



Teaching Organic Farming and Gardening



Resources for
Instructors



UCSC Farm & Garden Apprenticeship
Center for Agroecology &
Sustainable Food Systems
University of California
Santa Cruz



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Santa Cruz

Edited by Albie Miles and Martha Brown

The Center for Agroecology & Sustainable Food Systems is a research, education, and public service group dedicated to increasing ecological sustainability and social justice in the food and agriculture system. Our mission is to advance sustainable food and agricultural systems that are environmentally sound, economically viable, socially responsible, nonexploitative, and that serve as a foundation for future generations. The Center is located at the University of California, Santa Cruz.

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Foreword

It is a great pleasure to reflect upon the publication of *Teaching Organic Farming and Gardening: Resources for Instructors*. I first became acquainted with the Apprenticeship in Ecological Horticulture more than seventeen years ago when I arrived in the U.S. to take a faculty position at the University of California, Davis. I remember being very impressed with what the program was doing, and the people involved in making it work. I had never seen a program like it anywhere else, and jumped at the opportunity to come and work with the apprentices a couple of times as a guest speaker. Twelve years later I accepted the position of Director of the Center for Agroecology and Sustainable Food Systems, providing me the opportunity to work closely with the Apprenticeship as it continued to evolve into the dynamic program that has led to this manual being produced. The past five years working with the staff have been immensely rewarding. I have seen them spend many hours and weeks working to improve the course every year and to further refine the vision of what the program could become.

Now with the publication of this resource manual, the thought and experience that have culminated from years of running the program are available in a form that others can use. One of the strengths of the manual is that it effectively combines years of practical experience and staff knowledge with insights from farmers, extension personnel, graduate students, and faculty. When I read the manual myself, I realized how useful it would be to me as a professor. Not only does it encapsulate a solid foundation in multiple aspects of sustainable agriculture, as well as organic farming and gardening, it also provides practical teaching tools and resource links that can be used in numerous educational settings. I commend the efforts of everyone involved in putting this manual together, and am proud to have been involved in the process. I hope that others will find the manual as useful and informative as I did.

– Dr. Carol Shennan
Director, Center for Agroecology &
Sustainable Food Systems

The Center for Agroecology & Sustainable Food Systems, and the Farm & Garden Apprenticeship

The Center for Agroecology and Sustainable Food Systems (the Center) is a research, education, and public service unit of the Division of Social Sciences at the University of California, Santa Cruz, dedicated to increasing ecological sustainability and social justice in the food and agriculture system. Center research and education efforts seek to increase understanding of the social, economic, political and ethical foundations of agricultural sustainability; to establish the ecological and agronomic basis for sustainable production systems; and to demonstrate and facilitate the use of information critical to the adoption of sustainable food and agriculture systems.

The Center's work covers a spectrum that includes academic education and practical training, theoretical and applied research, and public service for audiences ranging from international grower groups to local school children. The Center's Alan Chadwick Garden and the 25-acre UCSC Farm are unique organic demonstration, education, and research sites on the UCSC campus.

The Farm & Garden Apprenticeship is a six-month training program held annually at the Center's farm and garden sites. Initiated by Alan Chadwick in 1967, this full-time course now brings participants of all ages from around the world to learn the basic skills of organic gardening and farming, while also studying the complex social and environmental issues surrounding sustainable agriculture and food systems. The program combines classroom instruction, small group demonstrations, and readings with hands-on learning in the fields, gardens, greenhouses, and orchards. The main instructors in the Apprenticeship course are the Farm Manager, the two Garden Managers, and the Community Supported Agriculture (CSA) Manager who work daily alongside the apprentices, present classes, and lead training sessions. UCSC faculty, researchers, and members of the agricultural community add a wide range of expertise to the course.

To date more than a thousand apprentices have completed the Apprenticeship training program. Graduates have established their own commercial farms and market gardens, run community gardens for inner city and prison populations, and developed

"There are very few programs that provide an academic component to the very real world of organic agriculture. This [Apprenticeship] program ranks among the very best in the nation thanks to the skill of the instructors, the diversity of the students, and the certified organic gardens and fields themselves."

—Bob Scowcroft, Executive Director
Organic Farming Research Foundation

school garden programs. Many graduates take part in international development and food security project. Others have raised the standards of the organic food industry through work with certification programs and retailers. One of the most important outcomes of the Apprenticeship is the ripple effect our graduates have working locally, nationally, and internationally to promote, practice, and teach sustainable, organic farming and gardening.

Our 25-acre farm and 3-acre garden are vibrant demonstration and education sites open to the public year-round on the UCSC campus. Thousands of visitors come annually to see the hundreds of varieties of annual vegetable and flower crops, fruit trees, and perennial plantings and to learn about sustainable growing methods. The Center and the Life Lab Science Program work together to put on school group tours and a children's summer camp using the Life Lab Garden Classroom at the farm. In conjunction with our community support group, the Friends of the UCSC Farm & Garden, the Center offers a year-long series of organic gardening classes, workshops, and seasonal celebrations.

For more information on the Center and its activities, contact us at:

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For questions about the Apprenticeship program, see the Center's web site or contact us at 831.459-2321, apprenticeship@ucsc.edu.

Preface to the Second Edition

In his 2003 review of *Teaching Organic Farming and Gardening: Resources for Instructors*, Raymond Poincelot, editor of the *Journal of Sustainable Agriculture*, wrote that “Both the Center for Agroecology and Sustainable Food Systems and the UCSC Farm and Garden Apprenticeship have been in the forefront of organic farming and gardening for many years. Their track record has been excellent and this resource guide is no exception. This resource guide is likely to become the benchmark for such materials and promises to be very useful to educational, extension, research and other professional institutions and programs interested in training organic farmers and gardeners.”

Teaching Organic Farming and Gardening appears to be living up to that promise, based on feedback from educators, extension personnel, community gardening coordinators, farmer-mentors, international workers and others. We’ve received letters and emails from around the world noting the useful role it has played in their own training programs, and in many cases thanking us for making the resources available to download for free from our web site (www.ucsc.edu/casfs).

We also received a number of questions about another critical aspect of farming and gardening education: learning to sell what you grow. Making the farm or

market garden an economic success requires a suite of skills, including locating land, planning appropriate marketing strategies for selected crops, and managing income and expenses. In response we produced a second training manual in 2005, *Teaching Direct Marketing and Small Farm Viability: Resources for Instructors*, that addresses business planning, marketing options, budgeting and cash flow management, and land tenure (also available to order or download from the web site noted above).

Another outgrowth of *Teaching Organic Farming and Gardening* also debuted in 2005. *Exploring Sustainability in Agriculture: An Online Sustainable Agriculture Instructional Resource* offers instructors a complete course outline, catalogue description, and set of annotated resource lists to use in developing classes in sustainable agriculture (click on the *Instructional Resources* link at www.ucsc.edu/casfs). This online tool grew out of an effort spearheaded by Albie Miles, curriculum coordinator at the Center for Agroecology and Sustainable Food Systems, in collaboration with college and university educators around the country.

This second edition of *Teaching Organic Farming and Gardening* includes new and updated material, and incorporates feedback we received on the first edition. Along with our other new resources, we hope you’ll find it useful in your work.

Preface to the First Edition

This training manual, based on the core classes of the Center for Agroecology and Sustainable Food System's Apprenticeship Program, provides instructional materials for teaching organic farming and gardening, along with related sustainable agriculture topics, in a wide variety of educational settings. Our staff instructors are often asked to share their expertise and lesson plans with other groups that want to develop similar training programs. Drawing on the Apprenticeship's 35-year history, the staff and seven invited authors have written and produced this 600+-page resource for teaching many of the basic skills and concepts covered in the six-month course.

The training manual is designed for—

- colleges and universities with programs in sustainable agriculture, student farms or gardens, and on-farm education programs
- urban agriculture, community garden, and farm training programs
- farms with internship or apprenticeships
- agriculture extension stations
- school gardening programs
- organizations such as the Peace Corps, US AID, and other groups that provide international training in food growing and ecological growing methods
- master gardener programs

One strength of the Apprenticeship is its combination of classroom instruction, small group field classes, hands-on training, and student-directed reading or projects. It was our intention to capture that combination of practical skills training and more academic instruction in this resource. Although much of the material is designed for field or garden demonstrations and skill building, most of the units can also be tailored to a classroom setting.

The instructional materials included in this manual are also available on our web site, www.ucsc.edu/casfs, in PDF format. Individual units or the entire text can be downloaded from the web site at no cost. It is our intention that the instructional materials be updated and added to on the web site in the future, and we encourage educators to visit the site to offer evaluations and to send us instructional materials that may be of use in future revisions. We hope that this resource will be used as widely as possible for education and training.

Acknowledgments

This resource represents the work of many different people and many years of instruction and hands-on training in the fields, gardens, greenhouses, and classrooms at UC Santa Cruz. For years, decades even, the Center for Agroecology and Sustainable Food Systems' (the Center's) staff had wanted to develop a formal document that encompassed the core classes and practical training sessions of the Apprenticeship course. It took the diligent work of Albie Miles to bring this project to fruition. He shepherded the project for over two years, coaxing drafts and rewrites out of busy instructors and farm/garden managers, overseeing the pilot testing and evaluation of classes and demonstration sessions, and writing or contributing to many of the units.

Special thanks goes to Martha Brown for overseeing the production of the manual, working extra hours with the designer and printer on how to best present this unusual resource, and editing and proofreading every one of its more than 600 pages. Designer Nancy Enge of Ajax Designs provided the invaluable service of creating an attractive and user-friendly document, and donated a good portion of her time to finish the project. Science illustrator Cathy Reinhard produced wonderful line drawings for several units.

The Apprenticeship staff instructors, Jim Leap, Orin Martin, Christof Bernau, and Nancy Vail, took time from their busy production and instruction schedules

to write and pilot new versions of classes. Center Director Carol Shennan wrote and pilot tested classes as well as reviewing all of the units. The other contributing authors, listed on the next page, deserve many thanks for writing and, in many cases, teaching (and then revising and teaching again) the materials now presented in this resource. The reviewers performed the important service of checking units for facts, relevance, and usability based on their expertise as growers, scientists, and instructors.

Ann Lindsey brought in the grant funding for the training manual and helped initiate and guide the project. We want to acknowledge again and thank those who funded the project: The Richard and Rhoda Goldman Fund, The Arkay Foundation, The Organic Farming Research Foundation, The Mary A. Crocker Trust, The Foxwhelp Group of the Tides Foundation, and John Kinder. Without their generous support, this project would not have been possible.

We want to acknowledge the many apprentices in the 2000–2002 Apprenticeship courses who helped shape this document by offering their evaluations of classes and training sessions. We also want to recognize that the foundation for this manual has been laid over 35 years of training, with many hands and minds of apprentices and instructors building the garden and farm on the campus, as well as building a pool of knowledge and skills that we continue to draw upon.

Contributors and Reviewers

CONTRIBUTORS

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Christof Bernau, the Center's Farm Garden Manager, oversees the demonstration and production garden, managing the greenhouse facilities and nursery production, and teaching horticulture classes for apprentices, UCSC students, and the general public.

MARTHA BROWN (*Editor*)

Martha Brown, the Center's Senior Editor, writes, edits, and designs the Center newsletter, *The Cultivar*, and other Center publications, along with managing the web site. Martha also writes for other agricultural publications and has a graduate degree in Science Communication from UCSC.

JILL HARRISON (*Social Issues in Modern Agriculture*)

Jill Harrison is a PhD candidate in the UCSC Department of Environmental Studies focusing on agriculture in California, with special attention to migrant farmworkers, environmental justice, and the changing structure of rural communities.

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Mark Van Horn is the Director of the Student Experimental Farm at the University of California, Davis.

Introduction: How to Use This Resource

Teaching Organic Farming and Gardening: Resources for Instructors is a tool intended to increase and improve education in practical organic agriculture and horticulture skills and concepts. While the majority of the manual is devoted to practical training, the instructional materials also cover the science behind the practices, and provide a detailed introduction to social and environmental issues in agriculture. Although much of the material is designed for field or garden demonstrations and skill building, most of the units can also be tailored to a classroom setting. The manual is designed so that units or even individual lectures or demonstrations can be pulled out to be used on their own or in any sequence.

This manual is divided into three sections:

PART 1: ORGANIC FARMING AND GARDENING SKILLS AND PRACTICES

The eleven units in this section emphasize the “how-to” aspects of organic gardening and farming, including propagation, irrigation, tillage, transplanting, and compost production. This section also introduces students to critical skills and considerations in the management of soil fertility and agricultural pests (arthropods, diseases, and weeds) in organic systems. The information included in the manual is based on certified organic production practices that meet or exceed the USDA’s National Organic Program (NOP) standards. Included throughout is an overview of principles and practices used in NOP-certified production.

PART 2: APPLIED SOIL SCIENCE

This three-unit section covers basic information on soil physical properties, soil chemistry, and soil biology and ecology, providing a more detailed overview of the underlying scientific principles that inform many of the organic farming practices covered in Part 1.

PART 3: SOCIAL AND ENVIRONMENTAL ISSUES IN AGRICULTURE

This four-unit section first outlines the history and development of agriculture in the U.S. and then introduces students to social and environmental issues associated with conventional agriculture practices and the current organization of the food system. This section also introduces students to sustainable agriculture

and to some of the current obstacles to more sustainable food and agriculture systems.

UNIT COMPONENTS

Each unit in this manual contains multiple components, with some components being designed for the instructor, some for students, and some for both. Not all units contain all of the components outlined below, as some units are largely lecture-based (requiring no field demonstrations or hands-on exercises, for example) and others are exclusively field-based, thereby requiring no lecture.

The units are designed with some or all of the following components:

Introduction—A one- or two-page overview for use by instructor and students

In the Introduction, the *Unit Overview* provides a summary of the unit, including a description of the information and skills to be conveyed. The *Modes of Instruction* list the suggested lectures, demonstrations, exercises, and assessment questions included in the unit (with an estimated time required for both preparation and implementation). The *Learning Objectives* list the fundamental skills and concepts in each unit that students are expected to learn. The learning objectives serve as the foundation for overall unit content and provide the basis for the evaluation of student comprehension.

Lecture Outlines—Instructor outlines to guide presentations and/or discussions

The lecture outlines include pre-assessment questions that may be used to gauge student knowledge at the beginning of the unit. The outlines are intended to provide a broad but comprehensive overview of a subject, identifying many of the key concepts within a given discipline. Instructors are encouraged to adapt the overall content of the lecture to specific audiences or settings. Some units have one lecture outline and some have several.

Detailed Lecture Outlines—Student outlines that parallel the instructor outline in greater detail

These include the essential qualitative and quantitative information addressed in lectures/discussions. Copies

(or electronic versions) of the lecture notes can be given to the student before the lecture. All technical terminology is either defined in the text or included in the glossary of terms at the end of each unit.

Demonstration Outlines

These instructor outlines provide an overview of the preparations and suggested content for field demonstrations of specific agricultural and horticultural practices. They include time requirements for preparation, materials lists, site preparation instructions, the demonstration sequence, and demonstration lecture outline.

Step-By-Step Sheets—For student use following Demonstration Outline

These detailed “how-to” instructions walk students through tasks such as building a compost pile and preparing a planting bed. The sheets include the preparation, sequence, and techniques used in executing a task (parallels the instructor’s Demonstration Outline). The step-by-step sheets contain sufficient information for students to use them as a reference tool when working independently. Intended to be provided with the Hands-on Exercises, below.

Hands-On Exercises

These activities or exercises serve to reinforce student comprehension of the subject matter or skill through active participation and practice immediately following a technique-based demonstration.

Assessments Questions (and Answer Key)

Five to ten short essay questions based on the lecture content and demonstration(s) are used to gauge student comprehension of the subject matter presented. Questions are intended to be a balance of theoretical and applied knowledge and require some synthesis of information. Assessments are based on learning objectives.

Suggested Readings

Certain units list specific preparatory readings for the student (see the Unit Overview or the beginning of the Resources section).

Resources Section

This section includes an annotated listing of books, periodicals, web sites, video productions, organizations, and equipment or material suppliers on the subject matter addressed in each unit.

Appendix Section

The appendices provide tables, graphs, charts and/or graphics used as visual aids in lectures, demonstrations, or as student reference materials associated with the Hands-on Exercises.

Glossary

Several units include an alphabetical listing of technical terms used in either the lecture or demonstration.