AGGE 150 Sustainable Production Systems  
3 Units

Recommended for Success: Before enrolling in this course, students are strongly advised to complete more than two agricultural laboratory courses.

Fundamental concepts and processes of sustainable agricultural systems, with emphasis on integrating agricultural activities with ecological principles.

Field trips might be required. (A-F Only) Lecture
Transfer: (CSU, UC)

II. LEARNING CONTEXT
Given the following learning context, the student who satisfactorily completes this course should be able to achieve the goals specified in Section III, Desired Learning:

A. COURSE CONTENT

1. Required Content:

   a. Introduction

   b. Sustainable agriculture

      i. Other terms related to sustainability

         a. Biodynamic farming

         b. Organic farming

         c. Bio-intensive/French intensive farming

         d. Premiculture

         e. Agroecology

         f. Alternative agriculture

         g. Low-till and no-till farming

         h. Regenerative farming

         i. Nature farming

         j. Low input sustainable agriculture

         k. Integrated pest management (IPM)

         l. Biointensive IPM

         m. Holistic resource management

         n. Integrated farming systems
o. Non organic sustainable farmers

ii. 1990 Farm Bill

iii. Common themes of sustainable agriculture
   a. Stewardship
   b. Systems perspective
   c. Interdisciplinary approach
   d. Transitional process to sustainable agriculture
   e. Participant responsibility

iv. The three "E's" of sustainability
   a. Economic viability
   b. Environmental health
   c. Social equity

c. Comparison of sustainable and conventional agriculture systems
   i. Conventional agricultural practices
      a. Intensive tillage
      b. Monoculture
      c. Water use
      d. Synthetic fertilizer applications
      e. Chemical pest control
      f. Genetic manipulation of crop plants
      g. Confined animal operations

   ii. Energy Use in agriculture
      a. Tillage functions
         a. Aeration of soil
         b. Incorporation of amendments
         c. Stimulation of mineralization
         d. Weed management
         e. Mediation of soil compaction

      b. Impact of intensive tillage on soil quality
a. Soil degradation
b. Reduction of organic matter
c. Increase in compaction and erosion
c. Formation of agricultural inputs
d. Irrigation
e. Food processing, packaging, transporting and refrigeration
f. Environmental impact

iii. Monoculture
a. Definition of monoculture production systems
b. Advantages of monoculture production systems
c. Susceptibility of monocultures to pest pressure
d. Pesticide dependence in monocultures

iv. Water use
a. Water use in agriculture
b. Impacts of water diversion
c. Irrigation and soil salinity
d. Irrigation efficiency and nutrient loss

v. Application of synthetic fertilizers
a. Role in production agriculture
b. Benefits of synthetic fertilizers
c. Usage trends
d. Effects on soil quality
e. Environmental impacts and risks
f. Human health risks

vi. Chemical pest control
a. Function and role of synthetic pesticides
b. Advantages
c. Trends
d. Environmental impact
e. Human health risks due to exposure
f. Energy use in pesticide production

vii. Genetic manipulation of plants/Genetically modified organisms (GMOs) in agriculture
   a. Definition of genetic engineering and transgenic organisms
   b. Description of technology
   c. Potential advantages of GMOs in agriculture
   d. Environmental quality risks
   e. Human health risks

viii. Confined feeding operations
   a. Definition and description
   b. Advantages of confined animal production systems
   c. Nutrient concentration on pollution
   d. Effects on animal health
   e. Energy and nutrient efficiency

ix. The sustainability of conventional agriculture
   a. Soil degradation
   b. Waste management
   c. Water usage
   d. Environmental pollution
   e. Dependence on external inputs
   f. Loss of genetic diversity (biodiversity)

d. Historical perspective of sustainable agriculture
   i. 1980-1990
      a. Debate over definition
      b. Division within the agricultural community and academia
      c. Scientific validity
      d. Economic concerns
      e. Publications
      f. USDA Low Input Sustainable Agriculture Program (LISA)

   ii. 1990-2000
a. Reauthorization of LISA
   a. Origination of the Sustainable Agriculture Research and Education Program (SARE)

b. Establishment of Information Centers
c. Growth of higher education curriculum and degree programs
d. Consolidation of the movement

iii. 2000 - present
   a. National Organic Standards Board

e. Elements of sustainable agriculture
   i. Soil health
   ii. Biological diversity
   iii. Integrated Pest Management (IPM)
   iv. Input efficiency
   v. Water conservation and protection
   vi. Protection of natural systems
   vii. Sustainable livestock production practices
   viii. Quality of life
   ix. Economic viability

f. Sustainable agriculture practices
   i. Soil fertility and nutrient cycling
   ii. Soil as a 'living' medium
   iii. Methods to protect and enhance soil quality
      a. Soil testing and analysis
      b. Cover crops
      c. Compost and manures
      d. Reduced tillage
      e. Organic matter
      f. management of wet soils
   iv. Enhancing and maintaining biological diversity
      a. Diversified agriculture
b. Benefits of cover crops
   a. Intercropping
   b. Habitat strips and hedgerows
   c. Soil microbiology
   d. Integrating crop and animal systems
   e. Wildlife habitat conservation

v. Integrated Pest Management (IPM)
   a. Complexity of pest problems
   b. Ecosystem structure
   c. Combination of pest management systems
      a. Prevention
      b. Cultural controls
      c. Biological controls
         Mechanical/physical controls
   d. Chemical controls

vi. Efficient use of inputs
vii. Water management
viii. Natural resource conservation
ix. Sustainable livestock production

2. Organic certification
   a. CCOF
   b. The organic marketplace
   c. Certifier's role
   d. Certification process overview
   e. Documentation
   f. Benefits and resources

3. Case Studies
   a. Stanislaus County
   b. Flowers/herbs/nurseries
   c. Livestock
d. Local Farmers Markets  
e. Local CSAs  
f. Sustainable Wineries  
g. Farm and Garden Suppliers  
h. Non-profits  

• ENROLLMENT RESTRICTIONS  
1. Advisories  
   Before enrolling in this course, students are strongly advised to Complete more than two agricultural laboratory courses.  

• HOURS AND UNITS  

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3 Units  

• METHODS OF INSTRUCTION (TYPICAL)  
  *Instructors of the course might conduct the course using the following method:*  
  1. Lecture  
  2. Small group projects and focused discussion  
  3. Multimedia presentations  
  4. Hands-on activities  

• ASSIGNMENTS (TYPICAL)  
1. EVIDENCE OF APPROPRIATE WORKLOAD FOR COURSE UNITS  
   *Time spent on coursework in addition to hours of instruction (lecture hours)*  
   A. Weekly assigned readings.  
   B. Small group research project and presentation, one per term.  
   C. Monthly reaction papers based upon in-class activities and readings.  
   D. Individual research project, one per term.  
   E. Self-directed field trip and report, one per term.  

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2. EVIDENCE OF CRITICAL THINKING

Assignments require the appropriate level of critical thinking

A. Develop a complete transition plan, including written and graphics descriptions, for an existing central valley mixed farm system to an ideal sustainable operation that includes redefining the crops and animal enterprises optimum for that environment and developing a complete list and description of the best management practices for animal and crop production and anticipated pest problems.

- TEXTS AND OTHER READINGS (TYPICAL)


- DESIRED LEARNING

A. COURSE GOAL

As a result of satisfactory completion of this course, the student should be prepared to:

develop competencies for addressing the environmental, social and economic challenges and opportunities associated with agricultural and food systems sustainability.

B. STUDENT LEARNING GOALS

Mastery of the following learning goals will enable the student to achieve the overall course goal.

A. Required Learning Goals

Upon satisfactory completion of this course, the student will be able to:

a. Define sustainable agriculture and related terms.

b. Identify historical milestones in the development of sustainable agricultural practices.

c. List and describe the historical social influences that have shaped the direction of development of the US agri-food system.

d. Define and discuss the principles and strategies of sustainable agriculture.

e. Compare and contrast conventional and sustainable agricultural practices.

f. Evaluate the role of soil fertility in an ecological food production system.

g. Evaluate methods to protect and enhance soil productivity.

h. Describe the principles and practices used to enhance and maintain biological diversity in an agricultural environment.

i. Identify strategies that combine management methods for integrated pest control.

j. Examine key principles and practices related to sustainable livestock production.

k. Review regulations related to organic certification.

l. Identify and evaluate local examples of enterprises engaged in sustainable agriculture production.
• METHODS OF ASSESSMENT (TYPICAL)

A. FORMATIVE ASSESSMENT
   A. In class objective examinations.
   B. In and out of class written assignments
   C. Participation in classroom activities
   D. Small group project and presentation

B. SUMMATIVE ASSESSMENT
   A. Term research project
   B. Final examination