

**TAMALPAIS UNION HIGH SCHOOL DISTRICT
Larkspur, California**

Course of Study

AGROECOLOGY

I. INTRODUCTION

“The garden cultivates the gardener.”

- Alan Chadwick, founder of the French intensive-biodynamic system of gardening.

Agroecology is an interdisciplinary course which teaches sustainable food production as a personally, socially, and environmentally integrated process. It emphasizes a hands-on approach through supervised, practical work in an on-site student garden. This course includes classroom activities that will prepare the student for the actual gardening work, and also incorporates activities that will delve more broadly and deeply into related science and social studies units.

The practical, hands-on aspect of this course will involve the student in designing, creating, and maintaining an organic food and flower garden. The student will learn and apply theories and techniques of sustainable food production.

The science emphasis will engage the student in studying the fundamentals of agroecology. The student will explore agroecological topics that bear directly on food production and its relationships to environmental, social, and personal health.

The social studies emphasis will start with a broad overview of the history of food production. The development of America’s food production system will be examined and compared to food production systems in other countries. Following this general survey, the student will engage in more penetrating analyses of selected topics.

The analyses involved in each unit topic will promote the student’s thinking processes and his/her understanding of science and social studies concepts.

This course is intended for, but not limited to, students who have completed World History I and II and one semester of a Life Science class.

II. GOALS

Students should:

- A. Develop concepts of culture, human behavior, natural systems, and social change.

- B. Reinforce foundations in values analysis, skills development, and acquisition of information.
- C. Build a quality of understanding necessary for integrating developments, events, and ideas in science social studies.
- D. Be able to create constructive changes that will promote environmental, social, and personal well-being.
- E. Engage in meaningful, practical, and joyful work.
- F. Be empowered and learn from mistakes.
- G. Build community – learn to live with peers and adults.
- H. Challenge themselves.
- I. Have a sensorial relationship with the earth.
- J. Develop a personal vision, a set of beliefs and moral values.

III. OBJECTIVES

Students should:

- A. Demonstrate the ability to grow food in an environmentally sustainable manner.
- B. Understand and be able to explain the history, philosophy, and methodology of America's current agricultural system and its effects on natural resources and human health.
- C. Understand and be able to explain the history, philosophy, and methodology of sustainable agricultural systems and their effects on natural resources and human health.
- D. Demonstrate knowledge of where and how to obtain evidence and how to evaluate the evidence.
- E. Demonstrate the ability to apply the methodology of scientific inquiry to various aspects of growing food.
- F. Identify and analyze diverse perspectives on and interpretations of issues and events relating to food productions.
- G. Distinguish between fact, interpretation, and opinion; appreciate the function of each.
- H. Understand the contributions made by peoples of diverse cultures to the development of sustainable food production, explain how he/she benefits from those contributions.
- I. Participate in accordance with our democratic principles in personal, social, political, economic, and environmental issues that are affected by America's current food production.
- J. Demonstrate personal congruence, joy, and cooperation in growing food and in acting responsibly for the planet.

IV. GARDENING METHODS

- A. Garden planning
 - 1. Site analysis

2. Personal needs and preferences
3. Layout and design
4. When to plant
5. Crop rotations
6. Companion planting
7. Isolation from cross pollinators
8. Species selection
9. Supplies and suppliers
10. Current and long range plans on paper
11. Garden calendar on paper
12. Budget, funding sources, short and long range financial plans

B. Soil preparation and soil improvement

1. Tool and supply identification and organization
2. Bed and path measurement and delineation
3. Proper soil moisture examination prior to cultivation
4. Cultivation
5. Natural soil amendments
6. Animal manures
7. Compost
8. Worms
9. Mulch
10. Cover crops and green manures
11. Dynamic accumulators
12. Crop rotations
13. Acid and alkaline conditions
14. Watering

C. Seed propagation and planting

1. Supplies
2. Germination indoors and outdoors
3. Preparation of seedling soil mixes
4. Seed germination
5. Seed sowing in flats
6. Seed sowing in beds
7. Fertilization of seedlings
8. Transplanting seedlings
9. Thinning seedlings
10. Watering seedlings

D. Maintenance of garden

1. Watering
2. Fertilizing

E. Pest Control

F. Harvesting

G. Selected topics

1. Pruning
2. Individual crop's needs
3. Greenhouse management
4. Cold frame, fence, other construction
5. Marketing
6. Maintenance of inventories, budgets, grants and donation of files

V. CONTENT: SOCIAL STUDIES EMPHASIS

A. History of agriculture

1. The earth in review
2. Food gathering and hunting
3. Food producing origins
4. Food producing consequences
5. History of specific crops

B. History of U.S. agriculture

1. American Indians
2. Farming prior to World War II
3. Jefferson, Morrill, and the upper crust
4. Emergence of oil-chemical-industrial farming
5. Re-emergence of sustainable agriculture

C. Sustainable agriculture in the U.S. and elsewhere in the world

1. Traditional systems
2. Modern systems

D. Hunger myths and realities

1. Hunger awareness
2. Scarcity
3. Nature
4. Colonialism
5. Agrotechnology
6. Overpopulation
7. Trade
8. Food power
9. Wealth and poverty
10. Big business
11. Foreign aid
12. Food self-reliance
13. Working for change

E. The American farm crisis

1. Origins and connections
2. Economic
3. Environmental
4. Social

F. Visions for a sustainable future

1. Good farming and public good
2. Agroecology: A holistic scientific paradigm
3. Economics of sustainable agriculture
4. Energy and agriculture
5. Necessary conditions for worldwide sustainable agriculture
6. One utopian farm

G. What we can do

1. Public remedies
2. Accelerating the process of change
3. Supporting appropriate foreign assistance programs
4. Working together for change
5. Organic gardens for the home and community
6. Further education and training

VI. CONTENT: SCIENCE EMPHASIS

A. The development of agricultural ecology

1. Relationships among soils, animals, vegetation, and growing practices
2. Ecological constraints
3. Socioeconomic pressures
4. Co-evolution between culture and environment
5. Dynamics of mineral cycles, energy transformations, biological processes, and socio-agroecological relationships

B. The scientific basis of agroecology

1. Different roots for agroecology than for most of western science
2. Six premises acknowledging social and ecological co-evolution
3. Research activity employing agricultural systems

C. Stability of agroecosystems

1. Modern oil-chemical-industrial systems
2. Traditional systems
3. Elements of sustainability

D. Models for agroecosystem design

1. Primary production
2. Land use capability

3. Vegetational patterns
4. Knowledge of local farming practices

E. Crop characteristics and cropping patterns

1. Photosynthetic capabilities
2. Maximization of net economic gains
3. Designing for sustained high yields and profits
4. Crop combinations for compatible roots systems

F. Crop characteristics and cropping patterns

1. Growing period
2. Photoperiodism
3. Growth habits
4. Root systems

G. Agroecological features of traditional agriculture

1. Crop diversity in time and space
2. Advantages offered by polycultural systems
3. Polycultural classifications
4. Polycultural design
5. Intercropping systems
6. Agroforestry systems
7. Cover crops
8. Cropping systems with legume cover crops
9. Minimal tillage systems

H. Agroecological basis of insect pest, pathogen, and weed management

1. Insect pest management
2. Diversity and plant diseases
3. Diversity and weed populations
4. Ecological role of weeds in agroecosystems
5. Plant disease ecology
6. Biological control of plant pathogens

I. Nutrition

1. Soil and plants
2. Humans

J. Basic plant science

1. Plant parts and their functions
2. Plant growth and development
3. Plant identification
4. Soil ecology
5. Interplay of moisture, light, temperature, and air
6. Plant propagation

VII. EXPECTATIONS

The following expectations of students are keyed to the Model Curriculum Standards for Sciences (S) and Social Studies (HS) by citing the specific standard being addressed.

Gardening Methods Expectations

- A. Students should learn and be able to demonstrate the factors that affect garden planning. Students should also be able to maintain and revise current and long range plans. Students are expected to understand and discuss the relationships between garden planning and budgeting.
- B. Students are expected to understand and apply the basics of soil preparation and soil improvement. The student should understand soil ecology and demonstrate natural methods of analyzing, maintaining and enriching soil.
- C. Students are expected to learn and demonstrate techniques for propagating seeds and for caring for young seedlings.
- D. Students should learn and demonstrate when, how, and how much to water and to fertilize different crops.
- E. Students are expected to learn and demonstrate the integrated pest management format of pest control. They are expected to learn pest identification, monitoring, and the protocol measures.
- F. Students will be expected to learn and demonstrate how to determine ripeness and when and how to harvest specific crops.
- G. Students will be expected to learn and demonstrate knowledge and skills in: pruning, greenhouse management, simple garden construction projects, meeting individual crop's needs, marketing, and maintaining records.

Social Studies Expectations

- A. Students are expected to learn and discuss the history of agriculture in the world and its major environmental and social consequences. (HS-33 #1,2,4; HS-34 #7,8,10; HS-35 #13, 14, 18, 19, 20)
- B. Students should be able to identify and compare American farming policies and practices from the early American Indians, to Thomas Jefferson, to the Industrial farm, to sustainable farms. (HS-14 #A.1; HS-15 #B.4; HS-17-19 #C.11-20; HS-21-22 #D.26-29; HS-23 #D.32; HS-50 #G.17; HS-54 #8; HS-55 #9)
- C. Students are expected to be able to recognize and discuss examples of sustainable agriculture in traditional and modern systems in the U.S. and elsewhere in the world. (HS-33 #1, 2, 3, 4; HS-34 #7, 8, 10; HS-35 #13, 14, 15)
- D. Students should demonstrate an awareness of world hunger, and be able to identify the common hunger myths. Students are also expected to be able to present counter arguments to the common myths. (HS-15 #B.4; HS-16

- #B.9; HS-17 #B.10; HS-35 #15, 19; HS-50 #F.15, 16; HS-50 #G.17; HS-55 #9; HS-57 #15)
- E. Students are expected to learn and discuss the major dimensions of the current American farm crisis. (HS-15 #B.4; HS-17 #B.10; HS-17-19 #C.11-20; HS-21, 22 #D.26-29; HS-49 #E.14; HS-53 #5)
 - F. Students are expected to develop and present visions for a sustainable agriculture that considers economics as well as culture and the environment. (HS-22 #D.28, 29; HS-23 #D.31; HS-24-25 #D.34-36; HS-36 #21, 22; HS-51 #H.19; HS-57 #16)
 - G. Students are expected to learn, discuss, and participate in specific options for effecting change toward the development of ecologically, socially, and economically sustainable agriculture. (HS-24-25 #D.34-36; HS-36 #21, 22; HS-47 #C.7; HS-50 #G.17; HS-51 #H.19; HS-57 #16)

Science Expectations

- A. Students should learn about and be able to discuss the factors that affect the multi-disciplinary approach to agroecology. (S-8-12 #9-18)
- B. Students are expected to understand and express the scientific basis of agroecology. Students should be able to discuss and explain the differences between agroecology and most western science. (S-8-12 #9-18)
- C. Students are expected to learn and discuss the features and differences in stability between sustainable agroecosystems and modern oil-chemical-industrial agroecosystems. (S-8 #10; S-11 #16; S-12 #17, 18)
- D. Students should understand and be able to identify factors that affect models for agroecosystem design. (S-8 #10; S-11 #16; S-12 #17, 18)
- E. Students are expected to identify and explain factors that affect the choice of cropping systems. (S-8 #10; S-11 #16; S-12 #17, 18)
- F. Students are expected to identify and explain crop characteristics and cropping patterns of agroecosystems. (S-8 #10; S-11 #16; S-12 #17, 18)
- G. Students are expected to identify and explain the agroecological features of traditional agriculture. (S-8 #10; S-11 #16; S-12 #17, 18)
- H. Students should understand and be able to explain the agroecological basis of insect pest, pathogen, and weed management. Students are expected to demonstrate a well-developed knowledge of the role of diversity in the ecology of plant diseases and weeds. (S-5 #3, 4; S-11 #15, 16; S-12 #17, 18)
- I. Students are expected to understand and demonstrate knowledge of soil, plant, and human nutrition. Students should be able to apply that knowledge to the garden, the food store, and the kitchen. (S-4 #1.2; S-7 #7, 8)
- J. Students are expected to understand and demonstrate an understanding of basic plant science. (S-4 #1.2; S-5 #3, 4; S-11 #15, 16)

VIII. GENERAL INFORMATION

This course may be used to fulfill part of the District graduation requirement in Life Science. It may also be used as a Social Studies elective. It does not meet the University of California entrance requirements.

A. Prerequisites

None, though completion of World History 1-2 and one semester of Life Science are recommended.

B. Credit

5 credits per semester may be earned up to a maximum of 10 credits. If taught by a credentialed Social Studies teacher, the student may elect to take the course as a Social Studies elective. If taught by a credentialed Science teacher, the student may elect to take the course for Life Science. If the teacher is credentialed in both, the student may elect any combination of Life Science/Social Studies.

IX. OPPORTUNITIES FOR POST HIGH SCHOOL EDUCATION TRAINING IN AGROECOLOGY

X. SUGGESTED MATERIALS

A. Books

Although no core book or textbook is required, we will utilize sections from the following resources:

Gardening “How To”

1. * *How to Grow More Vegetables*. Jeavons.
2. * *Encyclopedia of Organic Gardening*. Rodale Publishing.
3. * *Park’s Success with Seeds*. Reilly.

Agroecology – Social Studies and Science

4. *New Roots for Agriculture*. Jackson.
5. *The Unsettling of America: Culture and Agriculture*. Jackson.
6. *Agroecology: The Scientific Basis of Alternative Agriculture*. Altieri.

B. Curriculum guides for school gardens

1. *A Basic Curriculum Guide for School Gardens*. Peterson. U.C. Cooperative Extension, Contra Costa County, CA.
2. *Breaking Ground: A Guide for School and Youth Gardening Programs*. Tidd. The San Francisco League of Urban Gardeners, San Francisco, CA.
3. *Bringing Home the Bacon: School Gardens and Home Careers in Urban Farming*. Smith. Rancho Vejar Inc., Santa Barbara, CA.
4. *Children's Gardens: A Field Guide for Teachers, Parents and Volunteers*. Bremner and Pusey. Common Ground Program, Los Angeles, CA.
5. *The Growing Classroom*. Project Life Lab, Santa Cruz County Office of Education, Capitola, CA.
6. *Ladybugs and Lettuce Leaves*. Project Inside/Outside, Center for Science in the Public Interest, Washington, D.C.
7. *Project Roots*. Lansing School District, Lansing, MI.
8. *The Youth Gardening Book*. Ocone. National Gardening Association, Burlington, VT.

C. Curriculum guides for teaching hunger issues

1. *Educating for Peace and Justice*. McGinness. Institute for Peace and Justice, St. Louis, MO.
2. *Energy, Food and You: An Interdisciplinary Guide for Elementary Schools*. (Request secondary level edition.) Washington State Office of Public Instruction, Seattle, WA.
3. *Exploding the Hunger Myths: A High School Curriculum*. Williams. Food First/Institute for Food and Development Policy, San Francisco, CA. (Outstanding!)
4. *Ah-hah! A New Approach to Popular Education*. GATT-Fly. Between the Lines, Toronto, Ontario, Canada.
5. *Strangers in Their Own Country: A Curriculum Guide on South Africa*. Bigelow. Available from Food First/Institute for Food and Development Policy, San Francisco, CA.

D. Audiovisual and other teaching materials and catalogs

1. American Friends Service Committee. San Francisco, CA.
2. Center for Science in the Public Interest. Washington, D.C.
3. Center for Teaching International Relations. Graduate School of International Relations, University of Denver, Denver, CO.
4. Center for World Development Education. London, England.
5. Church World Service Film Library. Elkhart, IN. (Excellent!)
6. Film Makers Library. New York City, NY.
7. Food First/Institute for Food and Development Policy. San Francisco, CA. (Outstanding!)
8. Global Learning, Inc. Montclair, NJ.
9. Global Perspectives in Education Network, New York City, NY.
10. Institute for Peace and Justice. St. Louis, MO.

11. International Alliance on Sustainable Agriculture. University of Minnesota, Minneapolis, MN.
12. Mennonite Central Committee Audiovisual Library. Akron, PA.
13. National Film Board of Canada. New York City, NY.
14. National Gardening Association. Burlington, VT.
15. National Science Teachers Association. Washington, D.C.
16. Oxfam America. Boston, MA.
17. Pacifica Radio Archive. Los Angeles, CA.
18. Science for the People. Cambridge, MA.
19. Simile II. Del Mar, CA.
20. Social Studies School Service. Culver City, CA.
21. University of Illinois Film Center. Champaign, IL.

E. Gardening methods (The first six books are especially recommended.)

1. * *Gardening: The Complete Guide to Growing America's Favorite Fruits and Vegetables*. National Gardening Association.
2. * *Designing and Maintaining Your Edible Landscape Naturally*. Kourik.
3. * *The Self-Sufficient Gardener*. Seymour.
4. *The Bountiful Solar Greenhouse*. Smith.
5. *Build It Better Yourself*. Hylton.
6. *California Vegetable Growing*. Solomon.
7. *Carrots Love Tomatoes*. Riotte.
8. *Companion Plants*. Philbrick and Gregg.
9. *Directory of Seed and Nursery Catalogs*. National Gardening Association.
10. *Encyclopedia of Natural Insect and Disease Control*. Yepson.
11. *The Food and Heat Producing Solar Greenhouse*. Yanda and Fisher.
12. *Gardening for All Seasons*. New Alchemy Institute.
13. *Growing and Saving Vegetable Seeds*. Rogers.
14. *Guide to Vegetables and Fruits*. Rodale Press.
15. *Jeff Ball's 60-Minute Garden*. Ball.
16. *Joy of Gardening*. Raymond.
17. *National Gardening Association Gardening Series*. National Gardening Association.
18. *The Organic Method Primer*. Rateaver.
19. *New Western Garden Book*. Sunset Publishers.
20. *The Solar Greenhouse Book*. McCullagh.
21. *Seeds and Cuttings*. Loewer.
22. *Weeds and What They Tell*. Pfeiffer.
23. *Wood Projects for the Garden*. De Christoforo.

F. General references on agroecology

1. *Agricultural Ecology*. Azzi.
2. *Agricultural Ecology*. Cox and Atkins.
3. *Agricultural Ecosystems. Unifying Concepts*. House, Stinner, Lawrence.
4. *An Agricultural Testament*. Howard.
5. *Agroecology: The Scientific Basis of Alternative Agriculture*. Altieri.

6. *Aid as Obstacle*. Lappe, Collins, Kinley.
7. *Altars of Unhewn Stone*. Jackson.
8. *The Biology of Agricultural Systems*. Spedding.
9. *Building a Sustainable Society*. Brown.
10. *The Care of the Earth: A History of Husbandry*. Lord.
11. *The Case for Eco-Agriculture*. Walters.
12. *The Changing American Diet*. Brewster and Jacobson.
13. *Circle of Poison*. Weir and Schapiro.
14. *The City People's Book of Raising Food*. Olkowski.
15. *Deep Ecology*. Devall.
16. *Destroy to Create: Interaction with the Natural Environment in the Building of America*. Frederick, Lowenstein, Sochen.
17. *The Earth Manual*. Margolin.
18. *Environmentally Sound Agriculture*. Lookeretz.
19. *Environmentally Sound Small Scale Agricultural Projects*. Mohonk Trust.
20. *Evolution and Ecology: Essays on Social Transformation*. Steward.
21. *Exploding the Hunger Myths*. Williams.
22. *Farm Management in Peasant Agriculture*. Collinson.
23. *Farmers of Forty Centuries*. King.
24. *Farming for Profit in a Hungry World*. Perelman.
25. *Farming: Sources for a Social & Ecologically Accountable Agriculture*.
Alternative Agriculture Resources Project, U.C. Davis.
26. *Fighting the Famine*. Twose.
27. *Food First*. Lappe and Collins.
28. *Food First Action Alert*. (Bulletins.) Institute for Food and Development Policy.
29. *Food for Beginners*. George and Paige.
30. *Forest Farming*. Douglas and Hart.
31. *From the Land and Back: What Life Was Like on a Family Farm and How Technology Changed It*. Stadtfeld.

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67. *The Unsettling of America: Culture and Agriculture*. Berry.
68. *Working in Horticulture*. Richardson/Moore.
69. *Yearbook of Agriculture: Farmers in a Changing World*. 1940. U.S. Agric. Dept.

G. Periodicals and proceedings on agroecology

1. *Acres, USA*
2. *Agrarian Advocate*
3. *Agricultural Systems*
4. *Agriculture and the Environment*
5. *Agroecology*
6. *Agro-Ecosystems*
7. *Agroforestry Review*
8. *Alternative Agriculture News*
9. *Appropriate Technology*

10. *Avant Gardener*
11. *Bio-Dynamics*
12. *Bio-Science*
13. *Cornucopia Project Newsletter*
14. *The Cultivar*
15. *Drift Dodger*
16. *Earth Island Journal*
17. *Ecophilosophy*
18. *Food First News*
19. *Green Revolution*
20. *Harbinger*
21. *Hot Ideas*
22. *IFOAM Bulletin*
23. *In Context*
24. *The IPM Practitioner*
25. *The Land Report*
26. *Manna*
27. *The Mother Earth News*
28. *Multinational Monitor*
29. *National Boycott News*
30. *The National Farmer*
31. *National Gardening*
32. *New Alchemy*
33. *New Farm Magazine*
34. *Nutrition Action*
35. *Organic Gardening*
36. *Permaculture Activist*
37. *Pesticide Action Network Newsletter*
38. *Pesticides and You*
39. *Proceedings – Farming with a Future: Making and Marketing the Transition.*
U.C. Cooperative Extension, U.C. Davis.
40. *Proceedings – Sustainability of California Agriculture.* U.C. Cooperative
Extension, U.C. Santa Cruz Agroecology Program
41. *Rain*
42. *Raise the Stakes*
43. *Science*
44. *Science for Villages*
45. *The Small Farm Advocate*
46. *Synthesis*
47. *TRANET*
48. *UTNE Reader*
49. *VITA News*
50. *Whole Earth Review*

*** The reading materials with an “*” before them are especially outstanding and are highly recommended.**