

Agricultural Management and Rangeland Resources

(College of Agricultural and Environmental Sciences)

Faculty. See under the departments of Agronomy and Range Science; Pomology; and Vegetable Crops.

The Major Program

This major is designed for students who are interested in understanding agricultural systems, their management, and their relationship to the environment. Courses are selected to provide an interdisciplinary background that encompasses both natural science and social science. Students will acquire a core understanding of agricultural production systems as managed ecosystems, how they function, how they interact with the natural environment and how they are intimately connected with human society and social changes. In addition, students will develop an area of specialization. Within the two areas of specialization, students chose between a broad-based education and one focused in selected areas.

The Program. Specialization in Sustainable Production Systems covers food and agriculture production, agroecology, pest ecology and management, crop improvement and propagation. Students may also develop an emphasis in particular production areas such as agronomy, environmental horticulture, pomology, vegetable crops or viticulture. The Range and Natural Resources specialization emphasizes the theory and practice of natural resource management in grazed ecosystems.

All students gain practical experience through a combination of internships and practica. Students may also pursue an Honors thesis in their senior year.

Career Alternatives. Graduates from this program are prepared to pursue a wide range of careers, including various technical and management positions in agricultural and business enterprises; farming; consulting; private, state and federal agencies concerned with rangeland and natural resource management; Cooperative Extension; international development; teaching; agricultural and environmental journalism, information and communication services. Graduates are qualified to pursue graduate studies in the natural and social sciences, such as agroecology, environmental studies, pest management, education, business management.

B.S. Major Requirements:

	UNITS
Written/Oral Expression	8-12
See college English requirement.....	8
One of English 102A, 102B, 102C, 102D, 102E, 102F, 102G, or 104A, 104C, 104D, 104E, or 104F.....	4
Perspectives on Agriculture and the Environment	13
Agricultural Management and Rangeland Resources 1.....	3
Agricultural Management and Rangeland Resources 2.....	4
Applied Biological Systems Technology 49.....	2
Animal Science 1 or 2.....	4
Preparatory Subject Matter	41-43
Biological Sciences 1A-1B.....	10
Chemistry 2A-2B.....	10
Physics 1A-1B or Physics 7A-7B.....	6-8
Mathematics 16A.....	3
Agricultural Management and Rangeland Resources 21.....	3
Agricultural Management and Rangeland Resources 120 or Statistics 13 or 102.....	4
Economics 1A.....	5
Breadth/General Education	24
See General Education requirement.	
Depth Subject Matter	17-18
Agricultural Management and Rangeland Resources 150 or Environmental Science and Policy 100 or Plant Biology 117 or 142.....	4
Agricultural and Resource Economics 112 or 113 or 140.....	4-5
Agricultural Management and Rangeland Resources 101.....	3
Agricultural Management and Rangeland Resources 92, 99, or 137, or Applied Biological Systems Technology 145; International Agricultural Development 195A, 195B.....	3
Agricultural Management and Rangeland Resources 192, 199.....	3
Senior Thesis. The Senior Honors Thesis includes two or three successive quarters of guided scientific and/or scholarly research on an agricultural and/or environmental subject of special interest to the student. With adviser approval, the senior thesis can satisfy up to 12 units of restricted electives in the major.	

Area of Specialization (choose one):

Sustainable Production Systems.....53-57

Includes food and agricultural production, agroecology, crop improvement, propagation, and pest management. Students may choose between a broad education in sustainable agriculture or focus on one or two areas of agriculture (e.g., agricultural management, agronomy, crop improvement, environmental horticulture, pest management, pomology, vegetable crops, viticulture).

Crop biology and ecology depth requirement must be met with Plant Biology 142.

Plant Biology 152 or Biological Science 101.....4

Chemistry 8A, 8B.....6

Agricultural Management and Rangeland Resources 105.....3

Soil Science 100.....4

Select courses from Agricultural Management and Rangeland Resources 107, 110A, 110B, 110C, 112, 134, 135, 150, 160, 170A, 170B; Environmental Horticulture 120, 125, 130, 133; Plant Biology 173, 174; Viticulture and Enology 101A, 101B, 101C, 111, 115, 116.....12-16

Restricted elective courses chosen from the following groups with approval of the academic adviser.....(minimum 24 units)

Plant improvement and propagation

(Agricultural Management and Rangeland Resources 118; Biotechnology 171; Plant Biology 143, 152, 153, 154, 160, 171)

Plant physiology or plant nutrition (Environmental Horticulture 102; Plant Biology 111, 146, 157, 158, 172, 175; Viticulture and Enology 110)

Atmospheric, soil or water science

(Atmospheric Science 133; Environmental and Resource Sciences 100; Hydrologic Science 110, 124; Soil Science 107, 109, 111)

Pest ecology and management

(Plant Biology 176, 177; Entomology 110, 135; Nematology 100; Plant Pathology 120; Viticulture and Enology 118)

Agricultural economics

(Agricultural and Resource Economics 100A, 120, 130, 147; International Agricultural Development 110)

Agricultural management

(Agricultural and Resource Economics 100B, 140, 145, 150, 157; Applied Biological Systems Technology 142, 147; Agricultural Management and Rangeland Resources 121)

Animal production

(Animal Science 41, 41L, 104)

Policy, social science and ethics

(Agricultural and Resource Economics 147, 176; Agricultural Management and Rangeland Resources 121; Economics 123; Environmental Science and Policy 161, 175; International Agricultural Development 103, 104; Plant Pathology 140; Political Science 107)

Unrestricted Electives.....13-24

Range and Natural Resources.....47-53

This specialization brings together courses that provide a unified understanding of the interaction between livestock production and environmental quality in rangelands.

Agricultural Management and Rangeland Resources 112, 121, 130, 131, 134, 135, Plant Biology 102 or 145.....21-23

Soil Science 100.....4

Environmental and Resource Sciences 100 or 121 or Hydrologic Science 141 or 143.....4

Wildlife, Fish and Conservation Biology 110, 111, 120, 151.....6-7

Animal Science 41, Nutrition 115.....6

Agricultural Management and Rangeland Resources 132, Applied Biological Systems Technology 180, 182, or Hydrologic Science 182, 186.....3-5

Environmental Science and Policy 172.....4

Unrestricted Electives.....17-30

Total Units for the Major.....180

Major Adviser: R. Plant.

Advising Center located in 152 Hunt Hall (530-752-1715).

Quarter Offered: I=Fall, II=Winter, III=Spring, IV=Summer; 2003-2004 offering in parentheses.

General Education (GE) credit: **ArtHum** = Arts and Humanities; **SciEng** = Science and Engineering; **SocSci** = Social Sciences; **Div** = Social-Cultural Diversity; **Wrt** = Writing Experience.

Minor Program Requirements:

UNITS

Agricultural Systems and Environment.....18

Preparatory material: Statistics 13, 32, Agricultural Management and Rangeland Resources 120 or Sociology 42B, or the equivalent. Select one of the two following tracks:

Sustainable Agriculture track

Agricultural Management and Rangeland Resources 105, 150, Plant Biology 142, Soil Science 100.....15

Minimum of three units from the following: Agricultural Management and Rangeland Resources 107, 110A, 110B, 110C, 112, 170A, 170B 3

Range and Natural Resources track

Agricultural Management and Rangeland Resources 121, 130.....7

Minimum of 11 units from the following: Agricultural Management and Rangeland Resources 131, 134, 135, 150, Environmental Science and Policy 123, 172.....11

Minor Advisers: T.C. Foin (*Agronomy and Range Science*), K.J. Rice (*Agronomy and Range Science*).

Advising Center is located in 1144 Plant and Environmental Sciences.

Honors. The Senior Honors Thesis (Agricultural and Environmental Sciences 194H) includes two or three successive quarters of guided, scientific and/or scholarly research on an agricultural and/or environmental subject of special interest to the student.

With adviser approval, the Senior Thesis can satisfy up to 12 units of restricted electives in the major.

Courses in Agricultural Management and Rangeland Resources (AMR)

(Formerly courses in *Agricultural Systems and Environment*.)

Lower Division Courses**1. Agriculture, Nature and Society (3)**

Lecture—2 hours; discussion/laboratory—1 hour. Multiple perspectives and connections between the natural sciences, social sciences, and agriculture. Emphasis on agriculture's central position between nature and society and its key role in our search for a productive, lasting and hospitable environment. Several full-period field trips provide hands-on learning.—I. (I.) Gradziel

2. Botany and Physiology of Cultivated Plants (4)

Lecture—3 hours; discussion/laboratory—3 hours. Prerequisite: high school course in biology and chemistry recommended. A holistic introduction to the underlying botanical and physiological principles of cultivated plants and their response to the environment. Includes concepts behind plant selection, cultivation, and utilization. Laboratories include discussion and interactive demonstrations.—II. (II.) Saltveit, Marrush

7. Molecules, Risk and Public Policy (3)

Lecture—3 hours. Natural functions of molecules, their effects on humans, and their regulation through public policy. Students will learn about molecules that are discussed daily in newspapers. GE credit: SciEng, Wrt.

21. Applications of Microcomputers in Agriculture (3)

Lecture—1.5 hours; laboratory/discussion—2 hours; autotutorial—2 hours. Prerequisite: high school algebra. Concepts of computing and applications using personal computers, spreadsheets, database management, word processing and communications. Not open for students who have completed Computer Science Engineering 15, 30, 35 or Engineering 5.—I, II, III. (I, II, III.)

49. Organic Crop Production Practices (3)

Lecture—1 hour; discussion—1 hour; field work—3 hours. Principles and practices of organic production of annual crops. Topics include organic crop, soil, and pest management, cover cropping, composting, seeding, transplanting, irrigation, harvesting and marketing. Includes field trip(s). (P/NP grading only.)—I. (I.) Van Horn

92. Internship (1-12)

Internship—3-36 hours. Prerequisite: consent of instructor. Work experience on or off campus in all subject areas pertaining to agricultural and environmental sciences. Internship supervised by faculty member in the animal, plant, and environmental sciences. (P/NP grading only.)

98. Directed Group Study (1-5)

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5)

Primarily intended for lower division students. (P/NP grading only.)

Upper Division Courses**101. Agriculture and the Environment (3)**

Lecture—3 hours. Prerequisite: course 2 or consent of instructor. Interaction between agriculture and the environment. Principles required to analyze conflict and develop solutions to complex problems facing society.—II. (II.) Phillips

105. Concepts in Pest Management (3)

Lecture—2 hours; laboratory/discussion—3 hours. Prerequisite: Biological Sciences 1C or course 2, Chemistry 8B. Introduction to the ecological principles of integrated pest management, biology of different classes of pests and the types of losses they cause, population assessment, evaluation of advantages and disadvantages of different techniques used for pest management, IPM programs.—III. (III.) Bayer

107. Small Fruit Production (2)

Lecture—2 hours; two field trips arranged at mutual convenience. Prerequisite: Biological Sciences 1C or the equivalent. Strawberries (*Fragaria*), blackberries-raspberries (*Rubus*), blueberries-cranberries (*Vaccinium*) as important nutritional resources; their origin, production and utilization with emphasis on recent progress in integrated management. Offered in alternate years.—(II.) Shaw

110A. Principles of Agronomic Crop Production in Temperate and Tropical Systems (3)

Lecture—3 hours. Prerequisite: course in general botany or course 2 recommended. Fundamentals of field crop production in temperate and tropical climates. Resource utilization and economic, political and social problems are considered in relation to technological problems and their influences on agricultural development.—II. (II.) Travis, Rains

110B. Management of Agronomic Crops in Temperate and Tropical Systems (3)

Lecture—3 hours. Prerequisite: course in general botany or course 2; course 110A recommended. Application of agronomic principles in production of temperate and tropical crops. Specific crops discussed with reference to management and efficient use of physical and biological resources.—III. (III.) Travis, Rains

110C. Crop Management Systems for Vegetable Production (4)

Lecture—2 hours; laboratory—3 hours; discussion—1 hour. Prerequisite: course 2; course 110A recommended. Horticultural principles applied to production and management systems for vegetable crops. Laboratory and discussion will illustrate efficient field management and resource use practices.—I. (I.) Bloom, Marrush

110L. Principles of Agronomy Laboratory (1)

Laboratory—3 hours. Prerequisite: course 110B (may be taken concurrently). Field-oriented introduction to principles of agronomic crop production.—III. (III.) Travis, Rains

112. Forage Crop Ecology (3)

Lecture—3 hours. Prerequisite: Biological Sciences 1C or consent of instructor. Forages as a world resource in food production. Ecological principles governing the adaptation, establishment, growth and management of perennial and annual forages, including pastures, rangelands and hay; aspects of forage quality which affect feeding value to livestock. Offered in alternate years.—III. Teuber

118. Seed Production and Quality (4)

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 2 or Biological Sciences 1C; Plant Biology 152 recommended. Principles of crop seed production, storage and utilization. Biological and environmental factors influencing seed quality. Measurement and preservation of seed vigor and viability. Technological aspects of crop establishment from seeds. Laboratories include field trips to seed industry facilities. Offered in alternate years.—(III.) Bradford

120. Applied Statistics in Agricultural Science (4)

Lecture—3 hours; discussion/laboratory—2 hours. Prerequisite: upper division standing. Applications of statistical methods to the analysis and interpretation of research data in plant, animal, behavioral, food and nutritional sciences. Lectures cover basic concepts and statistical methods. Specialized laboratory sections cover procedures, data processing and interpretations. GE credit: SciEng.—I. (I.) Teuber, Geng

121. Systems Analysis in Agriculture and Resource Management (4)

Lecture—2 hours; discussion/laboratory—2 hours. Prerequisite: course 21 or equivalent computer experience, and Mathematics 16A. The process of systems analysis and dynamic simulation of biological and environmental systems, use of systems analysis for development of optimal management strategies for agricultural and environmental systems. GE credit: SciEng, Wrt.—I. (I.) Foin

122. Management of Information for the Agricultural and Environmental Sciences (4)

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 21 or consent of instructor. Introduction to systems and technology for acquiring, storing, manipulating and communicating various types of information including numerical data, text, graphics and multimedia images. Laboratory exercises introduce a wide variety of information management systems used in offices and laboratories. Offered in alternate years.

130. Rangelands: Ecology, Conservation and Restoration (3)

Lecture—3 hours. Prerequisite: Biological Sciences 1C; introductory ecology course and junior standing recommended. Introduction to the ecological principles and processes important for an understanding of the dynamics of range ecosystems. Emphasis on ecological and evolutionary concepts underlying management strategies for conserving biological diversity and environmental quality in rangelands. Offered in alternate years. GE credit: SciEng, Wrt.—(II.) Rice

131. Identification and Ecology of Grasses (2)

Lecture—7.5 hours; laboratory—20 hours; discussion—5 hours (total for course). Prerequisite: Biological Sciences 1C or course 2; Plant Biology 102 and junior standing recommended. Taxonomy and identification of western grasses. Development of skills in using plant identification keys. Ecology and evolution of grasses in grazing ecosystems. Given the week following spring quarter. Offered in alternate years.—III. Rice

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132. Geographic Information Systems in Applied Ecology (3)

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 21 or the equivalent computer skills. Introduction to GIS and its application to the analysis and management of agricultural, rangeland, and natural resources. Analysis of landscape properties. Field use of global positioning systems. GIS data organization, acquisition, and analysis. Use of Arcview GIS. Not open for credit to students who have completed Applied Biological Systems Technology 180 or 181.—II. (II.) Plant

134. Comparative Ecology of Major Rangeland Systems (3)

Lecture—3 hours; one Saturday field trip required. Prerequisite: course 130 or the equivalent; Environmental Studies 100 recommended. Study of vegetation structure, composition, and succession in North American rangeland communities. Description and comparison of interactions between vegetation and grazing animals on grassland, desert, forested, and tundra rangelands. Discussion of current rangeland management strategies. Offered in alternate years.

135. Ecology and Community Structure of Grassland and Savannah Herbivores (3)

Lecture—3 hours. Prerequisite: Biological Sciences 1A or 1B and course 2, or Biological Sciences 1C; general ecology course (Environmental Studies 100) recommended. Feeding ecology of grassland herbivores and its importance in evolution of herbivore communities and social systems. Optimal foraging, interspecific interactions, and primary productivity are considered as factors structuring natural and managed grassland and savannah systems. Offered in alternate years. (Former course Range Science 135.)—I. Demment

137. Field Course in Rangeland Monitoring and Management (2)

Lecture—1 hour; fieldwork—3 hours (week-long intensive field course given the week following spring quarter). Prerequisite: course 2 or the equivalent; Plant Biology 102 and junior standing recommended. Introduction to rangeland vegetation monitoring methods and management strategies. Field sampling of vegetation composition and structure, soil status, and wildlife and fish habitat. Grazing management strategies to achieve desired future condition of rangelands. Offered in alternate years.

150. Cropping Systems of the World (4)

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or Biological Sciences 1C, and Soil Science 10. General concepts of the functioning of cropping systems as related to resource availability, energy flow, economic yield, sustainability and integration; means of increasing resource use efficiency; low and high input cropping systems in temperate and tropical zones.—II. (II.) van Kessel

160. Agroforestry: Global and Local Perspectives (3)

Lecture/discussion—3 hours. Prerequisite: course 2 or Biological Sciences 1C, Plant Biology 142 or a general ecology course (Environmental Science and Policy 100). Traditional and evolving use of trees in agricultural ecosystems; their multiple roles in environmental stabilization and production of food, fuel, and fiber; and socioeconomic barriers to the adoption and implementation of agroforestry practices. (Same course as International Agricultural Development 160.) Offered in alternate years.—I. Weinbaum

170A. Fruit and Nut Cropping Systems (2)

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 2, Biological Sciences 1C, or consent of instructor. Overview of production and handling systems of major pomological crops, analysis of current cultural and harvesting problems and concerns associated with commercial fruit growing. Offered in alternate years.—I. (I.) McGranahan

170B. Fruit and Nut Cropping Systems (2)

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 2, Biological Sciences 1C, or consent of instructor. Overview of production and handling systems of major pomological crops, including analysis of current cultural and harvesting problems and concerns associated with commercial fruit growing. Offered in alternate years.—III. (III.) Gradziel, McGranahan

190. Seminar on Alternatives in Agriculture (2)

Seminar—2 hours. Prerequisite: upper division standing. Seminar on topics related to alternative theories, practices and systems of agriculture and the relationship of agriculture to the environment and society. Scientific, technological, social, political and economic perspectives. (P/NP grading only.)—II. (II.) Van Horn

192. Internship (1-12)

Internship—3-36 hours. Prerequisite: consent of instructor. Supervised internship on and off campus in agricultural and environmental sciences. (P/NP grading only.)

194H. Senior Honors Thesis (2-6)

Independent study. Prerequisite: Agricultural Systems and Environment major; senior standing; overall GPA of 3.25 or higher and consent of master adviser. Two or three successive quarters of guided research on an agriculturally related subject of special interest to the student. (P/NP grading only; deferred grading only, pending completion of thesis.)

198. Directed Group Study (1-5)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5)

Prerequisite: consent of instructor. (P/NP grading only.)