

# Sustainable Agriculture Systems Minor

## Guidelines for Graduate & Doctoral Students

**UNIVERSITY OF MINNESOTA  
COLLEGE OF AGRICULTURAL, FOOD AND ENVIRONMENTAL SCIENCES**

Society is seeking new approaches to food and fiber production that maintain the quality of the environment and the health and well being of the consumers, producers, and rural communities, now and in the future. The University of Minnesota recognizes this goal and offers a minor in Sustainable Agriculture that incorporates both interdisciplinary coursework and internship experiences. Through the program, students gain knowledge and experience in diverse areas and awareness of holistic approaches that are necessary to understand and develop sustainable systems.

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### Forms

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For further information, contact the Director of Graduate Studies or visit the Program Office for the graduate minor in Sustainable Agriculture Systems (415 Hayes Hall). This handbook and additional literature pertaining to the graduate minor are available at the Program Office.

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The minor in Sustainable Agriculture Systems is open to students enrolled in any program within the Graduate School at the University of Minnesota. This program will complement existing graduate major programs such as those in ecology, conservation biology, natural resources, sociology, geography, political science and public affairs, as well as those in the College of Agricultural, Food, and Environmental Sciences.

Contact the Director of Graduate Studies or the Program Coordinator for the graduate minor in Sustainable Agriculture Systems for an "Intent to Enroll" form. Students are admitted each semester. Soon after enrolling in the minor program, the student should identify a graduate faculty member in the minor program who will serve as the student's minor advisor. The minor advisor will make recommendations on courses for the minor and be closely involved in the student's internship. This person may have expertise in the area the student wishes to conduct an internship, although this is not a requirement for selecting a minor advisor.



## Curriculum




The program provides a curriculum with strong emphasis on systemic approaches to analyzing current agricultural production systems in the U.S., as well as environmental, economic, and social conditions that influence changes in agriculture. Courses designed specifically for this program integrate biology, ecology, agriculture, sociology, history, philosophy and economics. Students completing the requirements for the program receive a minor in Sustainable Agriculture Systems applicable to master's (M.S. and M.A.) and doctoral programs.

**Sustainable  
Agriculture seeks  
to balance three  
long term goals:  
Quality of life,  
Environment and  
Economics.**

Student interaction with individuals and groups actively involved with food production practices, policies and education, is an integral part of the program. The Colloquium in Sustainable Agriculture provides a forum for students, faculty, and members of the agriculture community to discuss issues of importance. An internship is a required part of the program. The internship gives students an opportunity to: gain practical experience in an area that complements their studies; broaden their understanding of food production; and develop learning and thinking skills that will serve them in a variety of settings. The internship tends to be very flexible in nature and can be completed as the student's schedule allows (See page 9 of this packet for more information).



## Minor Requirements

-  To obtain the minor, Masters and Ph.D. students must choose a graduate faculty member from the minor program to serve on their committee. This faculty member will help identify relevant courses to include in the student's program.
-  When submitting Degree Program form to the Graduate School, the signature of the Director of Graduate Studies (DGS) for the minor program is required.
-  Coursework must include 6 semester credits for an M.S. or M.A. program; 12 semester credits for a Ph.D. program. All students are required to take the Colloquium in Sustainable Agriculture (SAGR 8010) and Field Experience in Sustainable Agriculture (SAGR 8020) to obtain credit for their internship experience. Students in the Ph.D. program must take all 3 core courses. Additional credit requirements for the minor for both Masters' and Ph.D. students can be met with elective courses. A list of possible elective courses is provided here but should not be considered exhaustive. It is recommended that students select courses that will broaden their knowledge of agriculture and issues related to sustainable agriculture. These courses are correct as of Fall 2003. Students should call the respective departments to determine fall/spring semester offering schedule of each course.



## Core Courses (Required for Masters & PhD Students)

### SAGR 8010. Colloquium in Sustainable Agriculture. (2 cr)

Forum for University faculty and students, and representatives of the farming community, including farmers, grassroots organizations, agricultural businesses, and representatives of state agencies, to engage in discussions on topics related to sustainability of food production.

### SAGR 8020. Field Experience in Sustainable Agriculture. (1-4 cr)

Three to fourteen-week internship with producers or organizations working with sustainable agriculture issues. Students analyze these issues in a final written project and oral seminar.

## Core Courses ( Required for PhD Students / Elective for Masters Students)

### AGRO 5321. Ecology of Agricultural Systems. (3 cr)

Agroecology as the scientific investigation of agricultural systems. Formal methodologies of systems inquiry are developed and applied to problems in agricultural ecosystems (cross listed with ENT 5321).



## Electives

### AGET 5203. Environmental Impacts of Food Production. (3 cr)

Exploration of the environmental changes resulting from food production. Topics include crop production intensity, animal raising options, food processing waste alternatives, and pest control.

### AGET 5212. Safety and Health Issues in Agricultural Work Environments. (2 cr)

Examine emerging agricultural occupational safety and health issues including injury, work-related disease, pesticide exposure, pollution, biotechnology, and social implications of changing demographics and technologies.

### AGRO 4201. Agro-ecosystems and Crop Production. (3 cr)

Basic concepts in agro-ecosystems: organization, development, and function of field crop communities in contrast to natural ecosystems. Means of improving designed and managed systems for the benefit of humankind while minimizing impact on the ecosystem.

### AGRO 4605. Management Strategies for Crop Production. (4 cr)

Crop management situations/needs in various climate zones, soil types, from seed selection to crop storage. Focuses on cropping systems involving corn, soybeans, small grains, and forages. Emphasizes long-term productivity, profitability, and sustainability. Lecture, discussion, problem sets, laboratory.

### APEC 4103. World Food Problems. (3 cr)

A multi-disciplinary look at problems and possible solutions affecting food production, storage, and utilization in developing countries. Presentation and discussions introduce conflicting views on population, technology, and ethical and cultural values of people in various parts of the world. (Cross-listed with AGRO 4103).

### APEC 5651. Economics of Natural Resource and Environmental Policy. (3 cr)

Economic analyses, including project evaluation of current natural resource/environmental issues. Emphasizes intertemporal use of natural resources, natural resource scarcity/adequacy, environmental quality, and mechanisms for pollution control and their implications for public policy.



## Electives continued

### **AGRO 5999. Agroecosystems Analysis (Summer Field Course) (3 cr)**

This is a field-based "immersion" course that introduces students to the concept of the agroecosystem and their analysis with an underlying emphasis on sustainability. Students visit a number of farms of various types in Minnesota, Iowa and Nebraska, as well as other historic and cultural sites of significance to this region. There is considerable time for discussions with the farmers and students prepare oral and written analyses based on their observations and conclusions.

### **APEC 5711. U.S. Agricultural and Environmental Policy. (3 cr)**

U.S. agricultural policy in an open world economy; role of private markets and government in regulating supply and demand; income vs. price support, supply controls, environmental constraints, and export protectionism; functioning of markets; roles of public interest groups and future of American agricultural policy.

### **APEC 5721. World Agriculture: Problems, Policies, and Sustainability. (3 cr)**

Comparative agricultural systems and policies, issues of development and protection, resource use and sustainability in major production regions, international policy conflicts, international organizations and assistance, technological change, production and consumption balances.

### **BAE 5513. Watershed Engineering. (3 cr)**

Application of engineering principles to managing surface runoff from agricultural, range, and urban watersheds. Design of facilities and selection of land use practices for controlling surface runoff to mitigate problems of flooding and degradation of surface-water quality.

### **EEB 5122. Plant Interactions with Animals and Microbes. (4 cr)**

Cross-listed with Plant Biology and Plant Pathology Ecological and environmental implications of mutualistic and antagonistic interactions between plants, animals and microbes at organismal, population, and community levels.

### **ENT 5211. Insect Pest Management. (3 cr)**

Prevention or suppression of injurious insects by integrating multiple control tactics, e.g., chemical, biological, cultural. Strategies to optimize the dynamic integration of control methodologies in context of their economic, environmental, and social consequences.

### **ENT 5341. Biological Control of Insects and Weeds. (3-4 cr)**

Biological control of arthropod pests and weeds. Analysis of relevant ecological theory and case studies; biological control agents. Lab includes natural enemy identification, short experiments, and computer exercises.

### **FR 5104. Forest Ecology. (4 cr)**

Form/function of forests as ecological systems. Characteristics/dynamics of species, populations, communities, landscapes, and ecosystem processes. Examples applying ecology to forest management. Weekly discussions on research topics, exercises, current issues in forest resource management. Required weekend field trip.

### **FR 5142. Tropical Forest Ecology. (3 cr)**

Ecological principles related to form, function, and development of wet/dry tropical forests at organismal, community, and ecosystem scales. Ecophysiology, succession, productivity, biodiversity, sustainability, agroforestry, social forestry, and management alternatives. Natural distribution of forest types. Causes, consequences, and extent of deforestation. (Cross-listed with NRES 5142).



**FR 5251. Role of Renewable Natural Resources in Developing Countries. (1 cr)**

International perspectives on important resource issues including integration of natural resource, social, and economic considerations. Overviews of issues and case studies.

**FW 5455. Sustainable Aquaculture. (3 cr)**

Role of aquaculture in fisheries management, biodiversity rehabilitation, and food production around the world. Implications for the sustainability of human-environment interactions in different societies. Principles of fish husbandry.

**FW 8452. Conservation Biology. (3 cr.)**

Seminar examining population- to system-level biological issues (genetics; demographic processes; community, ecosystem, and landscape scale interaction; restoration ecology; ex situ strategies for restoration and recovery) and societal issues (social, economic, cultural perspectives; sustainable development strategies; roles of institutions; international and U.S. policies).

**FW 8465. Fish Habitats and Restoration. (3 cr)**

Mechanisms underlying physiology/behavior that shape fish community structure in specific north temperate habitats. Techniques and planning procedures for restoring lakes/streams.

**GEOG 5441. Quaternary Landscape Evolution. (3 cr)**

Roles of climate change, geomorphic history, vegetation change, and soil development in the evolution of landscape patterns during the Quaternary Period, with emphasis on North America.

**GEOG 5565. Geographical Analysis of Environmental Systems and Global Change. (3 cr)**

Applications of geographic information systems and other spatial analysis tools to the analysis of environmental systems patterns, dynamics, and interactions. Focus on global to landscape databases developed to analyze atmospheric, hydrospheric, geomorphic, pedologic, biologic, and human land use systems.

**GEOG 8335. Agrarian Change and Rural Development. (3 cr)**

Contours of agricultural and rural development in the Third World; theories of agrarian transformation and rural development; role of agriculture in economic development; peasant economy; the nature and role of state intervention in rural sector.

**HORT 4072. Growing Plants Organically: What It Means To Be Green. (3 cr)**

Science and ethics of organic cultivation. What is meant by "green" from a legal, scientific, and ethical perspective? Explore original literature on an organic practice, prepare a written report, and lead a class discussion.

**HORT 5031. Sustainable Fruit and Vegetable Production Systems. (4 cr)**

Integrated management of horticultural food production systems with an ecological perspective. Evolution, taxonomy, environmental control of plant growth and development, site selection. Intensive use of writing, decision cases, discussion.

**HORT 5032. Sustainable Commercial Vegetable Production Systems. (3 cr)**

Principles of commercial vegetable production. Integrated management of vegetable cropping systems. Site selection/environment, seed/stand establishment, cultural management practices, commodity use and handling from harvest to market. Perspectives on types of vegetable cultivars. Origin, historical significance/improvement through breeding, nutrition/medicinal aspects, physiological/environmental control of development.



## Electives continued

### **HORT 5071. Restoration and Reclamation Ecology. (3 cr)**

Ecological and physiological concepts as a basis for revegetation of grasslands, wetlands, forests, and other landscapes. Plant selection, stand establishment, evaluating revegetation success. State and federal programs that administer restoration and reclamation programs. Field trips within Minnesota.

### **HORT 8023. Evolution of Crop Plants. (2 cr)**

Origin, distribution, and evolution of cultivated plants; implication of the effects of evolutionary processes on crop breeding for needs of people today.

### **LA 5202. Landscape Ecology. (3 cr)**

Relationships among spatial patterns, temporal patterns, and ecological processes in the landscape. Topics include factors affecting landscape pattern, measurement of landscape pattern, material transport through landscapes, effects of landscape pattern on population dynamics, and landscape planning.

### **MGMT 5019. Business, Natural Environment, and Global Economy. (2 cr)**

Resource deployment policies that affect the natural environment and sustainability. Local/global environmental threats, how government policies address these issues. Business strategies/practices that produce "win-win" outcomes.

### **NRES 4195. Problem Solving in Natural Resources and Environmental Studies. (4 cr)**

Applying tools/skills in policy, planning, and managerial situations. Working with 'real world' client to produce publishable technical report.

### **NRES 5021. Plant Resource Management and the Environment. (3 cr)**

World vegetation management practices, extent, and implications. Emphasis on forest management, agriculture, and agroforestry; historical, current, and prospective practices; environmental and societal implications.

### **NRES 5061. Water Quality: Management of a Natural Resource. (3 cr)**

Biophysical water quality in the context of today's management concerns. Active learning approaches, and global and ecological perspectives toward understanding the management of surface and groundwater resources.

### **NRES 5202. Environmental Leadership and Ethics. (3 cr)**

Study of philosophy, art, science, and practice of leadership and its relationship to management and environmental ethics. Leadership models, traits, behaviors, style, and group process. Development of personal leadership philosophy.

### **NRES 5480. Special Topics: Population, Environment and Sustainability. (3 cr)**

This course examines contemporary debates over the relationships among population growth, environmental change and development. Covers current trends in population and theories about population change, relating contemporary debates to historical views of population; assessing alternative perspectives relating population dynamics to social and environmental change; and responses to the challenges of population, environment, and development as represented in the debate over 'sustainability'.

### **NRES 5482. Biosafety Science and Policy. (3 cr)**

Scientific/policy approaches to governing equitable/safe use of new biological technologies such as genetic engineering and its products (e.g., growth-enhanced, transgenic fish), hazardous materials, and wastewater treatment.



**NRES 5703. Agroforestry: Role in Watershed Management. (2 cr)**

Agroforestry practices, what they are, their intended purpose, and production and watershed protection benefits derived from such practices. Role of agroforestry in sustainable development. Agroforestry examples/case studies presented from North America and developing countries.

**PA 5721. Energy and Environmental Policy. (3 cr)**

Impact of energy production and consumption choices on environmental quality, sustainable development, and other economic and social goals. Emphasis on public policy choices for both energy and the environment and the linkages between them.

**PLPA 5204. Plant Disease Management. (3 cr)**

Principles of crop/pathogen biology, epidemiology, crop ecology, crop management practices that influence occurrence of plant disease. Interaction of crop management practices with plant disease. Strategies for controlling plant disease through management practices illustrated by examples from agronomic, horticultural, forest crops.

**POL 5441. Environmental Policy. (3 cr)**

How American political system deals with environmental issues. How third world countries deal with environmental protection/economic growth. How international community deals with global environmental problems.

**SOC 4305. Society and the Environment: A Growing Conflict. (3 cr)**

Societal causes and cures of ecological problems such as global warming, species extinction, and resource exhaustion.

**SOIL 4021. Environmental Impact Statements. (3 cr)**

Roles of governmental agencies, consultants, and private citizens in the EIS process. Students will read EIS, EAW and analyze their content and scope, and prepare an EAW according to Minnesota EQB guidelines and an EIS on a local project.

**SOIL 4511. Field Study of Soils. (2 cr)**

Learn to write soil profile descriptions in the field. Class requires hands-on experience to determine soil texture, color, and horizon designations in the field.

**SOIL 5515. Soil Genesis and Landscape Relations. (3 cr)**

Basic soil morphology and soil profile descriptions; pedogenic processes and models of soil development; soil geomorphology, hydrology, and hill slope processes; digital spatial analysis; soil classification; soil surveys and land use; soil geography.

**SOIL 5611. Soil Biology and Fertility. (3 cr)**

Soil microbial populations and biodiversity. Soil microorganisms. Biogeochemical cycles. Macro and micronutrient fertilization, and element function in plants and microbes. Composts, sludge and manures in fertilization. Plant microbe associations: nitrogen fixation, mycorrhizal fungi, and biological control of root pathogens. Pollution and bioremediation.







## Internship Program

The internship program was conceived by students, faculty and community representatives. Internships are designed to encourage and facilitate experiences in which students work with diverse issues related to the long-term viability of agriculture. The program also aims to help students develop decision-making skills by observing how solutions to complex problems in agriculture are arrived at and implemented. Through course requirements and interactions with faculty and other students, the program provides a setting for students to reflect on and analyze their internship, thereby enhancing the educational value of that experience.

**Experiential learning is an important aspect of the minor in Sustainable Agriculture Systems at the University of Minnesota.**

The goals of the internship program are to provide opportunities for students to:

-  Increase their understanding of the goals and concepts of sustainable agriculture and become aware of issues affecting the sustainability of agricultural production,
-  Become familiar with decision making approaches used by individuals and organizations,
-  Interact with members of the agricultural community and form working relationships with some of these individuals or groups, and / or
-  Perform work on a farm, or within a organization, public agency, or agriculture-related business, that will contribute to the development of sustainable food systems.

The internship is a three to fourteen week supervised off-campus experience that is required for all graduate students working toward the minor in Sustainable Agriculture Systems. The internship is conducted in addition to a research or thesis project in the student's major field of study. During the internship, students will work to complete specific objectives that are agreed upon by the student, the internship host, and a faculty member from the minor program. Students will receive credit for their internship by registering for SAGR 8020, Field Experience in Sustainable Agriculture, and completing academic requirements.



## Internship Opportunities

Through the internship, students gain experience with alternative farming systems, producer and community education, community development, alternative marketing, and procedures of change including policy making and implementation. To gain a broad understanding of agriculture, we encourage students to undertake internships that will provide experiences and exposure to issues they are unlikely to acquire through their own graduate research or course work. Hosts are asked to provide interns with opportunities to engage in representative activities, to allow interns to observe decision making activities on an individual or group level, and to consider the intern as a valuable contributor to their endeavors. Internships can be arranged with farmers, grassroots organizations, public agencies, or agricultural businesses. See Arranging and Internship for more information on available internship hosts.

**An internship in sustainable agriculture involves work that is directly related to agriculture in which environmental, social, and economic impacts of agricultural practices or policies are considered.**



## Internship Opportunities continued

### Arranging an Internship

Students should be enrolled in the minor prior to making arrangements for an internship. Internships can be conducted at any time of the year. Factors such as the student's course work and research or teaching obligations and the availability of internships of interest to the student will determine the timing.

Before exploring internship possibilities, the student should schedule a meeting with their chosen minor advisor to discuss ideas and internship topics. The next step in locating an internship host is the notebook labeled Graduate Internships in Sustainable Agriculture. A copy of this notebook can be found at the office of the Minnesota Institute for Sustainable Agriculture (MISA, 413 Hayes Hall) and on the MISA web page at [www.misa.umn.edu](http://www.misa.umn.edu). Follow the links to Student Programs and Graduate Minor.

The notebook and web site provide a brief description of potential internship hosts, a general description of the kinds of work an intern will do with each host, and the name and phone number of the contact person. The student should contact this person to find out more about specific internship projects that are available. In addition to this initial conversation, hosts may request an interview or resume from prospective interns. After identifying a host and defining the internship, the student should prepare a draft of an Internship Learning Agreement Proposal jointly with their advisor and host.

### Internship Credits:

The actual time requirement of internships will vary depending on the needs of the project and the time available to the student. Credit will be adjusted according to the time allotted to completion of the internship project. Semester credits for an internship will range from 1-4 credits. Number of hours worked on an internship varies considerably depending on the type of host and project. Here are examples of internship programs and credit assignments:

Internship Credit Table	Total hours	Credits
10 hours per week X 14 week semester	140	1
Break between Fall Semester and Spring Semester (8 hour days X 22 days)	176	2
Full time 2 months during summer months (8 hour days X 60 days)	480	3
Full time 3 months during summer months (8 hour days X 90 days).	720	4

Students should regard internships as contract projects that are unique and negotiated. Educational goals, academic requirements, work responsibilities, time requirements, and stipends or other benefits provided by the intern host, should be defined in the Internship Learning Agreement Proposal. By signing and submitting the proposal, the student agrees to the described conditions of the internship.

**Academic Credit:**  
All students enrolled in the minor must conduct an internship and register for the course SAGR 8020, Field Experience in Sustainable Agriculture. This is a variable credit (1 to 4) course.



## Internship Opportunities continued

### Funding

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In many instances, the host does not provide a stipend, although living accommodations are frequently provided by the host in the case of on-farm internships. Students may apply to the minor program for financial assistance of up to \$2,500. This option will be provided only if program funding permits. MISA was recently awarded a SARE grant to provide student internship support during the 2003-2006 school years. Students may apply for a fellowship from the minor program when a research or teaching stipend is not available during the period of the internship, or a stipend is not offered by the intern host. Alternatively, students may request funding that can be used to cover expenses such as travel, including food and lodging, postage, photocopying, or supplies. A Request for Funding Form should be submitted at the time the Internship Proposal is submitted. Proposals and requests for funding are approved by the Director of Graduate Studies and/or Program Coordinator.



## Internship Learning Agreement Proposal Guidelines

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After you have identified an internship project, you should prepare a two- to four-page Learning Agreement Proposal jointly with your advisor and internship host. Upon completion, a copy of the proposal along with a Request for Funding Form should be distributed to each of the following people:

- \* Student's minor advisor
- \* Intern host
- \* Director of Graduate Studies for the minor
- \* Program Coordinator

**Please use the headings and subheadings given below when preparing your proposal. Include typed copies of the following forms with your proposal: Proposal Cover Sheet, Request for Funding, and Proof of Health Insurance Coverage. These forms are included in this handbook and downloadable versions should soon be found on the minor web site. Additional copies are available in 413 Hayes Hall.**



## Components of the Proposal

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### 1. Project Overview

Your internship may be a part of a larger project conducted by your host; describe the overall project briefly and how your internship activities relate to it. If you are working with a producer, describe the farm operation and any special project you will be conducting.



## Components of the Proposal continued

### 2. Educational Intent

- Goals - List two or three learning goals that you have for your internship.
- Objectives - List one or two objectives for each goal.
- Strategies/Work Responsibilities - List the strategies you intend to use to accomplish your objectives. These should relate directly to the work you will be performing for your internship. Be sure to describe any final product that your intern host expects upon completion of the internship.

### 3. Academic Requirements

Describe the work you will complete in SAGR 8020, Field Experience in Sustainable Agriculture. State the number of credits for which you will register (1 to 4). See Academic Credit for further details.

### 4. Work Specifications

Give the beginning and ending dates of the internship, and work schedule (days/hours). Describe any benefits, such as a stipend, living accommodations, travel expenses, etc., that the intern host will provide. Describe any other special conditions that the intern host has requested.



## Requirements for SAGR 8020

A written project such as a term paper, decision case study, feasibility report, or other project may fulfill this requirement. The student and minor advisor prior to beginning work on the internship should determine the specific nature of the written project. We encourage you to do a written project that is in some way useful in disseminating your information. Examples of this type of project include: an article written for a local newsletter, or a case study presentation that can be used in a class. The Program Coordinator can give you examples of past student's final projects.

An oral presentation/discussion of the internship during a meeting of the Sustainable Agriculture Study Group's What's Up in Sustainable Agriculture (WUSA) brown bag series, or another public format. The presentation should be made during the quarter the student is registered for SAGR 8020, Field Experience in Sustainable Agriculture.

### Suggested (in addition to above requirements):

A journal or log in which the student describes his/her activities and observations on a weekly basis and reflects on four questions, which the student has identified at the start of the internship, pertaining to the goals of the internship project and sustainable agriculture.

For those students who wish to have more internship resources available to them, a reference packet Internship Resources is available in the Minnesota Institute for Sustainable Agriculture office (413 Hayes Hall) bookshelf. This packet contains material such as ideas for the student's journal or log questions, stages of intern development commonly experienced by students and personal reflection ideas for those wishing to have a more in-depth internship experience.



## Procedures for Completing an Internship Worksheet

### Internship Timeline

Completion Date	Student	Advisor	Host
	<ul style="list-style-type: none"> <li>◇ Enroll in program by submitting 'Intent to Enroll' form.*</li> <li>◇ Identify Advisor from list of graduate faculty</li> <li>◇ Meet with advisor to discuss internship ideas.</li> <li>◇ Research Internship options. Information available in 415 Hayes Hall and at the MISA web site (<a href="http://www.misa.umn.edu">www.misa.umn.edu</a>).</li> </ul>		
	<ul style="list-style-type: none"> <li>◇ Contact internship host to discuss internship ideas.</li> <li>◇ Develop Internship Learning Agreement (jointly with Advisor) and submit final version to Program Coordinator with 1) Proposal cover sheet, 2) Request for Funding and 3) Proof of Health Insurance forms.*</li> <li>◇ Determine appropriate number of course credits using Internship Credit table (jointly with Advisor).</li> </ul>	<ul style="list-style-type: none"> <li>◇ Discuss internship ideas with student.</li> <li>◇ Develop Internship Learning Agreement Proposal (jointly with student and host).</li> <li>◇ Determine appropriate number of course credits (using internship credit table jointly with student and host).</li> </ul>	
	<ul style="list-style-type: none"> <li>◇ Compete Internship</li> <li>◇ Give Oral presentation</li> <li>◇ Submit Final written report</li> </ul>	<ul style="list-style-type: none"> <li>◇ Site visit</li> <li>◇ Complete evaluation (in conjunction with the host)</li> </ul>	<ul style="list-style-type: none"> <li>◇ Host intern</li> <li>◇ Complete evaluation (in conjunction with the advisor).</li> </ul>

\* The Intent to Enroll Form, Proposal Cover Sheet, Request for Funding and Proof of Health Insurance Coverage Forms can be obtained from the Program Office in 415 Hayes Hall or the MISA web site ([www.misa.umn.edu](http://www.misa.umn.edu)). Follow the links to Student Programs and Internship Forms. They are also at the end of this packet.



## Graduate Faculty

**Deborah Allan**, Professor, Department of Soil, Water, and Climate  
Phone: 612-625-3158, E-mail: allan001@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** The plant root-soil interface; understanding roots and rhizosphere processes for the improved management of nutrient inputs and efficiency of nutrient use; monitoring soil quality, carbon and nitrogen dynamics and storage in different cropping and tillage systems.

Courses taught: SOIL 5611 Soil Fertility and Biology, SOIL 3612 Soil and Environmental Biology

**David Andow**, Professor, Department of Entomology  
Phone: 612-624-5323, E-mail: dandow@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Biological control of insect pests; the effect of agricultural diversity on insect populations, environmental effects of genetic engineering.

Courses taught: ENT 5320 Ecology of Agriculture, co-taught by Nicholas Jordan.

**David D. Biesboer**, Associate Professor, Department of Plant Biology  
Phone: 612-625-1799, E-mail: biesboer@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** The use of competitive native grass species for control of noxious weeds along highway right-of-ways as alternatives to pesticide usage. The use of native, short-stature, warm season grasses adapted to dry, high saline, compacted soils as low maintenance cover along roadsides. Modeling of eco-toxicological chemicals produced by the transportation industry and methods for decreasing their input into the environment.

**Vernon B. Cardwell**, Professor, Department of Agronomy and Plant Genetics  
Phone: 612-625-6754, E-mail: cardw001@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Collaborative research efforts in the areas of seed physiology; system approaches to farming; and agricultural literacy for schoolchildren through the Food, Fiber, Environment and Natural Resource Education program.

Courses taught: AGRO 3005 Applied Crop Physiology and AGRO 4305 Crop Harvest, Storage and Utilization.

**Iris Charvat**, Associate Professor, Department of Plant Biology  
Phone: 612-625-3199, Email: charv001@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Rhizosphere microorganisms, especially arbuscular mycorrhizal fungi, associated with native and naturalized plants in prairies and wetlands. Mycorrhizal associations: physiological / ecological studies. Use of mycorrhizal inoculum in habitat reclamation.

Courses taught: PBI0 1212 Plants and Society, BIOL 3007 Plant Biology: Diversity and Adaptation and BIOL 1901 Restoring Lands Back To Nature: Establishment of Prairies and Wetlands.

**Sharon Danes**, Professor, Department of Family Social Science  
Phone: 612-625-9273, E-mail: sdanes@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Interdynamics of family and business system issues that affect the viability of farm family businesses. Of particular interest is the contribution of farmwomen.



## Graduate Faculty continued

**John Deen**, Associate Professor, Department of Clinical Population Studies

Phone: 612-625-7784, Email: deenx003@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Pig production systems, pig disease control and pig welfare.

Courses Taught: Swine production, Swine diseases and Swine Records - all 2 week DVM short courses.

**Ruth Dill-Macky**, Associate Professor, Department of Plant Pathology

Phone: 612-625-2227, E-mail: ruthdm@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Epidemiology and management of plant diseases in field crop production systems with an emphasis on cereal grains. Development of field crop production systems with enhanced sustainability, and reduced pesticide use, through integrated management systems.

Courses taught: PLPA 1001 Microbes, Plants and People: The Social and Economic Impact of Plant Disease and PLPA 5204 Plant Disease Management.

**Susan Galatowitsch**, Assistant Professor, Department of Horticultural Science and Department of Landscape Architecture

Phone: 612-624-3242, E-mail: galat001@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Factors affecting ecosystem recovery in restored wetlands, including land use and invasive species.

Courses taught: HORT 5015 Restoration and Reclamation Ecology, LA 5201 Field Techniques for Landscape Analysis and LA 5202 Landscape Ecology.

**Jeffrey Gillman**, Assistant Professor, Department of Horticultural Science

Phone: 612-624-7432, E-mail: gillm003@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Sustainable agriculture problems including nutrient leaching and water conservation.

Courses taught: HORT 4041 & 5041 Nursery Production and Management I & II.

**Peter H. Graham**, Professor, Department of Soil, Water and Climate

Phone: 612-625-8268, E-mail: pgraham@soils.umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Interaction of host and microorganisms in the nodulation and nitrogen fixation of legumes. Current Projects include: influence of edaphic factors in nitrogen fixation by beans in North-Central Minnesota and in Tanzania; methods for inoculation and improved function of prairie legumes in revegetation and prairie settings; role and biodiversity of below-ground organisms, associated with crop and prairie legumes; and the effects of fragmentation on nitrogen fixation in natural ecosystems.

Courses taught: ES 3612 Soil and Environmental Biology and SWAC 5611 Soil Biology and Fertility.

**Jeffrey L. Gunsolus**, Associate Professor, Department of Agronomy and Plant Genetics

Phone: 612-625-8130, E-mail: gunso001@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Integrated weed management techniques to reduce herbicide inputs and economic risk. Plan, implement, and evaluate statewide educational programs on weed biology and corn and soybean weed management.

Courses taught: AGRO 3001 Introduction to Integrated Weed Management.



## Graduate Faculty continued

**Craig Hassel**, Associate Professor, Department of Food Science and Nutrition  
Phone: 612-624-7288, Email: [chassel@che2.che.umn.edu](mailto:chassel@che2.che.umn.edu)

**Research and Teaching Related to Sustainable Agriculture:** My interests focus on diverse knowledge systems that may offer alternative perspectives through which to understand health and address health and food issues. The Medicinal Herb Network brings together health care practitioners using herbs and growers of medicinal herbs. Key research questions include developing criteria for medicinal herb quality, linking landscape biodiversity and health to human health. Woodlands Wisdom is a project which builds the capacity of Tribal Colleges to address food/health issues using both traditional knowledge and modern science in their community. A food and nutrition science curriculum has been developed and a research agenda focusing on local food systems is being developed.

Courses taught: AGRI 1000H Native American Perspective on Land Use and the Environment and CSPH 5111 Ways of Thinking About Health.

**Emily Hoover**, Professor, Horticultural Science, Morse-Alumni Distinguished Teaching Professor  
Phone: 612-624-6220, E-mail: [hoove001@umn.edu](mailto:hoove001@umn.edu)

**Research and Teaching Related to Sustainable Agriculture:** Development of fruit crop production systems with enhanced sustainability through the use of integrated pest management; development of rootstocks with improved productivity, efficiency, and winter hardiness; use of decision case studies in research and education on agricultural sustainability.

Courses taught: HORT 1001 Plant Propagation, HORT 5031 Sustainable Fruit Production Systems and HORT 8005 Supervised Teaching Experience for Graduate Students (co-teach).

**Nicholas Jordan**, Professor, Department of Agronomy and Plant Genetics  
Phone: 612-625-3754, E-mail: [jorda020@umn.edu](mailto:jorda020@umn.edu)

**Research and Teaching Related to Sustainable Agriculture:** Application of plant population biology to problems in crop production, particularly weed management, and plant-soil biota interactions.

Courses taught: AGRO 5321 Ecology of Agricultural Systems.

**Robert P. King**, Professor, Department of Applied Economics  
Phone: 612-625-9732, E-mail: [kingr@umn.edu](mailto:kingr@umn.edu)

**Research and Teaching Related to Sustainable Agriculture:** Management information systems; agribusiness management and organizational design; cooperatives and other collaborative marketing groups; retail food marketing.

**Albert (Bud) H. Markhart III**, Associate Professor, Department of Horticultural Science  
Phone: 612-624-7705, E-mail: [amarkhar@umn.edu](mailto:amarkhar@umn.edu)

**Research and Teaching Related to Sustainable Agriculture:** Water and temperature effects on plants; develop more efficient water utilization in plant production. New methods of soil water measurement for building better irrigation delivery systems. Increasing root system performance at low temperatures.

Courses taught: HORT 4072 Growing Plants Organically (Hort 4072) and PBIO & HORT 5138 Water Relations, Mineral Nutrition, and Translocation in Higher Plants.



## Graduate Faculty continued

**Roger D. Moon**, Professor, Department of Entomology  
Phone: 612-624-2209, E-mail: rdmoon@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Ecology of insects associated with domesticated animals and their environments; sustainable parasite management practices for efficient production and animal comfort; rotational grazing; biological control.

Courses taught: ENT 4281 Veterinary Entomology (Primary instructor), ENT 5045 Insect Population Dynamics (Co-instructor) and AGRO 5121 Applied Experimental Design (Co-instructor).

**Helene Murray**, Director, Minnesota Institute for Sustainable Agriculture Adjunct Faculty, Department of Agronomy and Plant Genetics:

Phone: 612-625-0220, E-mail: murra021@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Participatory research, systems research, decision cases and local food systems.

**Kristen Nelson**, Assistant Professor, Department of Forest Resources and Department of Fisheries, Wildlife and Conservation Biology.

Phone: 612-624-1227, Email: kcn@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Human dimensions of natural resources and environmental management--community forestry, environmental sociology, dispute resolution, and participatory planning.

Courses taught: NRES 3202/5202 Conflict Management, Leadership and Planning, NRES 4195 Natural Resource Problem Solving and Planning, NRES 3251/5251 Natural Resources in International Sustainable Development.

**Kent Olson**, Associate Professor, Department of Applied Economics

Phone: 612-625-7723, E-mail: kdolson@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Analysis of organic and other alternative crop management strategies; alternative policies for sustainable agriculture; analysis of decision making by farmers.

Courses taught: APEC 3811 Principles of Farm Management.

**James H. Orf**, Professor, Department of Agronomy and Plant Genetics

Phone: 612-625-8275, E-mail: orfxx001@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Soybean variety development for general and value-added usage. Collaborative research areas: genetic basis for developing soybeans that are more competitive with weeds; determination of the usefulness of molecular marker technology in improving soybean protein, oil, quantitative traits, and soybean cyst nematode resistance; biological nitrogen fixation.

Courses taught: AGRO 4401 Plant Genetics and Breeding.

**Paul Porter**, Associate Professor, Department of Agronomy and Plant Genetics

Phone: 612-625-6719, Email: pporter@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Cropping Systems, Crop Rotation, Cover Crops, and Canola.

Courses Taught: AGRO 4605 Senior Capstone: Leadership, Decision Making, and Problem Solving, AGRO 4660 Management Strategies for Crop Production, AGRO 5999 Agroecosystems Analysis Field Course, AGRO 8605 Advanced Management of Agroecosystems



**Edward B. Radcliffe**, Professor, Department of Entomology  
Phone: 612-624-9773, E-mail: radcl001@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Research on pest management tactics and strategies intended to reduce reliance on pesticides, and Insect Pest Management (IPM). IPM is defined as applied ecology, an essential component of most and sustainable agriculture systems.  
Courses taught: ENT 5211 Insect Pest Management – IPM.

**Paul C. Rosenblatt**, Professor, Department of Family Social Sciences  
Phone: 612-625-3120, E-mail: prosenbl@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Research on families, including families involved in sustainable agriculture. Teaching qualitative family research methods; family theory; diversity and families.  
Courses taught: FSOS 8013 Qualitative Family Research Methods.

**Michael Russelle**, Soil Scientist, USDA-Agricultural Research Service, Adjunct Professor, Department of Soil, Water, and Climate  
Phone: 612-625-8145, Email: russelle@soils.umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Improve nitrogen recycling on dairy farms; Improve management strategies for intensively grazed pastures; Optimize nutrient reuse from by-products; Prevent degradation of surface and ground water by nitrogen and develop effective remediation strategies.  
Courses Taught: Occasional lecturer. Position is 100% research.

**Craig Sheaffer**, Professor, Department of Agronomy and Plant Genetics  
Phone: 612-625-7224, E-mail: sheaf001@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Culture and ecology of annual and perennial legumes in cropping systems; alternative perennial legumes for rotational grazing of pastures.  
Courses taught: SAGR 8010 Sustainable Agriculture Colloquium.

**John Shutske**, Associate Professor, Department of Biosystems and Agricultural Engineering  
Phone: 612-626-1250, E-mail: shutske@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Human health and safety issues related to the agriculture workplace and environmental exposures; hazards including equipment, animals, chemical agents, and physical agents (noise, radiation, etc). Involved in programs and strategies to address migrant worker health and safety needs, and disability accommodation for farm families.  
Courses taught: AGET 5212 Safety and Health Issues in Agriculture Work Environments and involved with minor program in agriculture health and safety offered through school of Public Health.

**Steve Simmons**, Professor, Department of Agronomy and Plant Genetics  
Phone: 612-625-3763, E-mail: ssimmons@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Qualitative and quantitative research to understand farmer decision-making and transformational learning strategies. Ecology and physiology of diversified cropping systems.  
Courses taught: Agro 3203 Environment, World Food Production and the Citizen, Agro 5999 Agroecosystems Analysis and Agro 8005 Supervised Teaching Experience.



## Graduate Faculty continued

**Chery Smith**, Associate Professor, Department of Food Science and Nutrition.

Phone: 612-624-2217, E-mail: csmith@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Food systems; nutrition and community assessments; food and culture; evaluation of eco-tourism on the nutritional status of Sherpas; and obesity prevention in minority populations.

Courses taught: FSCN 4614 Community Nutrition and FSCN 3615 Socio-Cultural Aspects of Food, Nutrition, and Health.

**Marla Spivak**, Associate Professor and Extension Entomologist -Apiculture, Department of Entomology

Phone: 612-624-4798, E-mail: spiva001@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Development of resistance to parasitic mites to reduce use of pesticides within honeybee colonies. Development of methods to conserve and rear native bumblebee pollinators. Regional extension activities (MN, WI, ND, SD, IA) on promoting diversification of beekeeping industry, pollination activities, queen rearing and stock selection.

Courses taught: ENT 4021 Honey Bees and Insect Societies and ENT 4022 Bee Management (intersession course).

**William F. Wilcke**, Professor and Extension Engineer, and Regional Coordinator for NCR-SARE Program

Phone: 612-625-8205, E-mail: wilck001@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** No official teaching appointment. Research and extension interests in post-harvest technology, sustainable agriculture, and alternative energy sources. Administrative responsibilities in sustainable agriculture.

**Donald Wyse**, Professor, Department of Agronomy and Plant Genetics

Phone: 612-625-7064, Email: wysex001@umn.edu

**Research and Teaching Related to Sustainable Agriculture:** Perennial weed control for grass and legume seed production groundwater quality. Course Taught: AGRO 4505 Biology, Ecology, and Management of Invasive Plants.

## Sustainable Agriculture Systems Graduate Minor Intent to Enroll

Please return to:  
Campus Address— 413 Hayes Hall

Mailing Address— Sustainable Agriculture Systems Graduate Minor  
411 Borlaug Hall, University of Minnesota, 1991 Buford Circle, St. Paul, MN 55108

Student's Name: \_\_\_\_\_

Address: \_\_\_\_\_

City, State, Zip: \_\_\_\_\_ Phone: \_\_\_\_\_

E-mail address: \_\_\_\_\_

Student ID#: \_\_\_\_\_

Degree Pursuing: \_\_\_\_\_ Major: \_\_\_\_\_

Major Advisor: \_\_\_\_\_ Dept: \_\_\_\_\_

Minor Advisor: \_\_\_\_\_ Dept: \_\_\_\_\_

Anticipated date for completing degree: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## Sustainable Agriculture Systems Graduate Minor Request for Funding

Please return to:  
Campus Address— 413 Hayes Hall

Mailing Address— Sustainable Agriculture Systems Graduate Minor  
411 Borlaug Hall, University of Minnesota, 1991 Buford Circle, St. Paul, MN 55108

Funding from the Sustainable Agriculture Systems minor program is available in the form of a fellowship for the period of the internship or as funds that may be used to cover expenses incurred as part of the internship.

Students may apply to the minor program for financial assistance of up to \$2500. This option will be provided only if program funding permits.

Students may apply for a fellowship from the minor program when a research or teaching stipend is not available during the period of the internship, or a stipend is not offered by the intern host. Alternatively, students may request funding that can be used to cover expenses such as travel, including food and lodging, postage, photocopying, or supplies.

A Request for Funding Form should be submitted at the time the Internship Proposal is submitted.

Please indicate below the type and amount of funding you are requesting; choose only one option.

<input type="checkbox"/> I am requesting a Fellowship Period for which Fellowship is requested (start/end dates): _____	Amount of funds
--	-----------------

OR

<input type="checkbox"/> I am requesting financial assistance for Expenses <b>My budgeted expenses are:</b> <ul style="list-style-type: none"> <li>• Travel-list destinations, purpose of travel, number of trips, and mileage</li> <li>• Lodging/Meals-list purpose of travel, destinations and other relevant information</li> <li>• Supplies</li> <li>• Other-list other items or services needed and cost per item</li> </ul> <p style="text-align: right; margin-top: 10px;">TOTAL</p>	Amount of funds
--	-----------------

Student's Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_



# Sustainable Agriculture Systems Graduate Minor Proposal Cover Sheet Internship in Sustainable Agriculture

Please return to:  
Campus Address— 413 Hayes Hall

Mailing Address— Sustainable Agriculture Systems Graduate Minor  
411 Borlaug Hall, University of Minnesota, 1991 Buford Circle, St. Paul, MN 55108

Student's Name: \_\_\_\_\_

Address: \_\_\_\_\_

City, State, Zip code: \_\_\_\_\_

E-mail address: \_\_\_\_\_ Phone: \_\_\_\_\_

Social Security #: \_\_\_\_\_

Student ID #: \_\_\_\_\_ Date of Birth: \_\_\_\_\_

Minor Advisor: \_\_\_\_\_

Intern Host: \_\_\_\_\_

Address: \_\_\_\_\_

City, State, Zip code: \_\_\_\_\_

Email address: \_\_\_\_\_ Phone: \_\_\_\_\_

Supervisor: \_\_\_\_\_

Start/Finish Dates: \_\_\_\_\_

Student Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Intern Host Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Advisor Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Approved: \_\_\_\_\_ Date: \_\_\_\_\_

## Sustainable Agriculture Systems Graduate Minor Proof of Student Health Insurance Coverage

Please return to:  
Campus Address— 413 Hayes Hall

Mailing Address— Sustainable Agriculture Systems Graduate Minor  
411 Borlaug Hall, University of Minnesota, 1991 Buford Circle, St. Paul, MN 55108

To insure that students enrolled in the graduate minor in Sustainable Agriculture Systems have adequate medical coverage during the period they are conducting internships, verification of health insurance is required. Health insurance purchased through the University of Minnesota or a comparable plan should provide coverage in the case of accidental injury to the individual.

This form must be completed by the student and returned to the Program Coordinator for the Sustainable Agriculture Systems minor before initiating on-site activities of the internship.

I verify that \_\_\_\_\_ (name of student), \_\_\_\_\_ (social security number),  
is covered by the following health insurance:

Name of insurance provider: \_\_\_\_\_

Policy number: \_\_\_\_\_

Dates of coverage: \_\_\_\_\_

Signature of student: \_\_\_\_\_ Date: \_\_\_\_\_



Mailing Address:  
 411 Borlaug Hall  
 University of Minnesota  
 St. Paul, MN 55108  
 Phone: 612-625-8235  
 Email: misamail@umn.edu

Or Stop By Our Office:  
 415 Hayes Hall, St. Paul Campus

**MISA's purpose is to bring together the agricultural community and the University community in a cooperative effort to develop and promote sustainable agriculture in Minnesota and beyond.**

**MISA's goals are to:**

- **Increase the University's response to the needs of the sustainable agriculture community and increase practitioner's influence on the university.**
- **Promote sustainable agriculture thinking within the University so that the concepts permeate teaching, research and extension.**
- **Work with rural communities in discovering and implementing the values of sustainability.**

**Check out the MISA Web site at [www.misa.umn.edu](http://www.misa.umn.edu) for the latest:**

- **Calendar of Events**
- **Announcements**
- **Publications**
- **Resources**
- **Sustainable Agriculture Newsletter**
- **And More!**

**Be a part of the Sustainable Agriculture Community at the University of Minnesota**

Join the Sustainable Agriculture Listserv by going to the MISA web site [www.misa.umn.edu](http://www.misa.umn.edu) and following the Email Discussion Group Link! The Listserv will keep you up to date on all the happenings in the sustainable agriculture community.

Attend our weekly What's Up in Sustainable Agriculture (WUSA) seminar series. WUSA is a group of students, staff, and faculty that meets bi-weekly for a brown bag lunch to talk about sustainable agriculture with other professionals in the field. The meetings are very informal. If you are interested, feel free to bring your lunch and stop by any of our meetings (Wednesdays 12 -1 PM, 306 Borlaug Hall or check the Calendar on the MISA web site for the Schedule). Video recordings of many of the WUSA seminars are available . Contact the MISA office, 612-625-8235 or [misamail@umn.edu](mailto:misamail@umn.edu), to request a copy of a seminar video or to be added to the WUSA email list.