Sustainable Food and Farming

A Concentration within the Plant, Soils and Insect Sciences Major

Introduction

The current generation of students graduating from American public universities with degrees in Agricultural Science will be faced with an unprecedented challenge to redesign food and farming systems in response to the "perfect storm" of climate change, peak oil, and the threat of global pandemic. These women and men will inherit industrial and technological food production systems that are simultaneously destroying or depleting much of the natural resource base upon which they depend, while endangering human and non-human species, and at the same time offering the highest material standard of living and rate of consumption ever known to those with access to education, money and/or political power. Our current industrial agricultural system must be re-imagined and re-created in ways that no longer rely on non-renewable resources, use natural resources at non-sustainable rates, or cause harm to people or the natural world, now or into the future. This will be the job of graduates of the Sustainable Food and Farming program.

As we begin the task of educating these graduates, we must clarify core community values so that science and technology may be guided to serve the needs of present and future generations. This work will require skills, knowledge and wisdom not currently central to the academic enterprise. Today's graduates in Agricultural Science are generally well-prepared to address problems and opportunities from both a practical management and a theory-based perspective at the organism, organ, cellular and molecular levels. Graduates in the future will also need to understand complex food and farming systems at the population, community, and ecosystem levels. Studies of social systems must complement studies of biophysical systems at these higher levels of complexity. A new set of academic and experiential education is required for the students of sustainable food and farming.

Rationale for the Concentration

There are at least 3 reasons for this concentration:

- Sustainable Food and Farming addresses the university mission of serving the public good in ways that are explicitly dedicated to economic viability, environmental integrity and social equity.

- Sustainable Food and Farming complements and builds upon the strengths of the Department of Plant, Soils and Insect Sciences.
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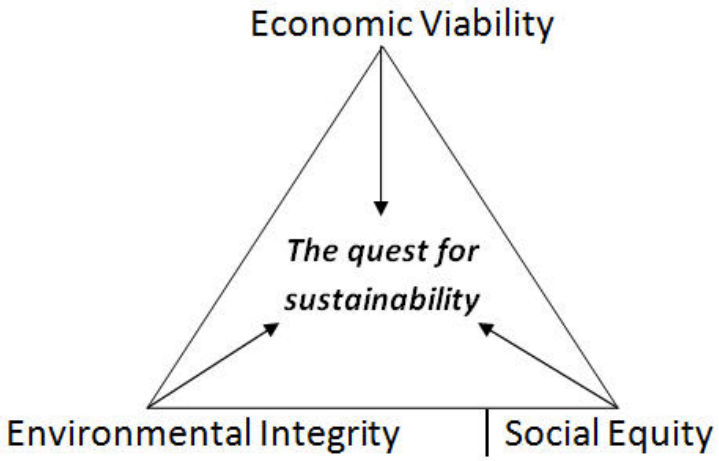
- There is significant student interest in learning about sustainable solutions to the many economic, biophysical, and social food and farming challenges of our time. Enrollment in the concentration has increased almost 10 fold in the past 6 years.

A Model for Sustainable Food and Farming Education

A widely accepted conceptual model presents sustainability as a quest toward three interrelated objectives: 1) environmental integrity; 2) economic vitality; and 3) social equity.



According to an article in *Science* (see; *Sustainability Science* by Robert W. Kates, et al., April 2001), the science community has generally ignored societal and political issues affecting sustainable development. This estrangement from so-called "non-scientific" issues has prevented the research and education establishment from making significant contributions to global sustainability. The authors of this article call for a new sustainability science that is different in "structure, methods and content" from the science of the past. The Sustainable Food and Farming Concentration was designed with this in mind by integrating the biophysical, social and economic sciences. We have identified courses that contribute to sustainability education in the following academic departments at UMass Amherst.

Animal Sciences	Environmental Sciences	English
Biology	Geosciences	Food Science
Communications	History	LARP
Education	Legal Studies	Management
Entomology	Resource Economics	Natural Resources Mgt.
Nursing	Political Science	Nutrition

Based on the evaluation of hundreds of job descriptions, we have generated a list of **skills, knowledge and wisdom necessary for sustainable food and farming education.** The broad categories are listed along with examples in the table below.

SKILLS (know how)	KNOWLEDGE (know what)	Wisdom (know why)
Technical Machinery maintenance Farming techniques Computer skills	**Historical and Philosophical Context** History of agriculture Philosophy of Sustainable Agriculture History of cultures	**Personal Sustainability** Ethics Personal Health & Nutrition Holistic decision-making Adult Education
Administration Accounting/Invoicing Strategic planning Organizational skills Advocacy & Facilitation Community Organizing Mediation Grant management Program evaluation	**Agricultural and Ecological** Plant & Soil Science Food production Ecology Livestock management Community Food Systems Holistic Management Food Quality	**Cultural Awareness** Cross cultural awareness Navigation of Local Politics How to Build a Movement Social Marketing Process of Social Change Social dynamics
Communication Writing proposals Press release writing Newsletter preparation Public speaking Listening Multiple languages Interpersonal Communication	**Social and Economic** Public policy Legal issues Land Trusts Community development Economic development Basic economics Tax Policies Ag Business Management	**Group Dynamics** Leadership Creativity with youth Problem Solving in Groups Community-based Research Community Action How to Work on a Team

Sustainability Curriculum Pedagogy

The evolution of new transformative teaching methodologies and learning objectives may have the greatest impact on education for sustainability in the long run. Current undergraduate education focuses primarily on building knowledge within a specific academic discipline. Sustainability education on the other hand, requires a broad set of learning that integrates multiple disciplines with new practical skills and the evolution of personal and community wisdom. Lacking wisdom, knowledge can be dangerous. Human knowledge alone, for example, has built weapons capable of destroying everything we love. Human knowledge alone has degraded ecosystems and created cycles of poverty and despair. Knowledge "alone" cannot solve the problems that we have created. To solve the problems of humanity, we must go beyond knowledge. Today we need skills, knowledge AND wisdom (where wisdom is defined as the awareness of what has value in life).

Developing wisdom will require the integration of thinking and feeling, mind and body, science and spirit, knowledge and values, head and heart. It will mean less time in classrooms and more time learning through experience. It will require a pedagogy founded on a model of transformative learning that engages the student's mind, body and spirit. Transformative education builds students' capacity to make meaning of their experiences, and reconstruct their notion of self beyond the individual-self to include the family-self, community-self, and global-self. Awareness of the connection between the individual, the community, and the cosmos are necessary attributes of education to prepare young people as leaders in sustainable world.

Learning "about" sustainability is not enough. Sustainability must be learned in the classroom as well as experienced. Most university programs are primarily grounded in a commitment to building *instrumental* knowledge, that is, knowledge about how the world works. Instrumental knowledge is used to manipulate the environment, and while important, it must be balanced by *communicative* knowledge of values, ideas, feelings and cultural concepts such as justice, freedom, equality and love.

Employment Opportunities

Employment opportunities for graduates of the Sustainable Food and Farming Concentration have been described here: http://people.umass.edu/jgerber/PSIS/SFFJobs.htm but include:

- ***Public Policy*** – this includes work for non-profit advocacy and educational organizations, government agencies, university research centers, and personal citizen involvement in political and community change efforts such as working directly with people and groups in community. Examples are community gardens, anti-hunger coalitions, and buy local campaigns.
- ***Educational*** - this includes youth education, citizen education, work with non-profit educational organizations, media work, and formal classroom teaching.
- ***Food Production*** – this includes application of knowledge of sustainable plant and animal production systems on farms, homesteads, community and personal gardens.

For more information on the concentration see: http://people.umass.edu/jgerber/PSIS/SFF.htm

General Student Learning Outcomes

Knowledge - Students will demonstrate a depth of knowledge and apply the methods of inquiry in a discipline or interdisciplinary area of their choosing.

Critical Thinking - Students will demonstrate the ability to access and interpret information, respond and adapt to changing situations, make complex decisions, solve problems, and evaluate actions.

Communication - Students will demonstrate the ability to communicate clearly and effectively both individually as well as a member of a team.

Diversity - Students will demonstrate awareness and understanding of the skills necessary to live and work in a diverse world.

Ownership of Learning – Students will acquire learning habits that respond to internal motivation rather than simply external motivation such as grades.

Personal and Professional Development - Students will demonstrate awareness and understanding of the ethical standards of their academic discipline and/or profession as well as skills for interacting with others in a civil society.

Specific Student Learning Outcomes

Student Learning Outcome	Description
Knowledge	SLO One: Students will demonstrate knowledge of crop and animal production, for example: • Crop growing techniques • Crop, land and soil management • Postharvest physiology and handling • Weed and pest management (including integrated approaches) • Organic gardening/farming systems • Animal husbandry, pasture and forage management • Irrigation and water management • Energy needs and technology for agriculture

	SLO Two: Students will demonstrate financial management and marketing skills, for example: • Farm record-keeping and production and sales records, and crop acreage reports • Market analysis, market development, types of marketing • Financial management for business and non-profits • Direct to consumer sales strategies • Working with restaurants, chefs, schools and other institutions SLO Three: Students will demonstrate knowledge of community organizing strategies, for example: • Working with coalitions • Participatory community development • School gardening; agriculture in the classroom • Grass-roots policy development • Strategies for community change • Community food systems and food security issues • International agricultural development SLO Four: Students will demonstrate a comprehension of agroecological principles, for example: • Ecological principles as applied to agricultural ecosystems • Principles of sustainability • Rural and urban agriculture • Permaculture principles and practices • Holistic Management • Organic agriculture
Critical Thinking	SLO Five: Students will demonstrate critical thinking skills, including analysis, reasoning, and questioning, for example: • Strong research and problem solving skills • Manage and coordinate the development of information, education, and research • System thinking skills and holistic decision making • Ability to evaluate research results • Ability to evaluate suggestions or recommendations from others.
Communication	SLO Six: Students will demonstrate excellent communication skills, for example: • Written and verbal skills, including public speaking skills • Interpersonal communication skills such as active listening and dialogue • Computer skills in word processing, database management, and electronic communications • Presentation, organizational, and budgeting skills

Diversity	SLO Seven: Students will demonstrate an awareness of different worldviews, cultures, and learning styles, for example: • Understanding other people and the ability to interact effectively with different people. • Becoming aware of world issues and pressing social, political, and economic problems. • Identifying multiple intelligences and diverse learning styles.
Ownership of Learning	SLO Eight: Students will demonstrate an ability to learn on their own, for example; • An ability to pursue ideas, and find information from multiple sources. • Increasing intellectual curiosity. • Responding to intrinsic rather than extrinsic rewards and measures of success.
Personal and Professional Development	SLO Nine: Students will develop personal and professional skills to be successful, for example: • Organizational skills with the ability to prioritize tasks and work under deadlines • Developing an understanding and enjoyment of art, literature, music, and drama. • Developing and clarifying your own values and ethical standards. • Understanding yourself--your abilities, interests, and personality. • Ability to function as a team member. • Develop good health habits; physical, emotional, spiritual. • Demonstrating academic and professional honesty • Participation in professional and personal interest groups. • Participate in research or creative projects with members of the community. • Gaining knowledge that will enrich your daily life or make you a more complete person. • Becoming a more satisfied, responsible human. • Identifying a sense of values and priorities in life.

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