Electrical Systems for Agricultural Buildings.” (1988)
- Recognition Award for “Contributions to Students,” University of Nebraska - Lincoln Parents’ Association and Teaching Council (eleven times since 1990)
- L. K. Crowe Outstanding Advisor Award in the College of Agricultural Sciences and Natural Resources (1993)
- John Deere Teaching Program Award in Power and Machinery, North American Teachers and Colleges of Agriculture (1996.)
- Senior Holling Award for Meritorious Teaching, University of Nebraska - Lincoln College of Agricultural Sciences and Natural Resources (2003)
- Recognition Award for “Valuable Contributions to Students in the Greek Community,” University of Nebraska - Lincoln Panhellenic and Interfraternity Councils (2003)
- Recognition Award for “People Who Inspire,” University of Nebraska - Lincoln Mortar Board (2006)

Current Professional Activities:

- Teaching in the area of agricultural power (internal combustion engines, electricity, and hydraulics) and applied physics.
- Curriculum development in agricultural sciences and agricultural systems technology.

Grants Funded:

**Full-Range Advising: Transforming the Advisor/Advisee Experience.**

*Role:* Co-Principal Investigator, *Grant Period:* 01/01/2006 - 01/01/2007 *Grant Type:* Teaching  
*Total Amount:* $22,000  
*Granting Agency Name:* Initiative for Teaching and Learning Excellence  
*Grant Purpose Statement:* To develop and update skills needed to be an effective advisor  
*IANR/CEHS Associated Faculty:* John Barbuto Jr, Co-Principal Investigator; Susan Fritz, Co-Principal Investigator

**Agricultural Mechanization Initiative, Great Plains Interactive Distance Education Alliance.**

*Role:* Co-Principal Investigator, *Grant Period:* 01/01/2006 - 01/01/2007 *Grant Type:* Teaching  
*Total Amount:* $14,010  
*Granting Agency Name:* U.S.D.A. Higher Education Challenge Grant  
*Grant Purpose Statement:* Off-campus outreach  
*Faculty Partners - Non-IANR/CEHS Associated Faculty:* Leon Schumacher, UMC; Tom Bromm, ISU; John Slocombe, KSU;
CURRICULUM VITAE

David Jones
PhD, PE, Professor
Biological Systems Engineering

215 L.W. Chase Hall
University of Nebraska
Lincoln, NE 68583-0730

Phone: (402) 472-6716
E-mail: djones1@unl.edu

Education:
Ph.D. Agricultural Engineering Oklahoma State University 1988
M.S. Agricultural Engineering Texas A&M University 1986
B.S. Agricultural Engineering Texas A&M University 1984

Professional Experience:

University of Nebraska – Lincoln, Biological Systems Engineering Department
2004 – Present Professor;
1995 – 2004 Associate Professor,
1989 – 1995 Assistant Professor,

Oklahoma State University, Agricultural Engineering Department
1986-1988 USDA National Need Ph.D. Fellow,

Texas A&M University, Agricultural Engineering Department
1984-1985 Research/Teaching Assistant,

Professional Registration: Registered in Nebraska, Professional Engineer No. E-8454.

Honors and Awards Received (3-year record):

2006 Advisor of the Year Finalist, 2006
2005 Certificate of Recognition for Contributions to Students by UNL Parents Association and the Teaching Council
2004 College Distinguished Teaching Award
2004 Recognition as an Outstanding Advisor, CoET - Student Advisor Board

Memberships in Professional and Honorary Organizations:

American Society of Agricultural Engineers (ASAE)
National Society of Professional Engineers (NSPE)
Nebraska Society of Professional Engineers (NeSPE)
American Society of Engineering Education (ASEE)
Institute of Biological Engineers (IBE)

Professional Interests:

My research efforts focus on modeling complex systems with particular interest in using fuzzy set theory to capture and describe uncertainty and ambiguity. This work has resulted in a wide range of collaborations ranging from processing to climatology. Of particular interest is modeling across scales and scale up of processes. Further interest exists in the classroom where an extensive teaching program is maintained. Particular
interest resides in the teaching of engineering design and problem solving, transport phenomenon in biological systems and the assessment of teaching and learning activities.

Refereed Articles (3-year record):

MICHAEL F. KOCHER, Ph.D., P.E.

Office:
205 L.W. Chase Hall, University of Nebraska-Lincoln, Lincoln, NE 68583-0726
Phone: (402) 472-3949, Fax: (402) 472-6338, E-mail: mkocher1@unl.edu

EDUCATION

1975-77 Midland Lutheran College, Fremont, Nebraska. Major: pre-engineering
1977-83 University of Nebraska-Lincoln, Lincoln, Nebraska
   B.S.--Agricultural Engineering, with distinction, December 1979
   Approximation of the Performance of a Solar Heated Floor.
1983-86 Oklahoma State University, Stillwater, Oklahoma
   Stress-Strain Models for Soil Using Wave Propagation.

WORK EXPERIENCE

1990-Present Associate Professor, Department of Biological Systems Engineering,
   University of Nebraska-Lincoln. Teaching (60%) and research (40%).
   Teaching expertise includes power systems design (fluid power
   hydraulics, electric motors, and internal combustion engines), engineering
   agricultural machinery, and sensors and control systems. Research areas
   include design and development of instrumentation for rapid evaluation of
   planter seed spacing performance, and evaluation of tractor performance
   (currently chair of Nebraska Tractor Test Board).
1986-1990 Assistant Professor, University of Arkansas. Research (70%) and teaching
   (30%) in the Power and Machinery area of Biological and Agricultural
   Engineering. Primary research areas: machinery aspects of combine
   harvesting and sensors.

KEY FUNDED PROPOSALS

Kocher, M.F. 2004. Development of a seed spacing measurement and analysis system
   for testing of seed processing operations. Project funded by CNH at $4300. I was the
   project leader.

   for 2003, 2004. I was a co-investigator on the project.

Kocher, M.F. 2002. Development of seed spacing instrumentation for Case (CNH Global
   N.V.). Project funded by CNH (Burr Ridge, IL) at $8,000. I was the project leader.

Kocher, M.F. 2002. Development of seed spacing instrumentation for Flexicoil (CNH
   Global N.V.). Project funded by CNH (Saskatoon, Saskatchewan, Canada) at $8,000. I
   was the project leader.
KEY PUBLICATIONS


