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Sustainable Agriculture for California Guide 1988.pdf

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Sustainable Agriculture for California: A Guide to Information

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1.0 Introduction

Sustainable agriculture is often described as farming that is ecologically sound and economically viable. It may be high or low input, large scale or small scale, a single crop or mixed farm, and use either organic or conventional inputs and practices.

The development of improved crops, cropping systems, irrigation, farm management, and marketing will be needed to make California farms more profitable and sustainable. These farms will typically rely more on biological resources and management than on non-renewable inputs of energy and chemicals. The foundation of a sustainable farm system is a comprehensive understanding of the land, the farm resources and operations, and potential short and long term markets.

There is a great deal of information that can be of value in helping farmers, extension agents, and researchers improve the sustainability of California agriculture. Unfortunately, this information is widely dispersed, uneven in quality, and some of the best work is in research reports and publications that were printed in limited quantities and are unavailable through conventional sources.

This guide was written to help farmers, extension workers, information specialists, and researchers find the information they need.

1.1 Acknowledgements

This guide was written by David Bainbridge, information specialist, Dry Lands Research Institute, and Steve Mitchell, agricultural librarian, U.C. Riverside, with assistance from Betty Pennington.

We have been helped immeasurably by the support and assistance of many farmers, researchers, and information specialists in California and around the world. They have shared their time, resources, and commitment to sustainable agriculture.

We would also like to acknowledge the support of Dr. Diana Freckman and Dr. Wes Jarrell, of DLRI, and Dr. Jill Auburn and Dr. Bill Liebhardt, of SAREP. Thanks also to our advisory group whose comments were timely and helpful.

The system of agriculture... if the epithet can be applied to it, which is in use in this part of the United States is as unproductive to the practitioners as it is ruinous to the landholders. Yet it is pertinaciously adhered to. To forsake it; to pursue a course of husbandry which is altogether different and new to the gazing multitude, ever averse to novelty in matters of this sort and much attached to their old customs, requires resolution, and without a good practical guide may be dangerous.

George Washington, 1783

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2.0 Sources of information

Finding the information that is needed to solve a farm problem or make a particular farm operation more sustainable and profitable is often challenging because each case and each year provides a unique set of conditions of soil, climate, and biological factors.

Some of the better sources of information include: U.C. Cooperative Extension personnel, members of other State and Federal agencies, such as the California Dept. of Food and Agriculture and the Federal Soil Conservation Service; farmers and farm organizations; faculty members at the Univ. of California, state and private universities and colleges; private consultants; librarians and information specialists; suppliers; information services, such as Appropriate Technology Transfer for Rural Areas (see 3.2); and books and periodicals.

The U.C. Cooperative Extension County Farm Advisor in your area (listed in the telephone book under County Government Offices) should be the first contact for production related information. If necessary they may call upon appropriate specialists and programs within the University such as the Sustainable Agriculture Research and Education Program, the Integrated Pest Management Project, or the Small Farm Center.

The Agroecology Program at U.C. Santa Cruz, and the Water Resources Center and the Dry Lands Research Institute at U.C. Riverside may also be able to provide assistance. It is best to write as some of these groups do not have the resources to respond to inquiries by phone. Be patient.

Faculty members at the U.C. and state college campuses may also be very helpful, but are often equally short of time and resources. The U.S.D.A. CRIS data base (see 2.21) may help you find someone who is already working on your subject.

Books and magazines are useful for the background and knowledge needed to identify and test new management practices and crops. Bibliographies or electronic data bases will help you find useful information in the library more quickly.

2.1 Libraries

In many cases you may wish to supplement these sources of information with library searches of your own. Your local librarian or the librarians within the U.C. system and in other library systems can help you find needed information. An agricultural or natural resources librarian is usually the best contact for a person interested in delving into the literature for research reports and detailed information. They can often tell you which faculty members are working on subjects you are interested in and which books or journals best cover your topic.

2.11 Libraries with an agricultural focus

University of California

U.C. Berkeley, Natural Resources Library [NATR] (415) 642-4493

Forestry Library [FORE] (415) 642-2936

U.C. Davis, Shields Library, Bio-Agriculture Dept. [MAIN] (916) 752-1203

U.C. Riverside, Bio-Agricultural Library [BIOAG] (714) 787-3238

Call numbers and libraries are provided in this publication for books in the U.C. system. Browsing near these numbers may help you find other books with relevant information. Books not entered in the U.C. computer system, MELVYL, may not be shown. Campus Codes: B= Berkeley; D= Davis; I= Irvine; LA= Los Angeles; R= Riverside; SB= Santa Barbara; SC= Santa Cruz; SD= San Diego. You may be able to obtain a U.C. library card by joining the Friends of the Library of the campus nearest you.

California State Universities

California Polytechnic State Univ. San Luis Obispo, Robt. E. Kennedy Library (805) 756-2029

California State Univ. Fresno, Henry Madden Library (209) 294-2403.

California State Polytechnical Univ. Pomona, Library (714) 869-3090

California State Univ. Chico, Meriam Library (916) 895-5862.

Humboldt State Univ., Library (707) 826-3441.

California State Univ., Stanislaus Library (209) 667-3232.

California State College, Bakersfield Library (805) 833-3042.

2.12 Interlibrary loan

Many books may be available at only one or two libraries. In most cases these can be obtained through inter-library loan. This service is available at most library systems, including public libraries. Privileges and services vary considerably. The National Agricultural Library and the State Library in Sacramento may also be useful.

2.2 Data bases

Electronic data bases enable searches to be done in minutes that would take days by hand. They are most useful for recent journal articles.

The University of California, C.S.U., most public libraries, and many other libraries subscribe to services that provide on-line access to these data bases. They can usually provide search assistance by appointment for a modest fee.

If you can't afford a search, the data bases are usually available in printed form which you can search manually. Most of these are at the U.C. Davis, Riverside, and Berkeley libraries. Many of these can be used at the other U.C., public, and college libraries as well.

These data bases can also be accessed and used by most home computers with a telephone modem through vendors, 2.23. Off-peak rates are often much cheaper than daytime charges. For details refer to the vendors below. The vendors also provide training materials and special services.

2.21 Recent sources covering ag data bases

Maman, J. 1986. Online agricultural data bases, *BioScience* 36(1):48-50.

Weintraub, J. 1986. Computerized information systems in American agriculture, *IAALD Quarterly Bulletin* 31(3):119-125.

Directory of online data bases. Cuadra Associates, Santa Monica, CA. A journal providing description and access contacts for existing and new data bases. [Z699.22 B/D/I/LA/ SB/SD]

Williams, M., Lannon, L. and Robins, C. 1985. Computer-Readable Databases: A Directory and Data Sourcebook - Science, Technology, Medicine. American Library Assoc., Chicago, IL [Z699.22.C66 B/D/I/LA/SB/SC/SD]

2.22 The data bases

Agricola--the National Agricultural Library data base, Beltsville, MD. From 1970 to present. Covers all agricultural subjects. Emphasis on federal and state material as well as journal articles. Free searches on computer (CD-ROM) at U.C. Davis and U.C. Riverside libraries, among others. Oriented toward research and practice with emphasis on the U.S.

Print form = National Bibliography of Agriculture.

CAB Abstracts--the Commonwealth Agricultural Bureau data base, Farnham Royal, England, coverage 1973 to present. Excellent article summaries (abstracts) often make this data base more useful than Agricola but it is also more expensive. Coverage is best on Commonwealth countries but the abstract journals that form the basis of this data base include U.S. and European sources as well. Includes both research and practice, with much low-input Third World coverage.

Print form = almost 30 separate abstracting journals, e.g., Horticultural Abstracts, Field Crops Abstracts, etc.

Agris--the United Nations agricultural data base, maintained by the Food and Agriculture Organization, Rome, Italy. Coverage from 1975 to present. Very good abstracts. Oriented toward research and practice, with much low-input Third World coverage.

Print form = Agrindex.

Agribusiness U.S.A.-- emphasizes agricultural business information from government and trade sources and periodicals. Expensive. Emphasis on markets, trade, and production rather than research.

Print form = none.

BIOSIS--worldwide coverage of biological research, 1969 to present. Searchable abstracts from 1976 provide added value. Research oriented.

Print form = Biological Abstracts.

CRIS--profiles current research by U.S.D.A., state agricultural experiment stations and cooperating researchers. CRIS can provide access to information before it is published and help identify researchers working on specific problems of interest. Available on computer disc (CD-ROM via OCLC). Research only.

Print form = none.

IMPACT--Univ. of California Integrated Pest Management Implementation Group at U.C. Davis operates this data base. Pest management guidelines for agricultural crops, weather database, degree day programs, pest and plant development models. Accessible by home computers. For information call (916) 752-8350. Emphasis on applied integrated pest management. See also IPM project manuals, see 9.30.

MELVYL--The University of California libraries data base of books and periodicals can be very helpful. Primarily research material, but some practical manuals and material as well.
Print form = none.

2.23 Data base vendors

BRS—BRS Information Technologies, 1200 Route 7, Latham, NY 12110
(518) 783-1161 or (800) 345-4BRS.

BRS included over 130 electronic data bases in 1987. Among these are CAIN = (Agricola), BIOL = (Biosis), CABA =(CAB Abstracts). Inexpensive user service called BRS After Dark.

DIALOG —Information Retrieval Service, 3460 Hillview Avenue, Palo Alto, CA 94304 (800) 3-DIALOG. Dialog offered 240 data bases in 1986 including Agricola, CAB Abstracts, Agribusiness U.S.A., Biosis, CRIS, and Agris. Inexpensive user service called Knowledge Index.

3.0 Sustainable agriculture organizations

In many cases these groups have limited staff and resources. Be patient and persistent. The most appropriate group to contact will depend on your climate and crop. We have included a wide range of organizations to provide growers with the best chance of finding someone with experience with their crop or product--whether it is crayfish or cold climate grain production. (for more complete listings see the books in the directory section 7.0)

3.1 California

Univ. of California Sustainable Agriculture Research and Education Program

U.C. Davis, Davis, CA 95616 Through your local farm advisor.

Univ. of California Statewide IPM Project-IPM Manual Group

U.C. Davis, Davis, CA 95616 Through your local farm advisor--computer hookups are available, see IMPACT under data bases.

Committee for Sustainable Agriculture (was Steering Comm. for Sust. Agric.) PO Box 1300 Colfax, CA 95713 (916) 346-2777

California Action Network, PO Box 464, Davis, CA 95617

The Small Farm Center, Coop. Extension, U.C. Davis, Davis, CA 95616, (916) 752-6690.

California Institute for Rural Studies, PO Box 530, Davis, CA 95617 (916) 756-6555

Calif. Certified Organic Farmers, PO Box 8136, Santa Cruz, CA 95061 (408) 423-2263

CCOF does organic certification of farms.

Ecology Action, 5798 Ridewood Rd, Willits, CA 95490

The following sources may also be of value for questions concerning sustainable agriculture:

The Water Resources Center, U.C. Riverside, CA 92521

Calif. Agricultural Technology Institute, Cal State Univ. Fresno Fresno, CA 93740 (209) 294-2361

Operate the CATI NET computer network.

Calif. Assoc. of Family Farmers, PO Box 363, Davis, CA 95617, (916) 756-7420
California Rare Fruit Growers, The Fullerton Arboretum, CSU Fullerton, Fullerton, CA 92634
Nutriclean, 149 Franklin Street, Suite B, Oakland, CA 94607 (415) 832-1415
Pesticide monitoring in food for chemical-free marketing programs.

3.2 National

Alternative Farming Systems
Information Center

National Agricultural Library
Room 111, Beltsville, MD 20701
(301) 344-3704

Bibliographic information, copies of rare
material, etc.

Appropriate Technology Transfer for Rural Areas
(ATTRA)

Box 17
7777 Walnut Grove Road
Memphis, TN 39119
(800) 346-9140

Free information service for sustainable
agriculture. Staffed with a mix of specialists who
answer questions on sustainable agriculture.

U.S.D.A. Office for Small Scale Agriculture
RM 635 Hamilton Building
U.S. Dept. of Agric.
Washington, DC 20250

Ask for their list of publications.

Organic Food Producers Assoc. of North America
(OFPANA)
PO Box 6414
Lehigh Valley, PA 18001

Bio Integral Resource Center
Box 7414
Berkeley, CA 94707

Biological pest management information.

Institute for Alternative Agriculture
9200 Edmonston Road, Suite 117
Greenbelt, MD 20770

Biodynamic Extension Service
20 Old Farms Road
Hatfield, MA 01038

Demeter Association
4214 National Avenue
Burbank, CA 91505

Soil Conservation Society of America
7515 N.E. Ankeny
Ankeny, IA 50021

American Farmland Trust
1920 N Street, NW Suite 400
Washington, DC 20036

National Coalition Against the Misuse of Pesticides
530 7th Street SE
Washington, DC 20003

3.3 Western U.S.

AERO
44 N Last Chance Gulch
Helena, MT 59601

Oregon Tilth Producers Coop
34168 Scott Lane
Cottage Grove, OR 97424

Washington Tilth Producers Coop
1219 Sauk Rd.
Concrete, WA 98234

Permaculture Institute of North America
4649 Sunnyside Avenue North
Seattle, WA 98103

Northern Plains Sustainable Agriculture Society
Rt 1 Box 73
Windsor, ND 58493

3.4 Midwestern U.S.

The Land Institute
2440 E. Water Well Rd.
Salina, KS 67401

Land Stewardship Project
512 West Elm Street
Stillwater, MN 55082

Ozark Organic Growers Association
1434 Lunsford
Fayetteville, AR 72701

Organic Growers and Buyers Association
PO Box 9747
Minneapolis, MN 55440

Center for Rural Affairs
PO Box 405
Walthill, NE 68067

Leopold Center for Sustainable Agriculture
104 Curtis
ISU
Ames, IA 50010

Micheal Fields Agric. Res. Institute
East Troy, WI 53120

Practical Farmers of Iowa
Rt 2 Box 132
Boone, IA 50036

Wisconsin Rural Development Center
PO Box 504
Black Earth, WI 53515

Organic Growers of Michigan
3031 White Creek Road
Kingston, MI 48741

Kerr Center for Sustainable Agric.
Box 588
Poteau, OK 74953

3.5 Eastern U.S.

Regenerative Agriculture Association
222 Main Street
Emmaus, PA 18098

Farming Alternatives Project
443 Warren Hall
Cornell Univ.
Ithaca, NY 14853

Maine Organic Farmers and Gardeners Association
(MOFGA)
PO Box 2176
Augusta, ME 04330

Natural Organic Farmers Association
PO Box 335
Antrim, NH 03440

Virginia Association of Biological Farmers
PO Box 252
Flinthill, VA 22627

Rodale Research Center
RD 1
Kutztown, PA 19530

Rodale Institute
33 East Minor
Emmaus, PA 18098

Sunny Valley Foundation
4 Sunny Valley Lane
New Milford, CT 06776

New Alchemy Institute
237 Hatchville Rd.
East Falmouth, MA 02536

3.4 Southern U.S.

Ozark Organic Growers Association
1434 Lunsford
Fayetteville, AR 72701

Carolina Farm Stewardship Association
PO Box 205
Bynum, NC 27228

Rural Advancement Fund
2124 Commonwealth Avenue
Charlotte, NC 28205

Meadowcreek Project
Fox, AR 72051

3.7 International

Agroecology Program
U.C. Santa Cruz
Santa Cruz, CA 95064

Rodale International
222 Main Street
Emmaus, PA 18098
(215) 967-8405

International Alliance for Sustainable Agriculture,
Rm 202 1701 University. Avenue SE
Minneapolis, MN 55414

Organic Crop Improvement Association
PO Box 819
Kearney, NE 68848
(308) 234-2645

Center for Indigenous Knowledge for Agriculture
and Rural Development, Dr. D.M. Warren, TCS
Program, 318 Curtiss Hall, Iowa State University,
Ames, IA 50011.

GTZ-Forschungsstelle für Internationale
Agrarentwicklung
Ringstr. 19
6900 Heidelberg, Germany

Ecological Agriculture Project
PO Box 191
MacDonald College of McGill Univ.
21,111 Ste. Anne de Bellevue
Quebec, Canada H9X 1C0

Information Centre for Low External Input
Agriculture [ILEIA]
PO Box 64
3830 AB Leusden, The Netherlands

Agreco
Oekozentrum Langenbruck
CH-4438, Langenbruck, Switzerland

Department of Ecological AgriCulture
Haarweg 333, 6709 RZ
Wageningen, The Netherlands

Henry Doubleday Research Association
Ryton-on-Dunsmore
Coventry, UK CV8 3LG

Division of Alternative Agric. Methods
University of Kassel
D-3430
Witzenhausen, West Germany

International Federation of Organic Agriculture
Movements (IFOAM)
c/o Bernward Geier
Norbahnhofstrasse 1 D-3430
Witzenhausen, FRG

Sustainable Agriculture Association
Box 1063
Nanton, Alberta T0L 1R0 Canada

4.0 Sources of books and written information

ANR Publications (U.C.)
6701 San Pablo Ave.
Oakland, CA 94608
(415) 642-2431
Free catalog.

AgAccess
PO Box 2008
Davis, CA 95617
Mail order agricultural book supplier, annotated
catalog.

Agribookstore, Winrock International
1611 North Kent Street
Arlington, VA 22209
Good international coverage.

Capability Books
PO Box 114
Deer Park, WI 54007

ACRES USA
PO Box 9547
Kansas City, MO 64133

Biodynamic Literature
PO Box 253
Wyoming, RI 02898

Robert Gear
PO Box 1137
Greenfield, MA 01302
Used and out-of-print ag. books

5.0 Abstract/index journals and books

Abstract journals and books provide an intermediate level of access to material. Not as slow as journal searching--not as fast as electronic data bases. They provide citations to relevant journal articles or books which you can then use to find the actual item in your library. There are two sustainable agriculture abstract journals.

Abstreco, Abstract Bulletin on
Sustainable Agriculture
Department of Ecological Agriculture
Haarweg 333, 6709 RZ
Wageningen, The Netherlands

International Ag-Sieve
Rodale International
222 Main Street
Emmaus, PA 18098.

For full coverage of the literature it is necessary to consult specialized abstract/index journals. These cover much of the literature on sustainable agricultural but you will need to sift for it. Abstreco and Ag-Sieve should be used in addition to these sources, not in place of them.

The most important index source is the National Bibliography of Agriculture. The most important abstract sources are the Common-wealth Agricultural Bureau's set of several dozen abstracting journals (e.g., Horticultural, Weed, Field Crop, IRRICAB, and Irrigation and Drainage Abstracts, etc.(ask your librarian about which cover your topic); Agrindex; and Biological Abstracts. There can be considerable overlap among these but each contains much unique material. Most of these are at U.C.B., U.C.D., U.C.R., and many of the state colleges listed. Call your local college or U.C. library first.

6.0 Bibliographies

Schwartz, J.W. 1981. A Bibliography for Small and Organic Farmers, 1920-78. U.S.D.A., Washington, DC 237p. [S605.5 S3--D]

MacLean, J.T. 1986. Organic Gardening and Farming. N.A.L., Beltsville, MD 22p. [S605.5A12 O71--B]

MacLean, J.T. 1986. Double-cropping and Interplanting, 1984-1986. N.A.L., Beltsville, MD 23p. [SB191 .R5 U541--B]

MacLean, J.T. 1983. Legumes in Crop Rotations, 1970-1983. N.A.L., Beltsville, MD 25p. [SB203.A12 M321--B]

Blanchard, J.R. and Farrell, L. 1981. Guide to Sources for Agricultural and Biological Research, U.C. Press, Berkeley, CA 687p. [S493.A12--B/D]

Coleman, E. nd. Annotated Bibliography of Biological Agriculture, Coolidge Center for the Advancement of Agriculture, Topsfield, MA 5p.

Lilley, G.P. 1981. Information Sources in Agriculture and Food Science, Butterworths, London, UK 603p. [S494.5 D6--B/D/LA/R/SB]

Hill, S.B. 1976. Reading References on Ecological Agriculture, Univ. of Regina, Department of Extension, Regina, Sask., Canada.

also see the National Agricultural Libraries series, Bibliographies of Agricultural Bibliographies, beginning with BLA-1 in 1978 and the Quick bibliography series.

There are also many extensive bibliographies on specific topics, such as: Satchell, J. and Martin, K. 1981. A Bibliography of Earthworm Research, Inst. of Terrestrial Ecology, Cumbria, UK 174p. [QL 391.04 S38--D].

Written bibliographies are often the only way to search material that was published before electronic data bases began.

7.0 Directories

A directory can often provide more rapid access to people, materials, and products. There is not a comprehensive guide to sustainable agriculture products, markets, and services--yet. Some information is available in the two directories listed. See also the advertisements in periodicals in section 8.0. For farm equipment see Agricultural engineering and equipment, section 9.90.

Sanzone, S. ed. 1985. Healthy Harvest: A Directory of Sustainable Agriculture and Horticulture, Potomac Valley Press, Washington, DC 64p. [S605.5 .H43--B/D]

Sanzone, S., Burman, J., and Hage, M.A. 1987. Healthy Harvest II, Potomac Valley Press, Washington, DC 119p. [S605.5.H4251--B]

C.A.N. 1988. Organic Wholesalers' Directory and Yearbook: Food and Farm Supplies, Calif. Action Network, Davis, CA 95617 (\$21.50 ppd + 6% CA tax)

Wyman, C. 1987. Sources of Help for Organic Gardeners, Small Farm Center, UC Davis, 20p.

Biggs, C. and Rashleigh, R. 1988. California Agriculture Directory, Calif. Service Agency, Sacramento, CA 95815. (a useful guide to California agriculture groups and associations)

Two of the larger suppliers of products and materials for sustainable agriculture in California are:

Peaceful Valley Farm Supply
11173 Peaceful Valley Rd.
Nevada City, CA 95959
(916) 265-FARM

Harmony Farm Supply
PO Box 451
Graton, CA 95444
(707) 823-9125.

8.0 Periodicals

Keeping abreast of current developments and reviewing recent research and demonstration projects is often easiest through the periodicals. The more useful journals and magazines include:

American Journal of Alternative Agriculture,
Institute for Alternative Agriculture, 9200
Edmonston Road, Suite 117, Greenbelt, MD 20770
[S605.5 A437 R/SC, S605.5 A5--B/D/R]

The New Farm, 222 Main Street, Emmaus, PA
18098. [S560.N4--B/D, S1 .N49--SC]

Sustainable Agriculture News, UC Sustainable
Agriculture Research and Education Program,
Agronomy Extension, UC Davis, CA 95616.

Agriculture, Ecosystems, Environment, Elsevier, 52
Vanderbilt Ave, NY, NY 10017. [S601 .A364--B/R,
S601 A1 --D/LA/SB, S601 A38--I]

Organic Market Report (OMNIS) PO Box 1300,
Colfax, CA 95713 [S605.5 O78--D,
HD9007.C2074--SC]

Marketing information and prices rather than
production practices.

The IPM Practitioner, Bio Integral Resource Center, Box 7414, Berkeley, CA 94707. [SB950.A1 .I2--B/D, SB950.A1I65--SC]

The California Journal of Sustainable Agriculture, CSA, PO Box 1300, Colfax, CA 95713 (just starting). [D].

The Cultivar, Agroecology Program, U.C. Santa Cruz, Santa Cruz, CA 95064

The Small Farm News, Small Farm Center, Coop. Extension, U.C. Davis, Davis, CA 95616

ACRES USA, PO Box 9547, Kansas City, MO 64133 [HD1401 .A3--B, S605.5 A3--D]

Conservation Impact, Conservation Technology Information Center, 1220 Potter Drive, Rm 170, West Lafayette, IN 47906

Sustainable farming practices are also appearing fairly regularly in conventional agriculture and science journals, including:

California Agriculture, Division of Agriculture and Natural Resources, Univ. of California, 2120 University Avenue, Berkeley, CA 94720 [S1 .C18--B, S1 .C15--I/RSC/SD, S39 C18--LA, S1. C3--SB]]

Soil and Water, U.C. Cooperative Extension, ANR Publications, 6701 San Pablo Ave., Oakland, CA 94608 [64092.XU2--B, SB 1 S6--I, S624.C3985--R]

California Farmer, 731 Market Street, San Francisco, CA, 94103 [F850.C117731--B, S1 C23--D, S1 C1351--LA, S1 C185--R/SB/SC]

Journal of Production Agriculture, 677 South Segoe Road, Madison, WI 53711

Intecol Bulletin, Inst. of Ecology, Univ. of Georgia, Athens, GA 30602 [QH540 I48--D/SB]

Agricultural Water Management, c/o Journal Information Center, Elsevier, 52 Vanderbilt Ave, NY, NY 10017 [S494.5.W3.A37--B/R/SB, TD388 A1 A34--D]

Agricultural Systems, c/o Journal Information Center, Elsevier, 52 Vanderbilt Ave, NY, NY 10017 A494.5 M3 A--D/SB, S3 .A43--R]

The Furrow, John Deere, 1400 Third Avenue, Moline, IL 61265

CATI Newsletter, Calif. Agric. Technology Institute, CSU Fresno, CA 93740

The Drylander, Dry Lands Research Institute, U.C. Riverside, Riverside, CA 92521.

Hort Ideas, Rt 1 Box 302, Gravel Switch, KY 40328

Depending on your topic, it may be helpful to examine the standard, specialist journals such as:

Hort Science, Journal of the Soil Science Society of America, Weed Science, etc.

and the alternative farming journals, such as:

MOFGA Newsletter, PO Box 2176, Augusta, ME 04330

Agrarian Advocate, Box 464, Davis, CA 95617

Harrowsmith, The Creamery, Charlotte, VT 05445 [S522 02 H37--D]

Small Farmer's Journal, Box 2805, Eugene, OR 97402 [S1 S5--D]

Countryside and Small Stock Journal, 312 Portland Rd., Waterloo, WI 53594 [SF1 C61--D]

Draft Horse Journal, Box 670, Waverly, IA 50677 [SF227 D72--D]

Permaculture Activist, 4649 Sunnyside Avenue North, Seattle, WA 98103

Sustainable Living in Dry Lands, Box S, Bisbee, AZ 85603

Biodynamics Magazine, Box 116A, Miller Avenue, Sheffield, MA 01257

Natural Food and Farming, Natural Foods Association, PO Box 210, Atlanta, TX 75551 [TX341 .N3--B]

Ask your librarian which journals are considered the major specialist journals on your topic. To most effectively use these and other journals consult abstract/index journals (section 5.0) and/or data bases (section 2.2).

9.0 Books

There are often many books that may be of value for a particular farm problem, but it is often difficult to find the right one. Much of the sustainable agriculture research has been in areas where climates, soils, and crops are different from most of California. The information they include may, or may not, be of much use here. This primer lists those books that we feel are most likely to be of value.

9.1 Overview

Sustainable agriculture requires skillful use of renewable, biological resources. The following manuals and books provide an introduction to using

these practices profitably. They are uneven and less than ideal--but the best available. A wider selection of books on this general topic is included in section 9.99.

Allen, P. and Van Dusen, D. 1988. Global Perspectives on Agroecology and Sustainable Agricultural Systems, Agroecology Program, University of California, Santa Cruz, CA 431p.

Altieri, M. 1987 Agroecology: The Scientific Basis for Alternative Agriculture, Westview Press, Boulder, CO 227p. [S589.7.A471--B/D/R/SC]

SCAREP. 1986. Sustainability of California Agriculture, Proceedings of a Symposium held in Sacramento, California, Jan. 1986. Univ. of California, Davis, CA 417p. [HD1775.C3 S87--B/D] (\$10.00ppd from Agronomy and Range, U.C. Davis)

Wyman, C. and Viera, L. 1986. Farming with a Future: Making and Marketing the Transition, Proceedings of a Conference Nov. 7, 1986, Fresno, CA, U.C. Cooperative Extension, Small Farm Center, U.C. Davis, CA 65p.

Francis, S.R. 1988. Sustainable Agriculture Survey Summary, U.C. Davis, Dept. of Agricultural Engineering, vp.

Nebraska Coop. Extension Service. 1987. Sustainable Agriculture--Wise and Profitable Use of Our Resources in Nebraska, Univ. of Nebraska, Lincoln, NE 222p. (\$7.00ppd, Agronomy Dept., Att'n JoAnn Collins, 279 Plant Science, Univ. of Neb. Lincoln, NE 68583).

Brusko, M. 1985. Profitable Farming Now, Regenerative Agriculture Association, Emmaus, PA 100p. [S605.5 .P76--SB]

Edens, T.C., Fridgen, C., and Battenfield, S., eds. 1985. Sustainable Agriculture and Integrated Farming Systems, Michigan State Univ. Press, East Lansing, MI 344p. [S401 .S87--B/D/LA, S441 .S8--R]

Stonehouse, B., ed. 1981. Biological Husbandry: A Scientific Approach to Organic Farming, Butterworths, London, UK 352p. [S605.5 B55--B, S605.5 B56--D, S605.5 B615--LA, S605.5 .686--SB]

Small Farm Resources Project and its 23 Cooperating Farm Families. 1987. Resourceful farming: A primer for family farmers, Center for Rural Affairs, Hartington, NE 118p.

Whatley, B.T. and the Editors of The New Farm. 1987. How to Make \$100,000 Farming 25 Acres. Rodale Press, Emmaus, PA 180p.

Jeff Chandler + Associates. 1987. California Small Family Farms: Who They Are, How They Operate, and What They Need. California Energy Commission, Sacramento, CA 179p.

9.2 Marketing

There is little doubt that marketing is one of the essential skills for survival as a "sustainable" farmer. International marketing and direct sales are common practices among successful small and large farmers. Organic certification can increase market price and may be worth considering, contact CCOF--see section 3.1.

Carter, H.O. and Nuckton, C.F. 1987. Marketing California's Specialty Crops: Worldwide Competition and Constraints, Univ. of California Agricultural Issues Center, U.C. Davis, CA 176p. [HD9247.C3 M37--D]

Wampler, R.L. and Motes, J.E. 1984. Pick Your Own Farming: Cash Crops for Small Acreages, Univ. of Oklahoma Press, Norman, OK 194p.

Kasmire, R., Wyman, C. and Sherman, M. 1987. Marketing for the Small Farmer: Direct Marketing and Quality Control. Small Farm Center, UC Davis, 4p.

Gustafson, M. and Moulton, C. 1983. Marketing for the Small Farmer: Choices in Marketing Fresh Fruits and Vegetables, Small Farm Center, UC Davis, 2p.

The farmer is the only merchant who buys retail, sells wholesale, and pays the freight both ways!

9.30 Pest Management

Univ. of California, Integrated Pest Management Series--excellent manuals. Available from ANR Publications (address in section 4.0). Publication numbers are Tomatoes-3274, Cotton-3305, Citrus-3303, Almonds-3308, Walnuts-3270, Grapes-4105, Alfalfa Hay-3312, Pears-out of print, Potatoes-3316, Cole Crops and Lettuce-3307, and Rice-3280. This group has also prepared a number of other reports.

Horn, D.J. 1988. Ecological Approach to Pest Management, Guilford Press, NY 285p. [SB931 .H595--R/SC]

Cavalloro, R. ed. 1987. Integrated and Biological Control in Protected Crops. A.A. Balkema, Rotterdam, p [SB950 A1I53--R]

Kogan, M. ed. 1986. Ecological Theory and Integrated Pest Management Practice. Wiley-Interscience, NY 362p.

Flint, M.L. and Van den Bosch, R. 1981. Introduction to Integrated Pest Management, Plenum Press, NY 240p. [SB950 .F56--B/D/I/R]

Pimentel, D. ed. 1981. CRC Handbook of Pest Management in Agriculture, CRC Boca Raton, FL v1-3. [SB950 C7--B/D/I/SB/SC, SB950 .H33--R]

Huffaker, C.B. and Rabb, R.L. 1984. Ecological Entomology, Wiley-Interscience, NY 844p. [QL463 .E18 --B/D/I/LA/R/ SB/SC]

Van den Bosch, R., Messenger, P.S., and Gutierrez, A.P. 1982. An Introduction to Biological Control, Plenum Press, NY 247p. [SB975 .V36--B/D/I/LA/R/ SB/SC]

Flint, M.L. ed. 1986. U.C. Syllabus of Biological Control Programs, U.C. Cooperative Extension, IPM Project, Davis, CA 83p.

Brown, R.H. and Kerry, B.R. 1987. Principles and Practice of Nematode Control in Crops. Academic Press, Orlando, FL 447p. [SB998 N4P74--R].

Grainge, M., Ahmed, S., Mitchell, W.C., and Hylin, J.W. 1986. Plant Species Reportedly Possessing Pest-control Properties. East-West Center, Honolulu, HI 249p. [SB951. 145.N37--B]

Cook, R.J. and Baker, K.F. 1983. The Nature and Practice of Biological Control of Plant Pathogens, Amer. Phytopath. Society, St. Paul, MN, 539p. [SB732.6 .C66--B/D/I/LA/R/SB/SC]

Steiner, M.Y. and Elliott, D.P. 1983. Biological Pest Management for Interior Plantscapes, Entomology Section, Alberta Envir. Centre, Vegreville, Alberta, Canada 30p. [SB975 .S73--B]

Yepsen, R.B. 1984. The Encyclopedia of Natural Insect and Disease Control, Rodale Press, Emmaus, PA 490p. [SB974 .E53--B/D/I/R/SB/SC]

9.30.1 Soil solarization

Soil solarization uses clear plastic sheeting to heat the soil and kill weeds and soil pathogens. It has proved to be very effective against many weeds and several soil pathogens in California.

Pullman, G.S., DeVay, J.E., Elmore, C.L., and W.H. Hart. 1984. Soil Solarization: A Non-chemical Method for Controlling Diseases and Pests, U.C. Coop. Extension, Berkeley, CA Leaflet 21377, \$1.50. 8p.

Katan, J., Greenberger, A., Alon, H., and Grinstein, A. 1976. Solar heating by polyethylene mulching for the control of diseases caused by soil borne pathogens, *Phytopathology* 66:683-688.

Hesketh, K. A. 1981. Soil solarization. *Proc. 33rd Ann. Calif. Weed Conf.*, Monterey, Sacramento, CA pp. 54-56.

Villapudua, J.R. 1985. Identification of a New Race of *Fusarium oxysporium* from Cabbage and Its Control by Means of Solarization of the Soil Amended with Cabbage Residues, PhD, U.C. Riverside, CA 125p.

Ashworth, L.J., and S.A. Ganoa. 1982. Use of clear polyethylene mulch for control of verticillium wilt in established pistachio nutgroves. *Phytopathology* 72:243-256.

Katan, J. 1981. Solar heating (solarization) of soil for control of soilborne pests. *Ann. Rev. Phytopath.* 19:211-236.

Pullman, G.S., J.E. De Vay, R.H. Garber, and A.R. Weinhold. 1981. Soil solarization for the control of Verticillium wilt of cotton and the reduction of soilborne populations of *Verticillium dahliae*, *Phythium* spp., *Rhizoctonia solani*, and *Thielaviopsis basicola*. *Phytopathology* 71:954-959.

9.32 Weed management

Radosevich, S.R. and Holt, J.S. 1984. *Weed Ecology: Implications for Vegetation Management*, Wiley, NY 265p. [SB611 .R33--B/D/R/SB/SC]

Rosenthal, S.S., Maddox, D.M., and Brunetti, K. 1984. *Biological Methods of Weed Control*, Thomson Publ., Fresno, CA 88p. [SB611.5 .R67--B/D/SB/SC]

McLeod, E. and Swezey, S.L. 1979. *Survey of Weed Problems and Management Techniques in Organic Agriculture*, Organic Agriculture Research Institute, Graton, CA 120p. [SB611 .M34--B/D]

Kurtz, E.A. ed. 1985. *Principles of Weed Control in California* Thomson Publ, Fresno, CA 474p. [SB612.C P751--B/D/R/SB]

Principles of mechanical and cultural weed control and weed management are included but not emphasized.

9.32.1 Weeder Geese

Weeder geese have been used for many years to control unwanted vegetation in commercial crops, waterways, and lawns. At one time there were more than 200,000 weeder geese in the cotton fields of the San Joaquin Valley.

Weeder geese don't compact soil as heavy equipment and people will. They work seven days a week, rain or shine. and can be put into wet fields when machinery would bog down and cause severe damage to the soil structure. They can pull weeds close to and within the crop row where machines cannot reach.

Jackson, S. and Reed, B. 1985. *Using Weeder Geese*. Permaculture Institute of North America, Seattle, WA 4p.

Johnson, C. 1960. Management of weeder geese in commercial fields. *Calif. Agric.* 14(8):5.

Anon. 1951. Geese for weed control in strawberry fields. *Amer. Nurserymen* 94(4):40-41.

Dutton, D. nd. *Chinese Weeder Geese*. Wind River Nursery, US Forest Service, Carson, WA 5p.

9.32.2 Flame weeding

Flame weeding has been successful on a variety of crops, including carrots, that have been difficult to manage without chemical controls. Flame weeding is now used for many crops in Europe and is being used by several growers in California.

Hoffmann, M. 1986. Abflammttechnik (book) and equipment, KTBL, Bartninstr. 49, Postfach 12 01 42, 6100, Darmstadt 12, Germany 83p.

Red Devil, Flame Engineering Inc. PO Box 577, La Crosse, KS 67548 (800) 255-2469

9.40 Soil Management

Harris, F., ed. 1979. Fertile Soil Without Chemicals, Saskatchewan Dept. of Agriculture, Univ. of Regina Extension, Regina, Sask., Canada 131p. [S654 .F34--D, S605.5 F47--SB]

Lopez-Real, J.M. and Hodges, R.D., eds. 1987. The Role of Microorganisms in a Sustainable Agriculture, AB Academic Press, Berkhamsted, UK 256p. [QR51 .I67--D]

Fitter, A.H., Atkinson, D., Read, O.J., and Usher, M.B. 1985. Ecological Interactions in Soil, Blackwell Scientific, London, UK 451p. [QH451 .5 S6--B/D/LA/R/SB/SD]

Mitchell, M.J. and Nakas, J.P., eds. 1986. Microfloral and Faunal Interactions in Natural and Agro-ecosystems, M. Nijhoff/Dr. W. Junk, Boston, MA 505p. [QH541 .5 .S6 M5--ALL]

Chen, Y. and Avnimelech, Y. 1986. The Role of Organic Matter in Modern Agriculture, M. Nijhoff/Dr. W. Junk, Boston, MA 306p. [S654. R651--B/D/I/R/SB/SC]

Jenny, H. 1980. The Soil Resource, Springer-Verlag, NY 273p. [S592.2 .J46--ALL]

Mortvedt, J.J., Giordano, M., Lindsay, W.L., Dinauer, R.C., Clark, V.S., and Eith, P. eds., 1972. Micronutrients in Agriculture, SSSA, Madison, WI 666p. [S587.5. T7. M5--D/R/SB]

Jeffrey, D.W. 1987. Soil-plant Relationships, Timber Press, Portland, OR 295p. [QK918 J41--B, QK918 J45--SC, QK901 J43--D]

Gershuny, G. and Smillie, J. 1986. The Soul of Soil: A Guide to Ecological Soil Management, GAIA Services, St. Johnsbury, VT 125p.

Walters, C. ed. 1975. The Albrecht Papers, ACRES USA, Raytown, MO 515p. [S691 .A597--B]

McAllister, J.C. 1983. A Practical Guide to Novel Soil Amendments, Rodale Research Center, Emmaus, PA 124p.

Lee, K.E. 1985. Earthworms: Their Ecology and Relationships with Soils and Land Use, Academic Press, Orlando, FL 411p. [QL391. A6 L441--B/D/LA/ R/SB/SC]

9.41 Biological Nitrogen Fixation

The 1973 oil embargo reminded California's farmers that fossil fuels are nonrenewable, limited resources. The farm sector was affected by shortages of fossil fuels and rapid price increases in nitrogen fertilizers made from fossil fuels. Natural biological

nitrogen fixation with the legume-Rhizobium symbiosis has been shown to be highly effective and offers considerable potential for energy conservation. Yet only a few legume species have been evaluated in California and legume based cropping systems have been little studied since the early part of this century.

The use of the Azolla-Anaebena symbioses has been explored for rice production in California. This is a common practice in many areas of the world. It proved to be effective in California but labor costs were considered to be too high for general use.

Subba Rao, N.S. 1982. Biofertilizers in Agriculture, A. A. Balkema, Rotterdam, The Netherlands 186p [S652 S92/1982--D].

Phillips, D.A. and Williams, W.A. 1987. Range-Legume Inoculation and Nitrogen Fixation by Root-Nodule Bacteria, Univ. of Calif. Agric. Exp. Sta. Bulletin #1842, 13p. (\$1.75)

Munoz, F. N. and Graves, W. 1987. Legumes for Orchard, Vegetable, and Cereal Cropping Systems, U.C. Coop. Ext. CP488-6/87eo, San Diego, CA 12p.

Vincent, J.M. ed. 1982. Nitrogen Fixation in Legumes. Academic Press, Sydney, Australia 288p. [SB317.L43 N57--B/D/R/SB]

Evans, H.J., Bottomley, P.J., and Newton, W.E. 1985. Nitrogen Fixation Research Progress. M. Nijhoff, Dordrecht 731p. [QR89.7 I58--D/R/Sb/SC, QU 70 I61--I/LA]

Monteith, J. and Webb, C., eds. 1981. Soil Water and Nitrogen in Mediterranean Type Environments, M. Nijhoff/Dr. W. Junk, The Hague 338p.[SB110 .S7--B/I/SB]

Beck, B.P., Materon, L.A., eds. 1986. Nitrogen Fixation by Legumes in Mediterranean Agriculture, M. Nijhoff, Boston, MA 379p. [SB317.L43 N5651--B/SB]

Englestad, O.P., Stelley, M., Dinauer, R.C., Kral, D.M., Buckholz, T.L. 1970. Nutrient Mobility in Soils: Accumulation and Losses, SSSA Sp. Publ. 4, Madison, WI 81p. [S590. S655--D, S591. N87--R/SB]

Postgate, J.R. 1982. The Fundamentals of Nitrogen Fixation. Cambridge Univ. Press, London, UK 252p. [QR89.7 P673--B/D/I/LA/R/SB/SC]

Frissel, M.J., ed. 1978. Cycling of Mineral Nutrients in Agricultural Ecosystems. Developments in Agricultural and Managed-Forest Ecology, 3. Elsevier Scientific Publishing Company, NY 356p. [S589. 7. S96--B/D/I/R/SB]

9.41.1 Ley Farming

The introduction of annual legumes and varietal improvements have helped double cereal and animal production in southern Australia since the 1930's. Several million acres of cereal production in comparable climates in California and Baja California would appear well suited for the adoption of ley farming.

The key features of this farming system are the use of self-regenerating annual legumes and integration of grazing animals in the rotation. The legume eliminates the need for nitrogen fertilizer by biologically fixing nitrogen from the atmosphere. The grazing animals recycle nitrogen, help manage the legume component, and suppress weeds.

Webber, G., Matz, N., and Williams, G. 1977. Ley Farming in South Australia, Dept. of Agric. and Fisheries, So. Australia, Bull. 15/77, 19p.

Puckridge, D.W. and French, R.J. 1983. The annual legume pasture in cereal-leys farming systems of southern Australia: A review, Agric. Ecosyst. Envir. 9:229-267.

9.42 Green Manure and Cover Crops

Green manure crops are grown and plowed under to improve the soil fertility and structure. They may also be used for grazing. Green manures can increase the general level of fertility by fixing nitrogen, mobilizing minerals, and by building up the soil organic matter.

However there are also some potential disadvantages. Green manure crops may exhaust the supply of soil moisture for the following crop, adversely affect growth through allelopathy or, in some cases, lead to an increase of certain diseases, insects, and nematodes.

Pieters, A.J. 1927. Green Manuring Principles and Practice, John Wiley and Sons, NY 356p [S661 .P5--D].

Finch, C.U. 1981. Cover Crops in California Orchards and Vineyards, U.S.D.A. Soil Conservation Service, Davis, CA 25p. [Microfiche .4282--B]

Miller, J.C.M. and Bell, S.M. 1982. Crop Production Using Cover Crops and Sods as Living Mulches, International Plant Protection Institute, Oregon State Univ., Corvallis, OR 123p. [S661 .5 .C7--D, SB284 .C76--B]

McLeod, E. 1982. Feed the Soil, Organic Agriculture Research Institute, Graton, CA 209p. [S661 .M34--B, S661 .M24--D]

9.50 Water Management

Letey, J., Roberts, C., Penberth, M., and Vasek, C. 1986. An Agricultural Dilemma: Drainage Water and Toxics Disposal in the San Joaquin Valley, U.C. Agric. and Natr. Res. Spec. Pub. #3319, Berkeley, CA 56p.[G4365 M6-16--B/R/D 1739.C2 A47--D/SC]

Am. Soc. Agric. Eng. 1985. Drip/Trickle Irrigation in Action, Am. Soc. Agricultural Engineers, St. Joseph, MI 929p. [S619. T74 I56--B/D/R/SB]

Boswell, M.J. 1986. Micro-irrigation Design Manual, James Hardie Irrigation, El Cajon, CA, vp.

Jorgensen, V. 1975. Drip irrigation bibliography, Bio-Agricultural Library U.C.R., Riverside, CA 45p. [Z5074.I7 J6--D/S613 .J673--R]

O.T.A. 1983. Water Related Technologies for Sustainable Agriculture in Arid/Semiarid Lands, Office of Technology Assessment, Washington, DC 412p. [S613 .W38--D, docs--B]

9.50.1 Improving Irrigation

The efficiency of conventional irrigation systems can be improved with minor revisions and more careful management. Recent articles of interest include:

Hanson, B.R. 1987. A systems approach to drainage reduction, Calif. Agric. 41(9-10):19-24.

Goldhammer, D.A., Alemi, M.H., and Phene, R.C.
1987. Surge vs. continuous flow irrigation, Calif.
Agric. 41(9-10):29-32.

McClintic, D. 1987. Notched-ditch irrigation catches
on, The Furrow (Western edition) 92(6):26-27.

Some of the alternatives that may be worth a
closer look include: closed conduit irrigation, porous
capsules, pipe injection, and pitcher irrigation.

Rawlins, S. L. 1977. Uniform Irrigation with a
Closed-conduit Gravity Distribution System, U.S.
Salinity Lab. Publication 602, Riverside, CA 12p.

Silva, A. de S., Silva, A. da S., and Gheyi, H.R.
1985. Viability of irrigation by the porous capsule
method, Trans. 12th Cong. on Irrig. and Drainage,
New Delhi, India pp.753-764.

Sawaf, H.M. 1980. Attempts to improve the
supplementary irrigation systems in orchards in
some arid zones. In: Rainfed Agriculture in the Near
East and North Africa, FAO, Rome, Italy 409p.

Bainbridge, D.A. 1988. Pitcher irrigation, Drylander
2(2):3.

9.60 Farming Systems

Farming systems research includes the full
environment of the farm including agronomic,
economic, environmental, and social factors. It has
proved to be very useful for developing better
production systems

Shaner, W.W., Philipp, P.F., and Schmehl, W.R.
1982. Farming Systems Research and Development,
Westview Press, Boulder, CO 414p.[S540.A2 S56--
B/D/LA/R/SB/SC]]

Harwood, R.R. 1979. Small Farm Development;
Understanding and Improving Farming Systems in
the Humid Tropics, Westview Press, Boulder, CO
160p. [HD1476.A3 .H36--B/D/LA/R/SB/SC]

Dalton, G.E. 1975. Study of Agricultural Systems,
Applied Sciences, London, UK 441p. [S401.S8--B/
D/SB]

Farming Systems Support Project. 1987.
Bibliography of readings in farming systems,
International Programs, Institute of Food and
Agricultural Sciences, University of Florida,
Gainesville, FL and US-AID, Washington, DC, 4
volumes.

9.61 Crop Rotations and Cropping Systems

Crop rotation is an integral part of integrated pest
management. Crop rotations that include animals can
be effective for the control of some of the persistent
weeds, such as bindweed. Crop rotations and
multiple cropping can also be used to favor
beneficial insects that will help protect a subsequent
crop.

Francis, C.A. ed. 1986. Multiple Cropping Systems,
MacMillan, NY 383p.[S603.7 M85--B/D/R/Sb/SC]

Abstracts on Intercropping
GTZ-Projekt Mischkulturen
Forschungsstelle für internationale
Agrarentwicklung Ringstraße 19
6900 Heidelberg, Germany
(in English. 849 ref. ceased in 1986).

Papendick, P.A., Sanchez, P.A., and Triplett, G.B., eds. 1977. Multiple Cropping: Proceedings of a Symposium. ASA Special Publication #27. ASA, Madison, WI 378p. [S22.A52 no. 27--D/SB/R]

FAO. 1983. Fertilizer Use Under Multiple Cropping Systems. FAO Fertilizer and Plant Nutrition Bulletin 5. FAO, Rome, Italy 210p. [S631.F32--B/D/R]

Motsinger, R.E. 1984. Plant Susceptibility to Major Nematodes in Georgia: a Guide to Planning Crop Rotations, Univ. of Georgia Coop. Ext. Bulletin, Athens, GA 15p [SB998.N45 M67--B].

(articles of value)

Crookston, R.K. 1984. The rotation effect. Crops and Soils 36(6):12-14.

Sahs, W.W. and Lesoing, G. 1985. Crop rotations and manure versus agricultural chemicals in dryland grain production. Soil and Water Cons. 40(6): 511-516.

Cassman, K. and Rains, D.W. 1986. A cropping systems approach to salinity management in California, In: Decisions Criteria for Residuals Management in Agriculture, U.C. Agric. Issues Center, Davis, CA. pp.153-175.

Shaw, B.T. 1948. Long-term crop and fertilizer rotations, Soil Sci. Soc. Am. Proc. 10:300-305.

9.61.1 Cropping Systems and Soil

A cropping system is the kind and sequence of crops grown on a given area of soil over a period of time. It may be a regular rotation of different crops, in which the crops follow a definite order of appearance on the land, or it may consist of only one

crop grown year after year on the same area. Other cropping systems may include different crops but lack a definite and planned order in which the crops follow one another.

A soil-management system includes the cropping system plus the other practices, such as the use of fertilizers, terracing, irrigation, and drainage, that accompany the cropping system.

9.62 Agroforestry

Many traditional farming systems integrate trees and crops. Many advantages can be realized from this combination. Some of the benefits include increasing the range of products and flexibility of marketing, nitrogen fixation, pest protection, groundwater management, and shelter for both crops and livestock.

Cervinka, V., Rice, I., Finch, C., Beyer, J., Menezes, F., and Ramirez, R., 1987. The Agro-forestry Demonstration Program in the San Joaquin Valley, Calif. Dept. Food and Ag., Sacramento, CA vp.

Smith, J.R. 1988 [1952]. Tree Crops, Island Press, Covelo, CA 428p. [SB186 S5--D/R/SC]

Sholto-Douglas, J. and De J. Hart, R.A. 1984. Forest Farming, Int. Tech. Publ., London, UK 207p. [SB170 S54--D/SB]

Brown, A. and Hall, N. 1968. Growing Trees on Australian Farms, Dept. Natl. Devel., For. and Timber Bureau, Canberra, Australia 397p. [SD391.B867--SC]

Pilarski, M., ed. 1988. International Green Front Report, Friends of the Trees, PO Box 1466, Chelan, WA 98816, 194p.

9.63 Range Mangement

Burcham, L.T. 1957. California Range Land: An Historico-Ecological Study of the Range Resource in California, State Division of Forestry, Sacramento, CA 261p. [SF85 .B8--D/I/R/SB/SC]

Vallentine, J.F. 1980. Range Development and Improvement, BYU Press, Provo, UT 545p. [SB193.V28--B/SB, SB199 .V32--D]

Branson, F.A. 1985. Vegetation Changes on Western Rangelands, Society for Range Management, Denver, CO 76p. [QK133 .B731--B]

Barnes, R.F., Ball, P.R., Brougham, R.W., Marten, G.C., and Minson, D.J. 1985. Forage Legumes for Energy Efficient Animal Production, U.S.D.A.-A.R.S., N.T.I.S., Springfield, VA 323p. [SB203 .F67--B/D/I/SB]

Ittner, N.R., Bond, T.E., and Kelly, C.F. 1958. Methods of Increasing Beef Production in Hot Climates, U.C. Ag. Exp. Sta. Bulletin #761, Berkeley, CA 85p.

9.64 Gardening

Although the gardening books may be of most value for the gourmet and small grower, some include details and suggestions that could be of value for production farmers. Dick Raymond's book is a good example with a section on sustainable production.

NGA. 1986. Gardening, National Gardening Association, Burlington, VT 431p. [SB321 .G285--I/SC]

Raymond, D. 1983. Garden Way's Joy of Gardening, Garden Way Publ., Pownal, VT 365p.

Doscher, P., Fischer, T., and Kolb, K. 1981. Intensive Gardening Round the Year, Stephen Greene Press, Brattleboro, VT 144p. [SB324.3 .D67--D/I]

Jeavons, J. 1982. How to Grow More Vegetables Than You Ever Thought Possible, Ten Speed Press, Berkeley, CA 159p. [SB324.3 J43 - B/D/I/SC]

Kourik, R. 1986. Designing and Maintaining Your Edible Landscape Naturally, Metamorphic Press, Santa Rosa, CA 370p. [SB473.K64 B/D/R/SC]

9.65 Traditional Farming Systems

Recent studies of traditional farming systems have discovered that these "primitive" systems are ecologically sophisticated and can provide many lessons for improving the efficiency and productivity of modern farming.

Wilkens, G. 1987. Good Farmers, U.C. Press, Berkeley, CA 302p. [S451.7 .W551--ALL]

9.65.1 Ridged Fields

Ridged or mounded fields are a common practice in many traditional agricultural systems. Recent research has shown they can be of great value in protecting avocado trees from root rot, *Phytophthora cinnamomi*.

Pryor, A. 1987. On the mound. Calif. Farmer 267(9): 16,53.

Erickson, C. 1988. Rediscovering ridged fields in the Andes. Drylander 2(1):6.

9.66 New Crops

New crops can provide excellent profits to those who learn how to grow and market them first. They can also break the bank and the spirit of those who try them.

C.A.S.T. 1984. Development of New Crops, Council for Agric. Science and Technology, Ames, IA 30p.

Roecklein, J.C. and Leung, P. 1987. A Profile of Economic Plants. Transaction Books, New Brunswick, CT 623p.
[SB91.R6 Ref.-R]

Tanaka, T. 1976. Cyclopedia of Edible Plants of the World. Keigaku Press, Tokyo, Japan 924p.
[QK 98.5 ref- B/D/I/LA/R/SB]

FAO Forest Resources Development Branch.
1983-1986. Food and Fruit-Bearing Forest Species,
1. Eastern Africa, 2. SE Asia, 3. Latin America. FAO
Forestry Paper 44, Rome, Italy.
[QK 98.5D48 F686 1983--D/LA/R]

Sholto-Douglas, J. 1978. Alternative Foods: A World Guide to Lesser-known Edible Plants. Transatlantic Arts, Levittown, NY 177p. [QK98.5 A1 S54 1978--B/D/I/LA/R.SB/SC]

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Some of the best new crops may be the flavorful old varieties. Information is available from.

Seed Saving Project
c/o Zea Sonnabend
Student Farm, Dept. of LAWR
139 Hoagland Hall
U.C. Davis, Davis, CA 95616

Seed Savers Exchange
PO Box 70
Decorah, IA 52101

There are also many crops which have been used extensively by native people and other cultures but which have not hit the commercial market here--yet.

Native Seeds/SEARCH
3950 West New York Drive
Tucson, AZ 85745

Natural Foods Institute
Box 185 WMB
Dudley, MA 011570

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Only on-farm research can determine the most workable system for a particular farm.

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The European farm community has taken biological farming more seriously and more special equipment is available.

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Production cost

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One key to sustainability - doing more with less - front and rear implements

A larger book on this topic will be released in 1990 or 1991.