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ALTERNATIVE ENTERPRISE AND AGRITOURISM: FARMING FOR PROFIT AND SUSTAINABILITY TOOL KIT

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V. ALTERNATIVE ENTERPRISE AND AGRITOURISM CATERGORIES

A. NATURAL RESOURCES

Guidelines for Increasing Wildlife on Farms and Ranches: With Ideas for Supplemental Income Sources for Rural Families. Great Plains Agricultural Council, Wildlife Resource Resources Committee, Cooperative Extension Service, Kansas State University. Send order to Wildlife Habitat Handbook, 118 Umberger Hall, Kansas State University, Manhattan, Kansas 66506 at a cost of $27.00. This 500 plus page book was prepared with the input of over 100 professionals involved in wildlife production, management, economics and identifying landowner opportunities.

A Symposium on the Economics of Wildlife Resources on Private Land. edited by Rhett Johnson, Auburn University. Papers were presented on general economic impacts, landowner economic impacts, hunting on private lands, economics of wildlife damage, endangered species act economic impact, and economics of wildlife resources. Call 334-844-4000.

Wildlife and the American Mind: Public Opinion on and Attitudes toward Fish and Wildlife Management. by Mark Duda, Responsive, Management 130 Franklin Street, POBox 389, Harrisonburg, VA 22801, 540-432-1888, www.responsivemanagement.com. This is an 800 page book containing results of more than 300 surveys. It presents recommendations, strategies on how to utilize this information to enhance fish and wildlife management programs and policies, as well as how to more effectively manage hunting, fishing and wildlife watching programs.

Land, Leases, and Wildlife. The southern counties in Texas have been holding workshops to introduce new rural landowners to alternative income-producing resources as well as address liability, ethical and tax value concerns. The workshops were sponsored by Texas Agricultural Extension Service, Texas Parks and Wildlife Department and the Natural Resources Conservation Service. For more information, call Wayne Scholtz, Extension Educator in Hondo, TX at 830-741-6180 or write him at 1506 Ave M, Hondo, TX 78861.

Tidelands Birding Festival, February 23-25th, 2001. This is an example of how a community is benefiting from its natural resource—birding. Call Miles Phillips at 842-234-1424 for more information and go to www.scnatureadventures.com for birding festival information.

Texas Partners in Flight. A newsletter containing articles about birding, but focus is on Texas. Two pages of birding web sites are included in the tool kit from the Spring 1998-2000 newsletter. A very good resource and subscription is free. Write to Texas Partners in Flight, Texas Parks and Wildlife, 4200 Smith School Road, Austin, TX 78744. Go to web site www.tpwd.state.tx.us/nature and click on the birding page to see the newsletter.

Wildlife Management for Missouri Landowners, Third Edition. Missouri Department of Conservation. It is a 90-page publication about making a wildlife management plan, cropland, grassland, woodland, idle area, wetland, and species management. It lists wildlife management services and presents wildlife management practices. To order write to: Missouri Department of Conservation, POBox 180, Jefferson City, MO 65102. Also go to www.conservation.state.mo.us.

Farming For Wildlife: Voluntary Practices for Attracting Wildlife to Your Farm. A joint publication of state, Federal and public organizations. Contact Wendell Gilgert or Ronald Schultze, NRCS state office. Call 530-792-5600. It presents many wildlife management practices that can be adopted by ranchers and farmers for use on agricultural lands. Focus is on CA but the practices can be applied "Anywhere" USA.

Establishing a Birding-Related Business: A Resource Guide. TAMU. Texas Agricultural Extension Service, Recreation, Park and Tourism Sciences. Call 979-845-5419 or go to http://agextension.tamu.edu. The first 8 pages provides an overview of birding trends and the last 8 pages provides a guide for establishing a birding business or activity in a community.

B. RECREATION/TOURISM

Bed &Breakfast:Is it the Right Business for You?. Missouri Cooperative Extension Service, University of Missouri and Lincoln University, Columbia, Missouri 65211, MP 667. Call 1-800-292-0969. This workbook will assist homeowners and other entrepreneurs in assessing the potential for opening and operating a Bed and Breakfast. It also has a good reference list of other publications and authors. A video is also available.

South Dakota Farm and Ranch Vacation: Resource Directory. South Dakota Department of Tourism. South Dakota Tourism, 711 E. Wells Aveune, Pierre, SD 57501, FAX: 605-773-3256. This publication is a very good checklist and steps one needs to follow when considering an agritourism or other added-value enterprises for a farm or ranch vacation. The focus is on South Dakota, but the steps are applicable anywhere.

Bed&Breakfast: Inns and Ranches of Wyoming. Wyoming Homestay and Outdoor Adventure Guide. Go to whoa@coffey.com for more information.
Trail Boss News. The newsletter contains a number of articles and information on alternative enterprises and agritourism for ranchers.

Town and Country Bed and Breakfast: Supplemental Income for Wyoming Families. by Susan J. Rottman and Jeff Powell. It addresses opening a business, facilities, guest relations, business management and marketing. Contact James A. Maetzold for a copy at 202-720-0132. Also, go to www.uwyo.edu/ranchrecr

Homeworking Mothers. It is a periodical for mother's interested in a careers at home. This is part of "Mothers'Home Business Newwork". Send $2.00 and a business-size self-addressed envelope to MHBN, Dept. FC3, POBox 423, East Meadow, NY 11554.

So You Want To Be In the Hunting Business? by J. Wayne Fears, Progressive Farmer, September 1997.

Beginning a Bed and Breakfast in South Carolina: Guidelines for Development. It is a 75-page publication on how to develop, organize, administer, operate and promote a B&B. Several SC B&B's are noted in the publication. It has worksheets and checklists to help you with your planning. For more information, contact Developing Naturally, Strom Thurmond Institute of Government & Public Affairs, Perimeter Road, Clemson, SC 29634. Call 864-656-0372 or go to www.strom.clemson.edu/

Minnesota Tourism Center. UMN It conducts research and provides Extension outreach to farmers and rural communities interested in develop agritourism. Go to www.tourism.umn.edu.

They Call It a Maze. You Might Call It Corn. Washington Post, August 28, 2000. Make a copy. It may be available at www.washingtonpost.com.

C. TREES/FORESTRY

The National Tree Trust. A non-profit group that works to help local volunteer groups in growing, planting, and maintenance of trees in rural communities, urban areas and along highways. For more information go to www.national-treetrust.org

Th*e National Fire Protection Association.* They provide information on community wildfire control measures. For more information, go to www.firewise.org/communities

The National Arbor Day Foundation: They provide information on trees in the riparian zone. For more information go to www.arborday.org.

USDA National Agroforestry Center. The Center's work focuses on agroforestry practices, including riparian buffers. For more information go to www.unl.edu/nac.

Agroforestry Center Publications

- *Agroforestry: Working Trees for Agriculture*.
- *Working Trees for Livestock.*
- *Working Trees for Wildlife.*.

-*Working Trees for Communities*.
-W*orking Trees for Treating Waste.*
-*Working Trees for Carbon Cycle Balance*.
-*Living Snowfences*
-*Growing Carbon: A New Crop That Helps Agricultural Producers and the Climate Too*
-*Diseases of Trees in the Great Plains*
-*Inside Agroforestry—a quarterly newsletter*
-*Several technical notes are also available on the web*

Small-Scale Alternative Agriculture. Woodlots two-page information sheet that can be obtained from san@nal.usda.gov or call 301-504-6245.

D. LIVESTOCK

The Small Dairy Resource Book:Information sources for farmstead producers and processors. It is a collection of library materials including trade magazines, books, publications and web sites. It contains abstracts on cheese, butter, ice cream, other dairy foods, dairy processing, food safety, business and marketing, animals, feeds and grazing, and appendices of suppliers, consultants, processing courses, organizations, etc. The 56 pages are a very good information resource. Your may order it by calling 802-656-0484 or go to www.sare.org

Alternative Marketing of Pork. Go to attra.org web site for a copy.
The production guide addresses the alternative production methods, breeds, health, general management concerns, and other management considerations. References and a resource section are provided.

The Stockman Grass Farmer. A monthly publication about grazing. Call 1-800-748-9808 for a free copy.

Small Scale Agriculture Alternative. Two page information sheets can be obtained by emailing san@nal.usda.gov or call 301-504-6245.

-Sheep
-Draft Animals
-Exotic Livestock
-Dairy and Meat Goats
-Cashmere Goats
-Angora Goats

E. POULTRY

Chicken Tractor: The Permaculture Guide to Happy Hens and Healthy Soil. by Andy Lee and Pat Foreman; Good Earth Publications, 1702 Mountain View Road, Buena

Vista.VA. 24416. Call 540-261-8775. This book is about raising chickens on a small scale in your backyard or on a small acreage. It is an innovative way of raising chickens which compliments your garden enterprise. The authors address all aspects of production and marketing in 300 pages. It also has a small farm resource list included in an appendix.

Sustainable Chicken Production. Go to attra.org to get a copy
The production guide addresses the alternative production methods, breeds, health, general management concerns, and other management considerations. References and a resource section are provided.

Pastured Poultry. This publication describes the experiences of 35 Southern farmers who from 1996-99 participated in a project to produce and market pastured poultry. Information includes pen-building, brooding, feeding, processing, marketing, legal matters, economics, and several other topics. A copy can be obtained by calling 1-800-346-9140 or it can be obtained off the web at http://www.attra.org

Small-Scale Alternative Agriculture. Poultry. Two page information sheet can be obtained by emailing san@nal.usda.gov or call 301-504-6245.

Raising Emus and Ostriches. SRB 97-06, NAL, USDA. This publication contains 70 pages of references on emus and ostriches production and marketing. For a copy contact 301-504-6559 or email afsic@nal.usda.gov or www.nal.usda.gov/afsic.

F. AQUA CULTURE

Evaluating an Aquaculture Enterprise. Go to attra.org web site to get a copy.
The production guide addresses the alternative production methods, breeds, health, general management concerns, and other management considerations. References and a resource section are provided.

Aqua culture in Illinois. Growth in aqua culture (trout and salmon) is summarized in Small Farm Today, July/August 2000, by Daniel Selock of the Southern Illinois University Carbondale's Office Of Economic and Regional Development. For more information, contact Daniel Selock at 618-536-4451 or email dselock@siu.edu.

Small-Scale Agriculture Alternative. Aquaculture two-page information sheet that can be obtained by emailing san@nal.usda.gov or call 301-504-6245.

Ponds in United States. There is a list of the ponds in the United States at the following web site www.corps_geo.USACE.Army.mil/HO.html

G. CROPS/HORTICULTURE

Backyard Market Gardening: the entrepreneur's Guide to Selling What You Grow. by Andy Lee and Good Earth Publications, 1702 Mountain View Road, Buena Vista, VA. 24416. Call 540-261-8775. It shows how to sell quality garden produce to the public for fun and profit. The production side is also discussed but not in as much detail.

Alternative Agronomic Crops. Go to attra.org web site to get a copy.
The production guide addresses the alternative production methods, varieties, health, general management concerns, and other management considerations. References and a resource section are provided.

We're Gonna Be Rich! Growing Specialty Cut Flowers for Market. Frank and Pamel Arnosky. Fairplain Publications, POBox 3747, Lawrence, KS 66046. 785-748-0609 or email: growing4market@earthlink.net

Growing for Market. A monthly magazine for direct-market farmers. For information about subscriptions, call 1-800-307-8949.

Marketing Channels: Pick-Your-Own and Agri-Enterainment. The production guide addresses the alternative production methods, general management concerns, and other management considerations. References and a resource section are provided.
To get a copy go to attra.org web site.

Kenaf. Go to Yahoo.com and enter "kenaf in Mississippi and search" There is information on production and processing that is practical, economical, and expanding.

Small-Scale Agriculture Alternatives. Two-page information sheet that can be obtained by emailing san@nal.usda.gov or call 301-504-6245.

- -Blueberries
- -Brambles
- -American Ginseng
- -Dessert Vines
- -Exotic Fruits
- -Foliage Plants
- -Herbs
- -Northern Nut Growing
- -Peppers
- -Pumpkins
- -Specialty Corns
- -Specialty Flowers
- -Specialty Mushrooms
- -Specialty Potatoes

-Specialty Vegetables
-Strawberries
-Wildflowers
-Shiitake Mushrooms
-Mushrooms
-Asparagus

H. APIARY

Small Scale AG. Bees. Two page information sheet can be obtained by mailing san@nal.usda.gov or call 301-504-6245.

I. NON-FARM/FARM RESIDENTS

Worms for Composting.
The production guide addresses the alternative production methods, varieties, health, general management concerns, and other management considerations. References and a resource section are provided. Go to attra.org to get a copy.

J. Education

A number of listings in TAB VII contain information on education.

K. General

Future Harvest. It is a non-profit organization with its focus on sustainable agriculture. The Chesapeake Association for Sustainable Agriculture (CASA) publishes a newsletter three times a year. It is about sustaining farming in the Chesapeake region. If you are interested, email fhcasa@umail.umd.edu. Or, contact Bruce Mertz at 410-604-2681.

Living on a Few Acres. A quarterly publication produced by the University of Minnesota, Washington County Extension office addressing many small acres issues and management. For more information, call Robert Olson, 651-430-6800 or email: rolson@extension.umn.edu.

Appropriate Technology Transfer For Rural Areas (ATTRA). ATTRA provides assistance in (1) sustainable farming production practices, (2) alternative crop and livestock enterprises, and (3) innovative marketing. Call 1-800-346-9140 or go to www.attra.org to find out what is available. They will personally gather information to answer your questions.

Example of University Extension Work through out the U.S. Most Universities devote staff to alternative enterprise assistance/development and agritourism. Several states have special "centers" or "institutes" or "economic development" devoted to work in

these areas. The University of Missouri Outreach and Extension web page is shown as an example of what is available at your land grant universities.

http://muextension.missouri.edu./xplor

Sustainable Agriculture...Continuing to Grow: Proceedings of the "Farming and Ranching for Profit, Stewardship and Community Conference, March 7-9, 2000." Western SARE. Call 435-797-2257 or wsare@mendel.usu.edu. or go to www.wsare.usu.edu for producer profiles and presentation of abstracts. The conference addressed—the sustainable farm, disease, pests and weeds, the sustainable ranch, marketing in a sustainable economy and sustaining agriculture. Farmers and ranchers made several presentations on how they are sustaining themselves through alternative enterprises.

Current List of Information Products, AFSIC, NAL, USDA. Go to www.nal.usda.gov/afsic for the online publications, email: afsic@nal.usda.gov to request the publication or call 301-504-6559. This is a 4-page list of publications and bibliographies available at the National Agricultural Library. It covers production alternatives, agritourism and marketing.

Ag Opportunities: Small Farms, New Family Farms and Agricultural Alternatives. University of Missouri Outreach. Missouri Alternatives Center. This is a "Choosing Your Enterprises: A checklist." Go to http://agebb.missouri.edu/mac.

Videocassettes in the NAL Collection Pertaining to Alternative Farming Systems. Compiled by Mary Gold, AFSIC. A 22-page listing of videos that was published in 1995 and recently another listing in 2000. There are no duplications in the two listings. Go to www.nal.usda.gov/afsic for the online publications, email: afsic@nal.usda.gov to request the publication or call 301-504-6559.

Small Farms@USDA. Web site with links to other organizations, funding opportunities and information on USDA small farm activities. Go to: www.usda.gov/oce/smallfarm/hotlinks.htm (See Tab XVIII)

Small Farm Center. University of California, Davis. The Center publishes a quarterly newsletter and other publications associated with small farm activities and agritourism. For information, call 530-752-8136 or email sfcenter@ucdavis.edu. For on line information go to: www.sfc.ucdavis.edu. (See Tab XVIII)

Missouri Alternatives Center. University of Missouri web site for alternative agriculture and agritourism publications, links and mailing addresses. For information call 314-882-1905 or go to: www.agebb.missouri.edu/mac. (See TAB XVIII)

Appropriate Technology Transfer for Rural Areas. It is the national sustainable farming information center operated by the private nonprofit National Center for Appropriate Technology. For information call 800-346-9140 or go online for publications and links to other sites at www.attra.org. (See TAB XVIII)

Greenbook '99 A Decade of Tools. Minnesota Department of Agriculture. Call 651-215-0367 or email: prescott.bergh@state.mn.us for the 2000 report. This publication is 152 pages about how farmers are adopting energy and sustainable agricultural alternative enterprises. It is stories about how people are applying alternative sustainable enterprises.

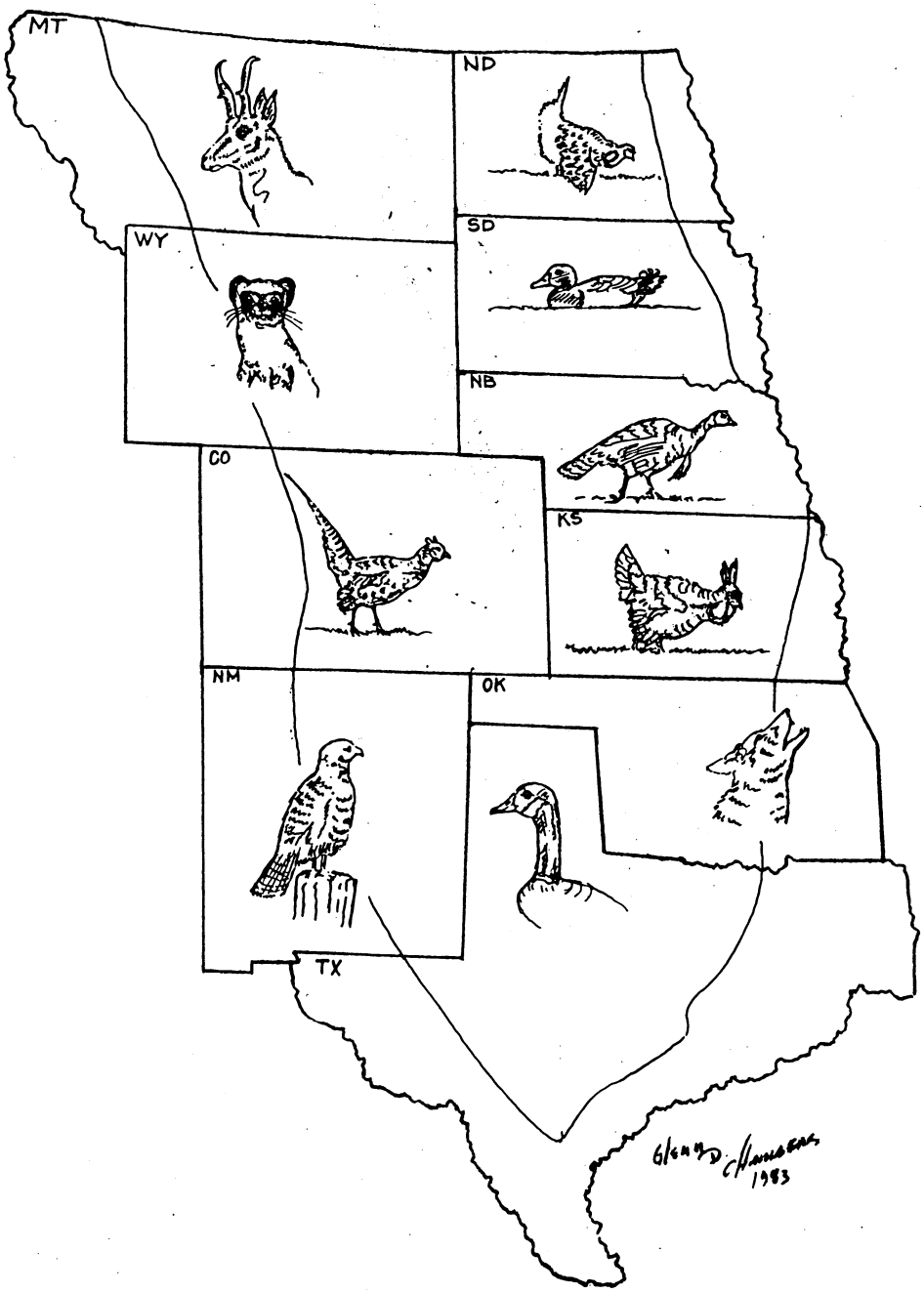
ACRES U.S.A. A monthly publication on commercially viable organic, sustainable farming, livestock, herb production and more. Call 1-800-355-5313 for a free catalog and copy.

Alternative Enterprise and Agritourism: Farming for Profit and Stewardship. NRCS Information Sheet. This a 4-page information sheet and a shorter version of the above paper. Additional copies can be made or ordered by calling 1-888-LANDCARE. See TAB I for a copy.

Guidelines for

Increasing Wildlife On Farms and Ranches

With Ideas for Supplemental Income Sources for Rural Families



Great Plains Agricultural Council
Wildlife Resources Committee

Cooperative Extension Service
Kansas State University

GUIDELINES FOR INCREASING WILDLIFE ON FARMS AND RANCHES

With Ideas for Possible Supplemental Income Sources for Rural Families

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ON PRIVATE LANDS

SYMPOSIUM PROCEEDINGS
AUGUST 5-7, 1996
AUBURN UNIVERSITY
AUBURN, ALABAMA

EDITOR: RHETT JOHNSON

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PREFACE

Four years after a very successful Symposium on Fee Hunting held at Clemson University in 1989, members of the Private Lands Committee of the Southeastern Section of The Wildlife Society began to discuss the possibility of a subsequent meeting, broadening the scope to include all economic aspects of wildlife management on private lands. At the Committee meeting in Biloxi at the 1994 Southeastern, I agreed to help put such a meeting together in Alabama, hosting it at Auburn University. Committee members involved in the planning phase included Rick Busch from Virginia's Department of Wildlife and Inland Fisheries, Fred Kinard of Westvaco Corporation, Mickey Easley of Wyncreek Plantation, Jim Miller, USDA Natural Resource and Environment Extension, Kirby Brown of the Texas Parks and Wildlife Department, and Dave Guynn and Greg Yarrow of Clemson University and coordinators of the 1989 Fee Hunting Symposium. Other early contributors included Pete Bromley and Lee Stribling from N.C. State and Auburn University, respectively.

The response to the "Call for Papers" was excellent and covered the variety of topics we wanted to feature. Topics included evaluations of the economic impacts of hunting and fishing, animal damage costs and control, the economic ramifications of endangered species protection, economic returns from wildlife management, natural resource entrepreneurship, hunting lease values and concerns, and landowner liability. The only disappointment was a dearth of papers on non-consumptive wildlife recreation and the potential economic benefits for private landowners. Papers came from a variety of regional and national universities, game and fish agencies around the region, environmental groups, forest industries and independent biologists.

The audience was equally diverse, with all of the aforementioned represented and attendees coming from nearly every southern state. In addition, requests from non-attendees for these Proceedings come in on a regular basis. The interest displayed by the natural resources community in this relatively newly recognized and evolving aspect of the wildlife profession suggests that subsequent symposia might be appropriate.

Greg Yarrow, Conference Coordinator for the Clemson Fee Hunting Symposium, kicked off the program with an introduction and the rationale for this meeting and we were off and running for three information-filled days. Too many people helped make this meeting a success to recognize all, but particular thanks go to Mickey Easley, Fred Kinard, Dave Guynn, Greg Yarrow, Tommy Counts, Chris Isaacson, Keith Hudson, and Susan Moll for their assistance and support.

Rhett Johnson

WILDLIFE AND THE AMERICAN MIND

Public Opinion on and Attitudes toward Fish and Wildlife Management

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- David Sarkozi's Birds of the Upper Texas Coast (with an amazing amount of great links; be sure and check this one out!) <http://texasbirding.simplenet.com/>
- Migration Over the Gulf Project (amazing quantitative data on migratory birds and insects tallied from off-shore oil platforms in the Gulf of Mexico) <www.transgulf.org>
- Archives of Passport to Texas <www.passporttotexas.com>
- Shorebirds, wetlands, and more, try Manomet Bird Observatory <www.manomet.org> or <www.mesc.usgs.gov/shorebirds/> for more information on shorebirds
- Whooping Cranes at Aransas NWR <www.electrotex.com/aoc/>
- Attwater's Prairie-Chickens <http://southwest.fws.gov/refuges/texas/apc.html>
- Environmental Protection Agency's (EPA) bird conservation Web site <www.epa.gov/owow/birds>
- Backyard bird feeding <www.fws.gov/r9mbmo/pamphlet/feed.html>
- Providing homes for birds <www.fws.gov/r9mbmo/pamphlet/house.html>
- Bird Identification Web site that is just like a field guide, try the USGS <www.mbr.nbs.gov/id/framlst/framlst.html>
- Backyard bird problems/nuisances <www.fws.gov/r9mbmo/pamphlet/prob.html>
- Problems with cormorants, try the USFWS home page <www.fws.gov/index.html> or for a more specific fact sheet <www.fws.gov/r9mbmo/issues/cormorant/fish%5Fimpacts.html>
- Problems with an urban heronry/rookery (coming to this Web site in mid-2000) <www.tpwd.state.tx.us/nature/birding>
- Waterfowl and wetland information <www.ducks.org>
- Alpha Codes used by banders and birders <www.pwrc.usgs.gov/bbl/manual/aspeclst.htm#E>
- Gulf Coast Bird Observatory <www.gcbo.org>
- Land Trust Alliance information <www.lta.org>
- Texas Department of Transportation county maps <www.lib.utexas.edu/Libs/PCL/txdot/TXDOTCounty.html>
- Information on flying birds striking towers, wires, buildings, etc. <www.towerkill.com>
- Information on constructing a wastewater wetland for birds and other wildlife <www.humboldt.edu/~ere_dept/marsh/ownmarsh.html#top>

Over Forty Useful and Interesting Web Sites on Birds and Bird Conservation

(Listed in no particular order)

- Texas Parks and Wildlife Birding Page (lots of great information; don't miss checking out this site!) <www.tpwd.state.tx.us/nature>
- Partners In Flight <www.partersinflight.org> and the Colorado Bird Observatory <www.cbobirds.org/pif/index.html>
- American Bird Conservancy <www.abcbirds.org>
- The Great Texas Birding Classic <www.tpwd.state.tx.us/nature/birding/bclass/index.htm>
- International Migratory Bird Day information and so much more, try the American Birding Association's Web site <www.americanbirding.org>
- World Birding Center <www.tpwd.state.tx.us/nature/birding/wbc.htm>
- North American Bird Conservation Initiative (NABCI) <http://rfi.on.ca/cec/about_frame.htm>
- Conservation and Reinvestment Act (CARA; formerly called Teaming With Wildlife where, if approved/passed, millions of dollars in secured funding will go towards nongame conservation and more) <www.teaming.com>
- Physiographic Regional maps for Partners In Flight <www.cast.uark.edu/pif/main/maincont.htm>
- Bird Species Management Abstracts by The Nature Conservancy's "Wings of the America" project <http://www.tnc.org/wings>
- Breeding Bird Lab <www.mbr.nbs.gov/bbs/bbs.htm> and <www.mp2-pwrc.usgs.gov/bbs/>
- Christmas Bird Count data, Project Feeder Watch, and many other great Cornell Lab of Ornithology citizen science projects <http://birdsource.tc.cornell.edu> and <www.birds.cornell.edu>
- Migratory songbird conservation <www.fws.gov/r9mbmo/pamphlet/songbird.html>
- Free-roaming domestic cats and their effect on native wildlife <www.dfg.ca.gov/hcpb/feralcat.html> and <www.abcbirds.org/catindoo.htm>
- Updates on Legislation, Regulation and Policy matters affecting birds <www.nmnh.si.edu/BIRDNET>
- Texas Ornithological Society (TOS) Web site <http://www.io.com/~pdhulce/tos/tos.html>
- Archives for the listserv "Texbirds" <www.audubon.org/listserv/TEXBIRDS.html>
- Aplomado Falcon reintroduction in Texas information, try the Peregrine Fund's Web site <www.peregrinefund.org/conserv_aplomado.html>
- Purple Martin Conservation Association <www.purplemartin.org>
- Hawk Watches in Texas <www.electrotex.com/aoc/>
- Information on bird diseases, mortality and health <www.emtc.nbs.gov/nwhchome.html>

Wildlife Management

for Missouri Landowners

Third Edition

with updated grass/legume recommendations

Missouri Department of Conservation

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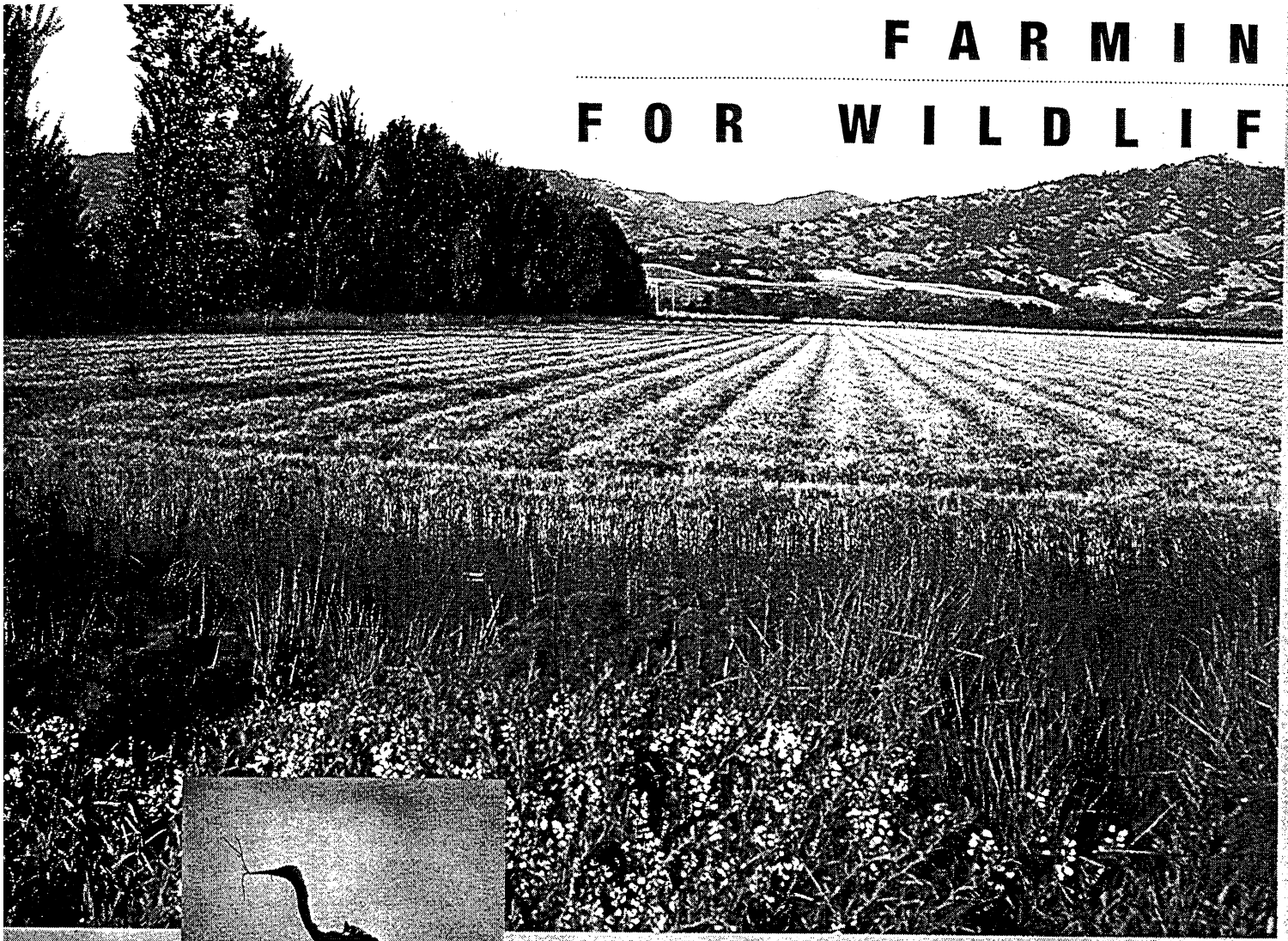

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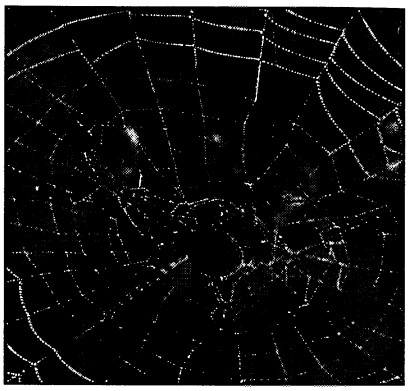

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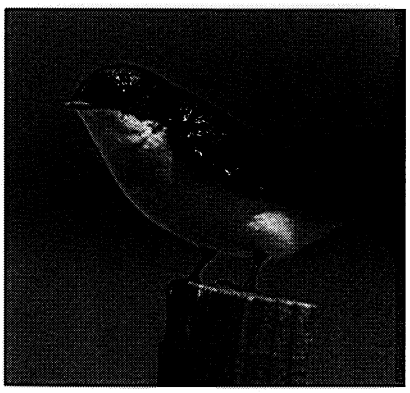

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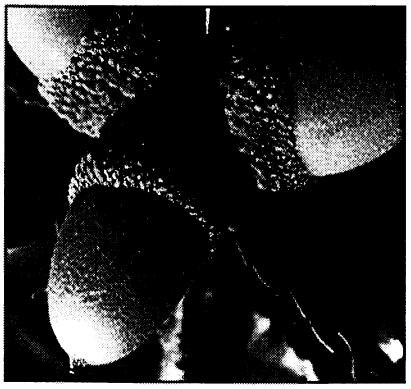

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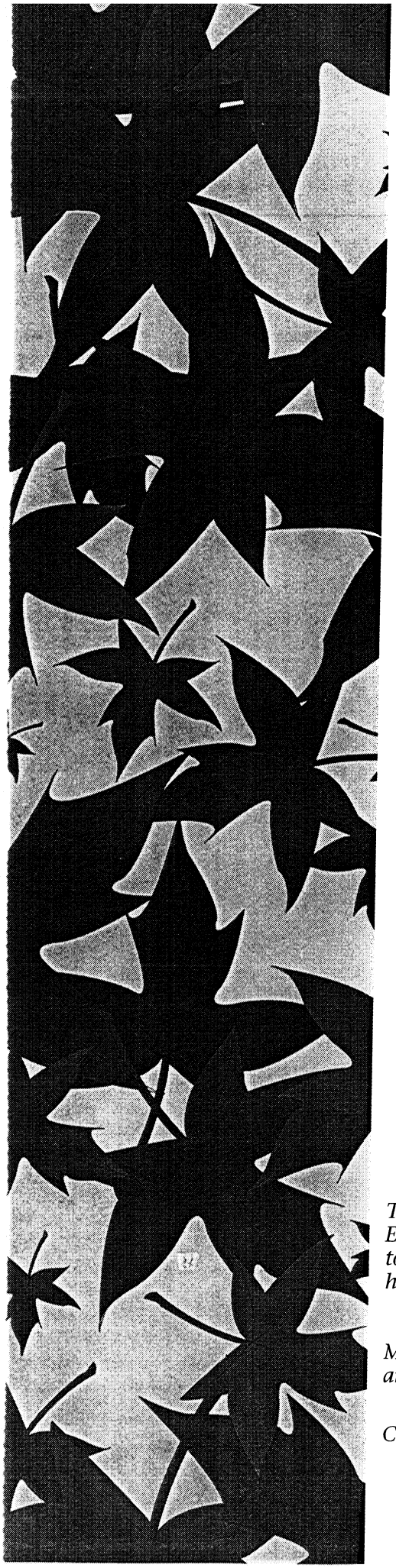
Establishing a Birding-Related Business

A Resource Guide



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Texas Parks and Wildlife Department

This report was funded in part by grants from the Renewable Resources Extension Act and the Trull Foundation. We would like to express our gratitude to the many individuals who were interviewed for this report. Their insights will help others who are considering developing birding-related businesses.

Many of the photos in this publication were taken by Bert Frenz. The authors are grateful for his permission to use them.

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Birdwatching is the fastest growing outdoor recreation activity in the United States (Outdoor Recreation Coalition of America, 1996). Many communities are enjoying substantial economic benefits from visiting birders. This has led many landowners and communities to consider establishing birding and wildlife watching enterprises and events as a means of generating income. Attracting birders and nature tourists is one way to diversify a landowner's income and a community's economic base.

Birding and nature tourism are also compatible with environmental preservation. They take advantage of natural scenic areas and habitats that attract specific bird species.

As with any business, success depends on understanding the industry and the customers one is trying to reach. The purpose of this guide is to present current information about the birding industry and birders themselves, and to help those who may want to establish birding-related enterprises.

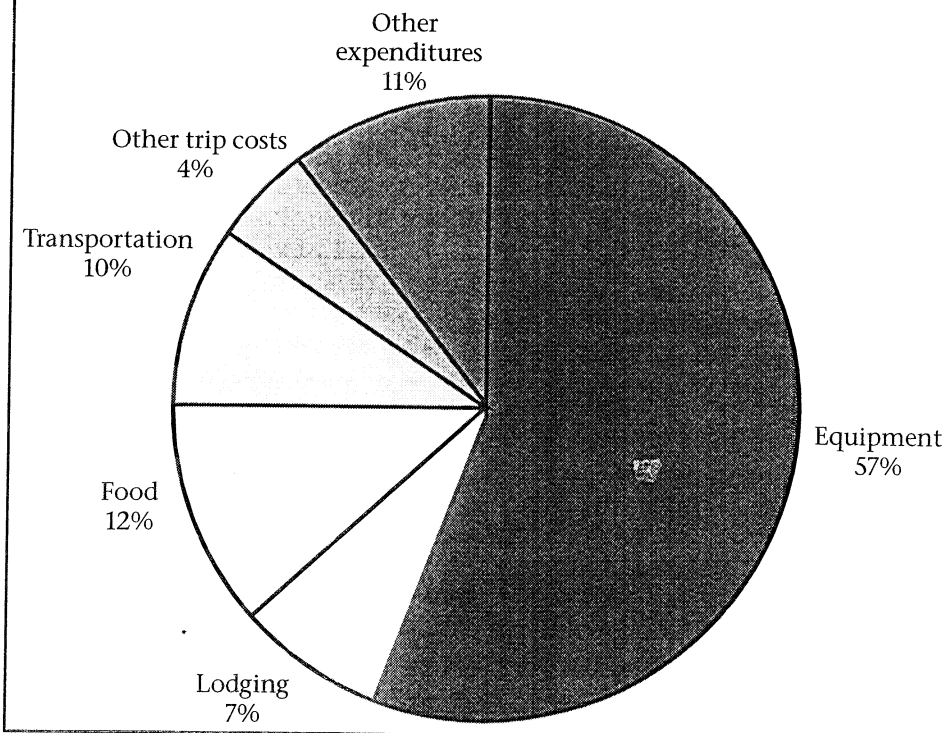
Information in this publication came from several studies, including the *1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation* (referred to as the National Survey), and the *1993-1994 National Survey of Recreation and the Environment* (referred to as *NSRE*).

Understanding the Birding Market

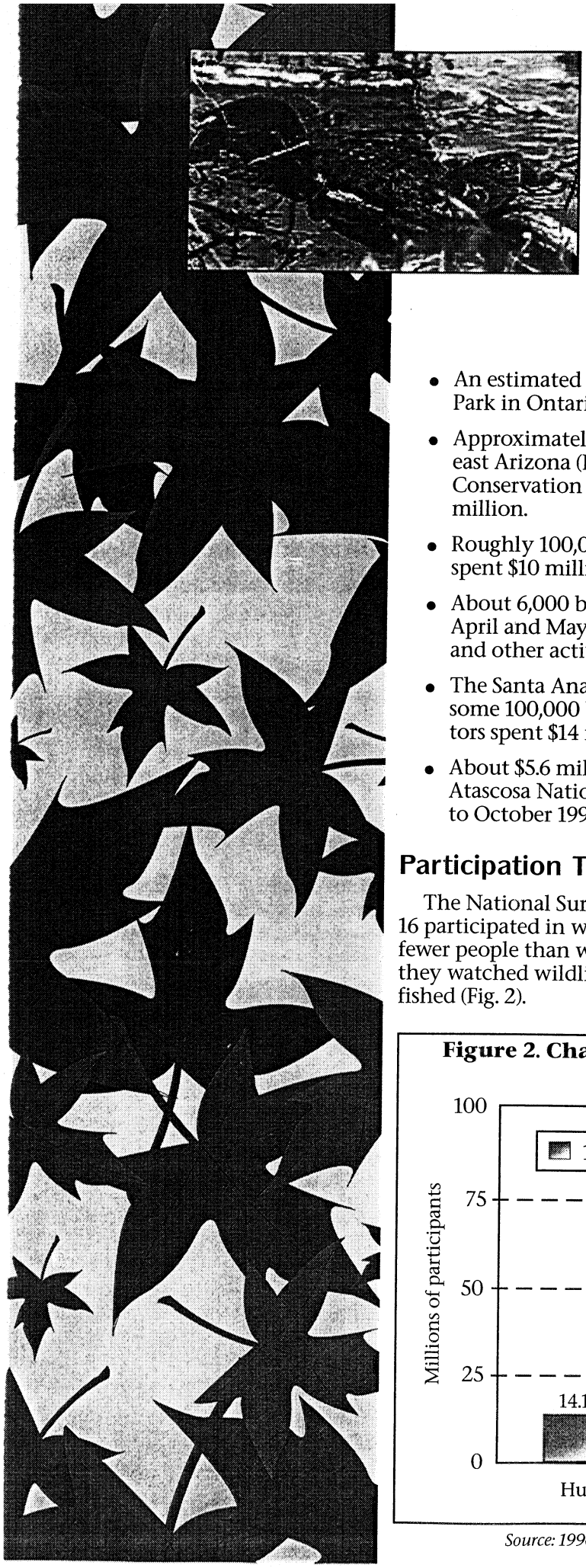
Economics

The *National Survey* reported that, in 1996, Americans spent approximately $31 billion on observing, feeding and photographing wildlife. Trip-related expenditures accounted for more than $9 billion (33 percent) of that total. Figure 1 shows a detailed breakdown of how wildlife watchers spent their money. "Other trip costs" includes such things as guide fees and public land use fees. "Other expenditures" includes magazines and books, membership dues, contributions, land leasing and ownership, and plantings.

Figure 1. Expenditures in the U.S. for Wildlife Watching: 1996.



Source: 1996 National Survey of Fishing, Hunting and Wildlife-Associated Recreation



Wildlife watchers spent an average of $554 per person for these activities in 1996, far less than the average amounts spent by hunters ($1,497) or anglers ($1,112). Still, wildlife watchers, particularly birders, generate substantial income for some communities and landowners.

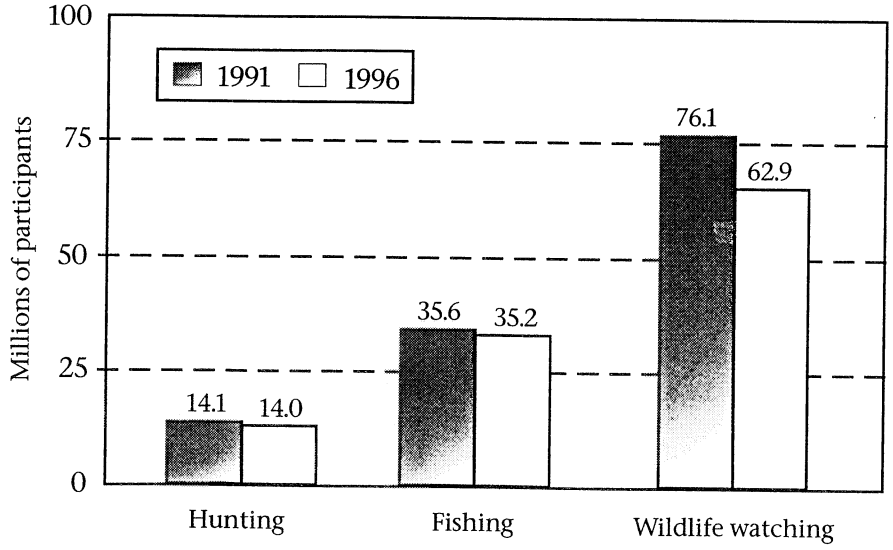
For example:

- The annual Hummer/Bird Celebration in Rockport/Fulton, Texas, attracted 4,500 visitors in 1995. They spent more than $1.1 million during the 4-day event (an average of $345 each). Of this amount, $316,000 was spent on lodging, $237,000 on meals in restaurants, and $278,000 on shopping.
- An estimated 20,000 birders spent $3.8 million at Point Pelee National Park in Ontario during May 1987.
- Approximately 38,000 people visited two birding "hot spots" in southeast Arizona (Ramsey Canyon and San Pedro Riparian National Conservation Area) from July 1991 to June 1992 and spent about $1.6 million.
- Roughly 100,000 birders visited Cape May, New Jersey in 1993 and spent $10 million.
- About 6,000 birders traveled to the High Island area of Texas during April and May of 1992 and spent more than $2.5 million for lodging and other activities.
- The Santa Ana National Wildlife Refuge near McAllen, Texas attracted some 100,000 birders from November 1993 to October 1994. These visitors spent $14 million in the area.
- About $5.6 million was spent by the 48,000 people who visited Laguna Atascosa National Wildlife Refuge in south Texas from November 1993 to October 1994.

Participation Trends

The National Survey reported that 63 million Americans over the age of 16 participated in wildlife watching in 1996. Although this is 17 percent fewer people than was reported in 1991, the number of Americans who said they watched wildlife far outnumbered those who said they hunted or fished (Fig. 2).

Figure 2. Changes in Outdoor Recreation Participation: 1991-1996.



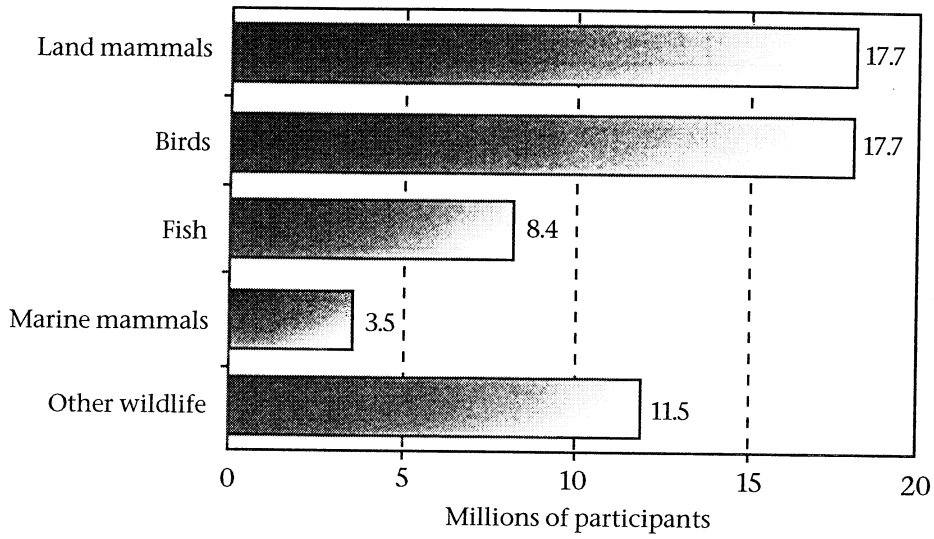
Source: 1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation

Of these 63 million Americans, 23.7 million said they traveled more than 1 mile from home to observe, photograph or feed wildlife. These are considered non-residential wildlife watchers. Residential wildlife watchers (some 61 million) are those who enjoyed wildlife watching within a mile of their homes.

The residential wildlife watchers said they fed birds or other wildlife (54 million), observed wildlife (44 million), photographed wildlife (16 million), maintained special plantings or natural areas for wildlife (13 million), and visited public parks (11 million). Almost all the residential wildlife watchers (96 percent) said they observed birds; many (87 percent) also like to observe mammals.

The non-residential wildlife watchers reported feeding wildlife (10 million), observing birds (18 million), and photographing wildlife (12 million). During their trips to observe wildlife, an equal number were interested in birds and land mammals (Fig. 3).

Figure 3. Types of Wildlife Observed During Non-residential Trips: 1996.



Source: 1996 National Survey of Fishing, Hunting and Wildlife-Associated Recreation

Only 25 percent of Texans said they engaged in wildlife watching in 1996, and the number of Texans who were non-residential wildlife watchers had decreased from 1.5 million to 1.3 million since 1991. However, Texas is a prime **destination** for wildlife watchers from across the country and around the world. About 1.4 million Americans said they traveled to Texas to observe wildlife (primarily birds). Only California, Pennsylvania and Florida attract more wildlife watchers. These visitors spent about $1.2 billion on wildlife watching in Texas.

Table 1 shows the rates of participation in wildlife watching among the U.S. population in 1996 (National Survey).

Birdwatching Trends

The number of Americans 16 years of age and older who watch birds grew from 21 million in 1982 to more than 54 million in 1994—a 155 percent increase (Fig. 4). However, it is important to keep these figures in perspective.

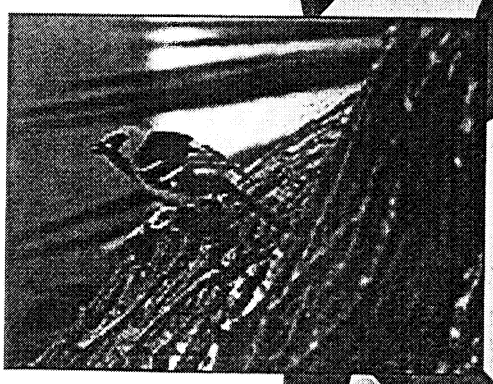
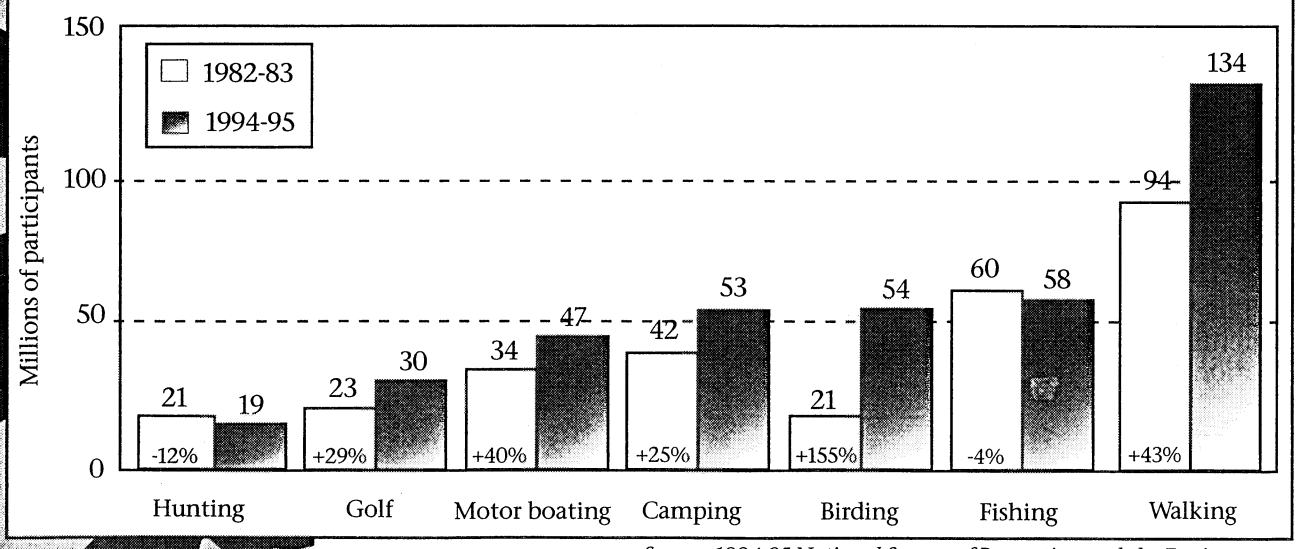


Table 1. Rates of Participation in Wildlife Watching.

Characteristics	% Engaging in residential wildlife watching	% Engaging in non-residential wildlife watching
Total U.S. population	**30.1**	**11.7**
Gender		
Male	29.0	12.1
Female	31.2	11.4
Race/Ethnicity		
Anglo-American	33.8	13.2
African-American	10.3	2.5
All others	14.7	7.3
Age		
16 to 17 years	17.6	8.6
18 to 24 years	14.6	8.5
25 to 34 years	26.4	13.0
35 to 44 years	34.4	15.5
45 to 54 years	34.4	14.8
55 to 64 years	35.5	10.6
65 years and older	32.2	6.0
Level of education		
11 years or less	20.6	5.4
12 years	27.2	8.9
1 to 3 years college	32.3	13.2
4 years college	35.1	15.6
5 years or more college	43.2	22.0
Annual household income		
Less than $10,000	22.1	5.8
$10,000 to $19,000	25.7	9.7
$20,000 to $29,999	29.6	11.7
$30,000 to $39,999	32.3	13.1
$40,000 to 49,999	36.1	14.4
$50,000 to $99,999	36.0	16.2
$100,000 or more	37.4	17.0

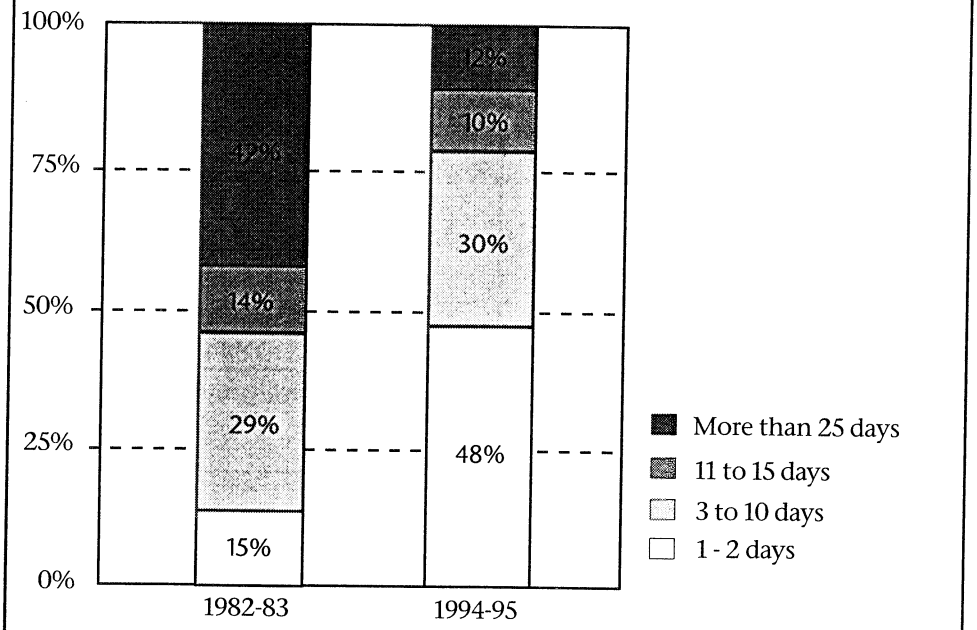
Figure 4. Changes in Participation in Selected Outdoor Recreation Activities: 1982-1994.



Source: 1994-95 National Survey of Recreation and the Environment

While the overall number of birders has increased, the average number of days per year they spend birdwatching may have decreased (Fig. 5). According to the *NSRE*, 42 percent of those who said they birdwatched in 1982 reported doing so on 25 or more days that year. Only 15 percent said they observed birds on just one or two occasions. In 1993 the percentages were very different—only 12 percent of birders reported spending 25 or more days on the activity and nearly 50 percent said they went bird watching on only one or two days.

Figure 5. Comparison of Days Spent Birdwatching: 1982-94.



Also, these data from the *NSRE* don't reveal whether people were residential or non-residential bird watchers. There are far more bird watchers who do so close to home than who travel to watch birds (*National Survey*).

Finally, there is wide variation in the skills and commitments of birders. A national study of birders reported that 60 percent of those who had gone birding in the last 2 years said they could identify ten or fewer species of birds (Fig. 6). Only 3.2 percent could identify more than 40 birds; only 30 percent said they used binoculars; and only 4 percent said they used a field guide.

So it is important for landowners and communities to be realistic about the birdwatching market. Despite the fact that a large number of Americans say they birdwatch, only a small percentage of them is committed to the activity in a serious way.

Characteristics of Wildlife Watchers and Birders

In Table 2, the demographic characteristics of residential and non-residential wildlife watchers are shown (*National Survey*). This a breakdown of the data in Table 1 for the 41.8 percent of the U.S. population who said they participated in either residential or non-residential wildlife watching. Characteristics of these groups are compared to characteristics of members of the American Birding Association. ABA members are generally serious birders, almost all of whom could be expected to travel away from home to watch birds.

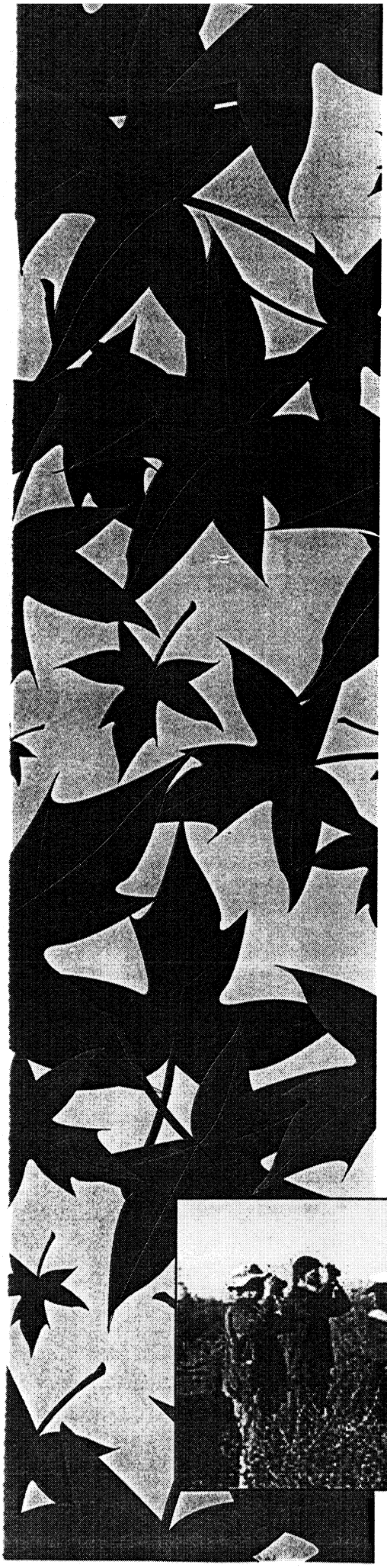
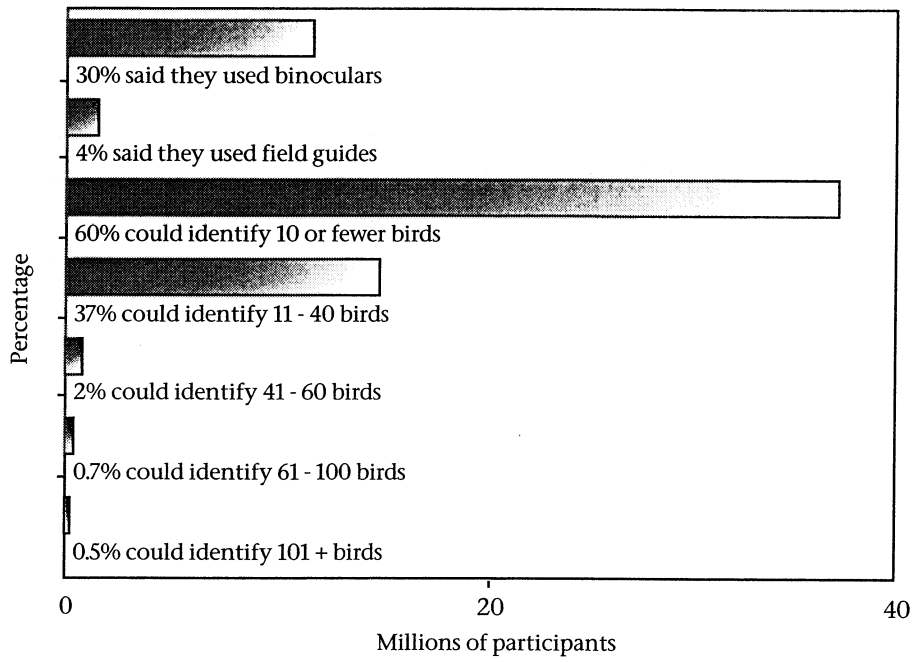


Figure 6. Characteristics of Birders.

"Of the 43 million Americans who said they birdwatched during the last two years . . ."



Source: Kellert, 1985

From this table we can see that those who travel away from home to watch wildlife tend to be Anglo-American, 25 to 54 years old, have at least a high school education, and have incomes of about $40,000 or more

Among the ABA members, 66 percent are male, 25 percent are 65 or older, most have a college degree or graduate degree, and 27 percent have annual household incomes of $100,000 or more.

Kinds of Birdwatchers

Birdwatchers are not all alike. Knowing the different segments of the birdwatching population can help landowners and communities create and promote attractions for particular segments of the market. The two studies discussed below shed light on the various kinds of birdwatchers.

1994 Study of Birders in Alberta, Canada (McFarlane, 1994)

Birders were asked about their birding habits, perceived skill levels, number of species on their life lists, number of birding magazines to which they subscribed, and the total value of their birdwatching equipment. From this data, the researcher identified four distinct groups of birders: casual birders; novice birders; intermediate birders; and advanced birders (Table 3).

Casual birders comprised 43 percent of the respondents. They had the lowest level of skill and experience, and had invested the least in equipment. They were motivated by an appreciation for birds and nature (43 percent), their desire to learn about and conserve the environment (39 percent), and their desire to improve their birdwatching skills (17 percent). Only 33 percent of them main-

Table 2. Demographic Characteristics of Wildlife Watchers and ABA Members.

Characteristics	Unites States population %	Residential participants %	Non-residential participants %	ABA members %
Gender				
Male	48.0	46.2	50.0	65.9
Female	52.0	53.8	50.0	34.1
Race/Ethnicity				
Anglo-American	83.1	93.1	93.3	98.3
African-American	9.3	3.2	1.9	0.0
All others	7.6	3.7	4.7	1.7
Age				
16 to 17 years	3.5	2.1	2.6	0.0
18 to 24 years	10.1	4.9	7.3	0.4
25 to 34 years	17.4	15.2	19.3	5.6
35 to 44 years	22.0	25.2	29.1	20.1
45 to 54 years	17.8	20.3	29.1	30.4
55 to 64 years	11.6	11.5	7.7	18.2
65 years and older	17.6	18.8	8.9	25.0
Level of education				
11 years or less	16.8	11.5	7.7	0.5
12 years	35.3	31.8	26.9	4.0
1 to 3 years college	22.3	24.2	25.5	18.6
4 years college	13.9	16.2	18.4	34.4
5 years or more college	11.4	16.4	21.5	42.5
Annual household income				
Less than $10,000	9.2	6.4	4.1	1.6
$10,000 to $19,000	12.1	9.7	8.9	1.2
$20,000 to $29,999	15.6	14.4	13.9	8.9
$30,000 to $39,999	14.3	14.4	14.2	10.9
$40,000 to 49,999	11.2	12.6	12.3	11.9
$50,000 to $99,999	29.1	32.7	35.7	38.5
$100,000 or more	8.5	9.9	10.9	26.9

tained lists of birds they had identified. However, 41 percent had participated in organized bird censuses.

Thirty-eight percent of respondents were **novice birders**. They had greater skill and commitment than the casual birders. Their motivations were: learning about and conserving the environment (46 percent); appreciation for birds and nature (28 percent); and improving their birdwatching skills (25 percent). Fifty-six percent kept lists of birds and had participated in bird censuses.

Intermediate birders made up 12 percent of the people in the study. They were more skilled and committed than both casual and novice birders. Like novice birders, they were motivated primarily by conservation (40 percent). However, many also wanted to improve their birding skills and see new or rare species (37 percent). About 23 percent were motivated by an appreciation of birds and nature. Three out of four said they listed birds, and seven out of ten had participated in bird censuses.

Advanced birders comprised only 7 percent of respondents. They had the highest skill and experience levels. More than half were motivated by a desire to improve their skills and see new or rare species (55 percent). One-third wanted to learn about and conserve the environment. A large percentage of them (91 percent) kept lists of birds they had seen. Nearly eight out of ten had participated in bird censuses; in addition, many of them had led bird walks and made presentations.

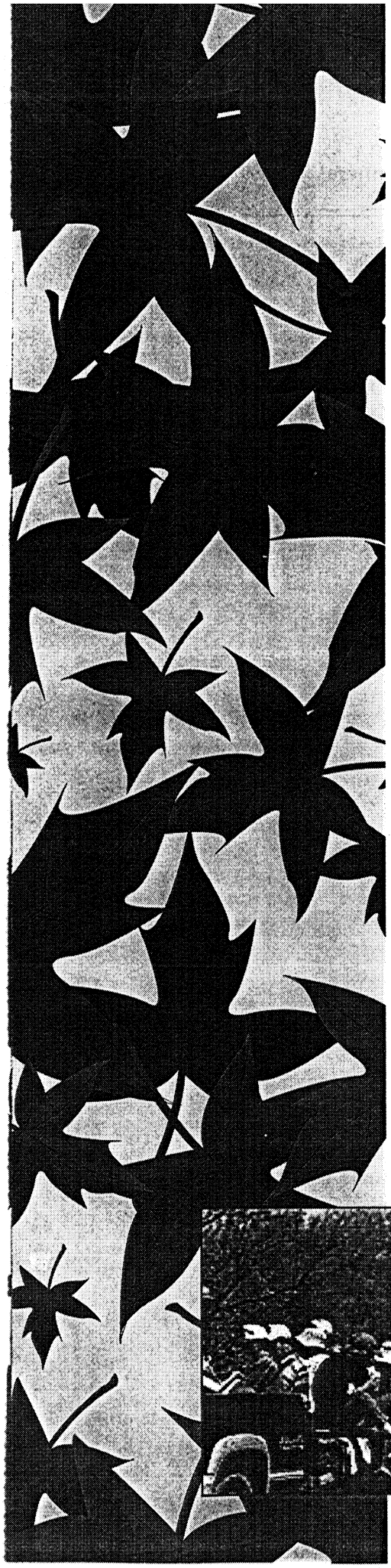


Table 3. Characteristics of Birder Groups Identified by McFarland.

Characteristic	Casual birders	Novice birders	Intermediate birders	Advanced birders
Days on birding trips in 1991 (*M*)	0.98	8.60	48.03	96.47
Perceived skill level (4-point scale from casual to advanced) (*M*)	1.90	2.72	3.17	3.38
Number of species on life list (*M*)	3.29	33.95	65.46	362.82
Number of birding magazine subscriptions (*M*)	0.04	0.16	0.39	2.32
Replacement value of equipment (9 categories from $0 to >$5000) (*M*)	1.32	3.05	3.03	5.07
Farthest distance traveled to go birding in 1991 (6 categories from 0 to >500 km) (*M*)	0.55	2.16	3.87	3.95

Adapted from McFarland, 1996

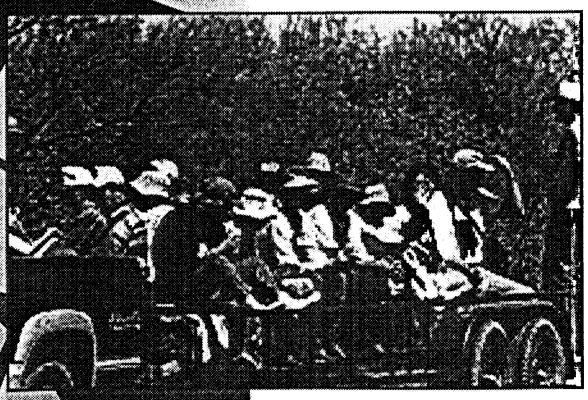
1996 Study of Visitors to the Annual Hummer/Bird Celebration in Rockport/Fulton, Texas (Scott, et al., 1996)

Based on answers to a survey, visitors to this event were categorized into four groups (Table 4).

Twenty-one percent of survey respondents were **generalists and water seekers**. They are not highly skilled birders, take relatively few birding trips, and do not spend a great deal of money on birding. They are attracted to places where they can enjoy water activities such as fishing and marine life tours, as well as nice lodging and restaurants. They like to combine birding with shopping, visiting small towns and historic sites, and other outdoor recreation. They especially like coastal areas.

Heritage recreationists and comfort seekers also are not highly skilled or committed birders. They made up about 40 percent of those surveyed. This group is attracted to communities that can provide heritage tours or historical sites, as well as birding opportunities, along with a restful environment and comfortable amenities. They are not interested in other outdoor activities. These individuals spend more money on trips than other groups.

Outdoor recreationists are relatively skilled birders. Twenty-five percent of the visitors in the survey were in this group. They are more likely than other birders to make trip decisions on the basis of other outdoor recreation available nearby. That is, outdoor recreationists are likely to birdwatch while involved in other activities such as canoeing, hiking, camping and biking. These individuals have little interest in shopping, visiting historic sites or seeking comfortable amenities.



The fourth group was the **serious birders**, who made up 14 percent of the festival visitors. They are the most skilled and the most involved in birdwatching, and travel approximately 1,975 miles per year to pursue their hobby. Their inter-

Table 4. Characteristics of Birder Groups Surveyed at Hummer/Bird Celebration

Characteristics	Generalists and water seekers	Heritage recreationists and comfort seekers	Outdoor recreationists	Serious birders
Number of birding trips taken last year (*M*)	6	9	14	28
Miles traveled last year to go birding (*M*)	667	1,415	1,930	1,976
Money spent last year on birding (*M*)	$335	$778	$1,134	$1,727
Number of field guides owned (*M*)	2.2	3.8	3.8	7.9
Number of organizational memberships (*M*)	0.6	1.4	1.4	1.8
Percent who keep a life list	15%	31%	37%	50%
Species able to identify by sight (*M*)	37	60	119	150
Total expenses at H/B Celebration (*M*)	$254	$353	$242	$289

M = Mean

Source: Scott et al., 19

ests are highly specialized. In short, they want to observe either new, rare, or a variety of birds, and are not overly concerned with lodging and food accommodations, shopping, or non-birding activities. While serious birders spend the most money overall for birding equipment and travel, it is interesting to note that the heritage recreationists and comfort seekers spent the most at the Hummer/Bird Celebration.

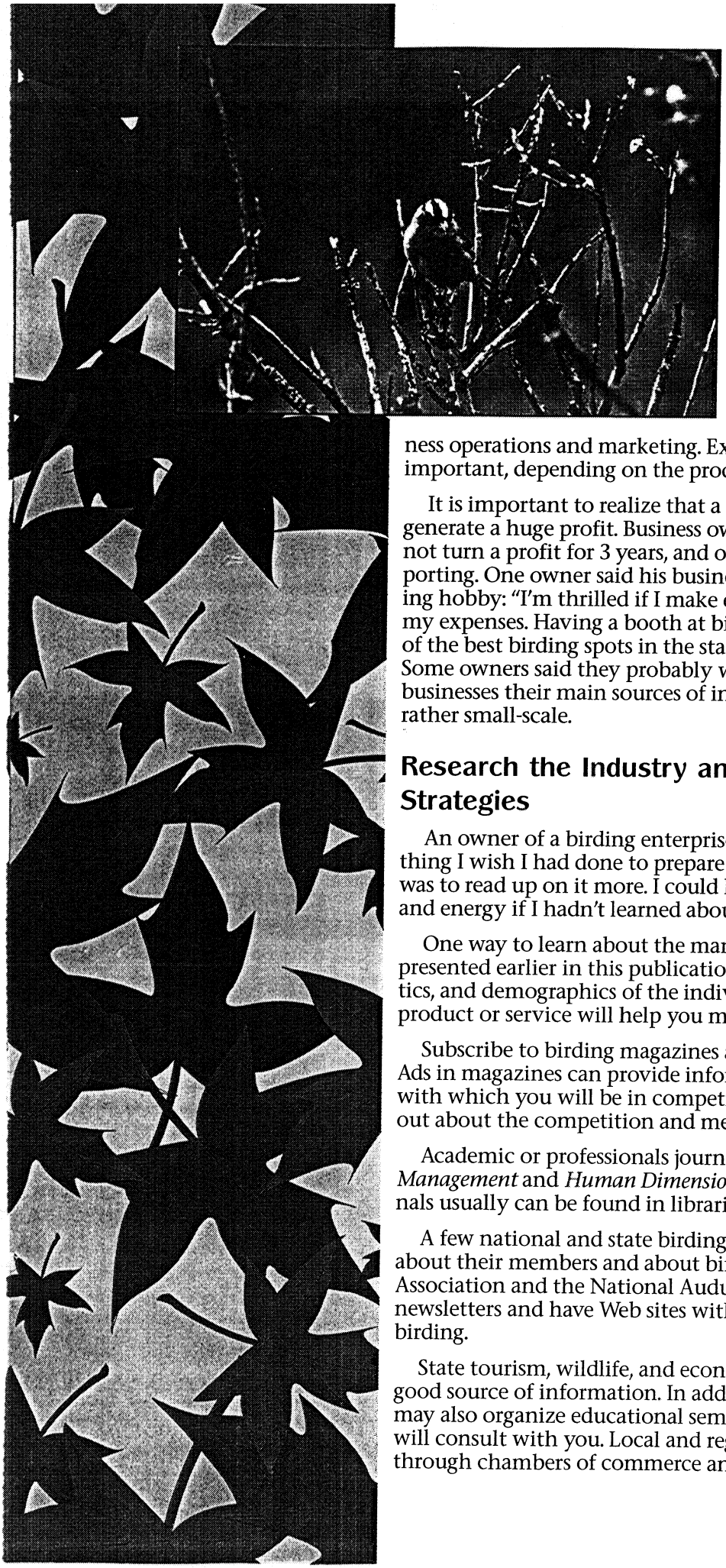
The popular media may portray all birdwatchers as being alike, but as these two studies show, there are many differences among them. Understanding the diversity among birdwatchers is helpful when developing a birding-related enterprise.

Beginning the Business

To establish any successful business you must first think about your personal motivations for starting the business. Then you should study the industry, determine the market segment you want to reach, and strategies for doing so. Deciding how to package, price and promote your product are other important decisions. The insights and experiences of people who operate birding-related businesses can be very helpful. Ideas in the following section were generated during interviews with seventeen such individuals. Five of them are birding tour guides, five own/operate birding locations and/or lodging, three are birding festival coordinators, and four own businesses that sell birding products (field guides, binoculars, birdhouses, artwork, etc.).

Recognize Your Motivations

Among the people interviewed, the most common reason for starting a birding-related business was a personal interest in nature,



particularly birding. They wanted to transform a hobby into a money-making business. A second reason, mentioned primarily by landowners, was the need to diversify economically.

While a personal interest in nature and birding is important, it is not sufficient to ensure business success. Those who cater to the public, in any business, must have a strong customer orientation. That means enjoying dealing with all kinds of people, being enthusiastic about entertaining and serving guests, having public relations skills, and having the stamina to work long hours. It is also important to be familiar with finance, accounting, business operations and marketing. Expertise at birdwatching may also be very important, depending on the product or service you offer.

It is important to realize that a birding-related business is not likely to generate a huge profit. Business owners interviewed said they typically did not turn a profit for 3 years, and often their businesses are not fully self-supporting. One owner said his business simply allows him to pursue his birding hobby: "I'm thrilled if I make enough money at these festivals to cover my expenses. Having a booth at birding festivals allows me to travel to some of the best birding spots in the state and helps pay for my associated costs." Some owners said they probably would not attempt to make their birding businesses their main sources of income, especially if their businesses were rather small-scale.

Research the Industry and Determine Marketing Strategies

An owner of a birding enterprise made the following observation: "One thing I wish I had done to prepare myself for opening this type of business was to read up on it more. I could have saved myself a lot of time, money and energy if I hadn't learned about this market the hard way."

One way to learn about the market is to study the kinds of information presented earlier in this publication. Knowing the preferences, characteristics, and demographics of the individuals who might be attracted to your product or service will help you make crucial business decisions.

Subscribe to birding magazines and analyze articles about birdwatching. Ads in magazines can provide information about products and services with which you will be in competition. Also attend birding festivals to find out about the competition and meet others who are in the birding business.

Academic or professionals journals such as the *Journal of Wildlife Management* and *Human Dimensions in Wildlife* can be helpful. These journals usually can be found in libraries at large universities.

A few national and state birding organizations provide information about their members and about birders in general. The American Birding Association and the National Audubon Society publish magazines and newsletters and have Web sites with information about the latest trends in birding.

State tourism, wildlife, and economic development agencies are another good source of information. In addition to distributing publications, they may also organize educational seminars or conferences or have experts who will consult with you. Local and regional information can be obtained through chambers of commerce and convention and visitors' bureaus.

Once you understand the birding market you can decide which segment of that market you will try to reach with your product or service. The birding market may be segmented by geographic area, demographics, skill level and commitment, or interest in particular products. Or, you may choose to market to more than one segment by developing two or more products, each with its own marketing strategy.

For example, a ranch might be habitat for a number of rare species, and have easy access to an international airport. The ranch owner might decide to pursue serious European birders as his desired market. His marketing strategy might be to advertise in European birding magazines aimed at serious birders.

Or, like the King Ranch in Texas, you might want to attract more than one market segment by offering different services for each. The ranch offers several different birding tours, from a 1-day tour for novice and intermediate birders in which the object is to see many different species, to a specialized tour for serious birders who want to see only rare species.

Develop the Product "Package"

Many birding enterprises rely on partnerships between two or more individuals or businesses. Small businesses that pool their resources often can create a more attractive product together than they could individually. Tour packages are a good example. A tour package groups several products and services to attract customers. The package might include lodging at a good birding location, meals, guided tours, etc. Some tour packages allow birders to visit areas, both public and private lands, to which they would not otherwise have access. Tour packages are attractive to customers because they include all necessary arrangements and services.

Birding festivals and events are also examples of partnerships in packaging products and services. Communities team up with members of the birding industry. The community provides the location, facilities, advertising, planning and event coordination. Members of the birding industry provide guide services, expert speakers for workshops, and products to purchase. Restaurants, hotels and non-birding businesses also can be part of these cooperative events.

The product "package" also can be quite simple; for example, a landowner might offer access to good birding habitat on a day-fee basis.

Determine the Price

Whatever the product, its price is important to potential customers. It can be complicated to set a price that strikes a balance between what the customer is willing to pay and what the business needs to charge in order to be profitable. One business owner gives this advice: "People won't always like, value or appreciate the same things you do. Just because you would be willing to pay a certain price for something doesn't mean your customers will. Check out what the competition is offering its customers and what they are charging. How does your product compare? Then price accordingly. If your price seems particularly high, make sure to point out the differences between your product and everyone else's."

Promote Your Business

Promotion helps you gain the attention of potential customers. In the birding industry, a good promotional mix includes advertising, publicity and marketing to industry insiders.

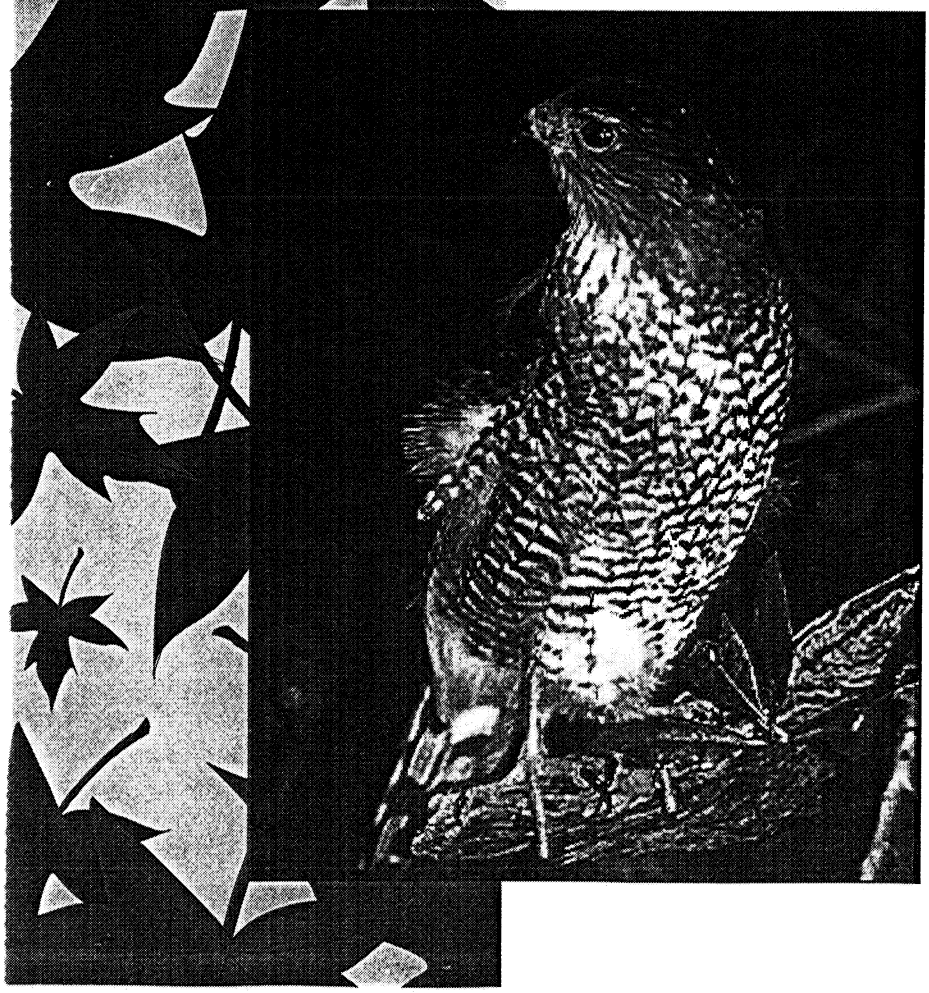
Advertising is any paid communication about a product or service through the mass media. It can be a good way to reach a wide audience. Ads should be timely, and they should be placed in media that reach the business's intended audience. The King Ranch advertises its tours in birding magazines and newsletters, and reports good response.

Karankawa Plains Outfitting Company, Prude Ranch, B-Bar-B Ranch and other businesses have developed Web pages to reach birders who are scouring the Internet for information on new birding locations. To increase their site hits, these businesses have made an effort to link their sites to different search engines that provide information on birding. Such directories are often regional in nature, and are sponsored both by individuals and by organizations such as the Texas Parks and Wildlife Department.

Birding festival organizers and large-scale tour operators often use direct mail to advertise. Costs of direct mail include purchasing mailing lists, postage and printing, but this can be an effective way to reach people in a given market segment.

Favorable **publicity** can be a powerful promotional tool for any business. An example is an article about a product or service, such as the opening of a new birding/wildlife watching business, in the state's fish and wildlife magazine or in a newspaper. News publicity has two advantages over other forms of promotion—it may influence people who are skeptical about advertisements, and it has the credibility of an unbiased news source.

Satisfying customers and gaining the acceptance of other birding business owners can be the most important way to promote your business. These **industry insiders** have information, contacts and influence that can help you succeed. An excellent way to meet and establish business relationships with others in the industry is to attend birding festivals and other events. You can also invite industry representatives to tour your location, or send them product samples, to gain their opinions and familiarize them with what you have to offer. They may then help spread the word to others.

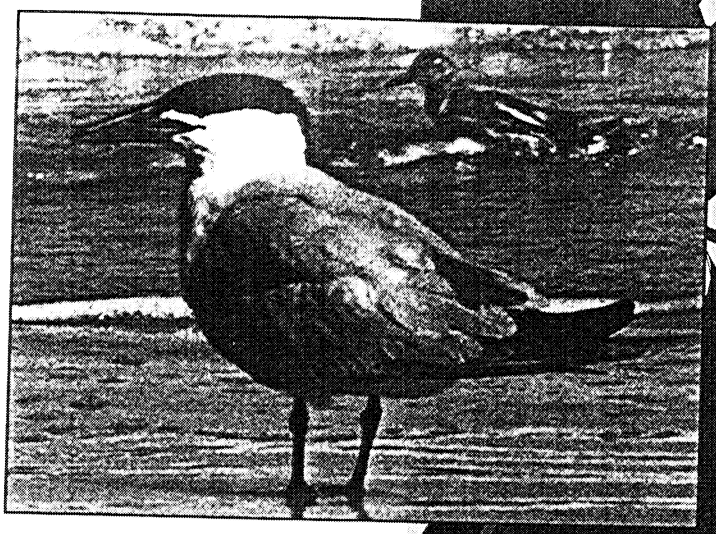


Networking with nature tourism/birding associations, chambers of commerce, and visitors' bureaus will establish relationships that can help your business.

Birders are being bombarded with information from the many new businesses established in recent years. With so many choices, they are influenced by what they hear from other birders. Positive word-of-mouth promotion may be the most effective kind of all.

One owner of a birding location/accommodation explained how customer references and her association both with industry insiders and local organizations helped her business succeed: "An individual from Texas and Parks and Wildlife explained to us that the diversity of birds and wildlife on our ranch would be attractive to birders from around the country. From there, word got around that we had sort of a birding spectacle, which resulted in visitors coming to our ranch. Because of all the interest, we looked into building an observation room and a bed and breakfast. Now we place ads in various birding magazines, which brings us a lot of customers; but many of our guests are not heavy bird-

ers. The local visitors' bureau directs many tour groups to us for general interest tours. By far, I believe that guests who told others about their positive experiences are our greatest source of advertisement."



Developing Your Unique Product

Deciding what your product will be, and then developing it, requires some research and forethought. The steps in this process are:

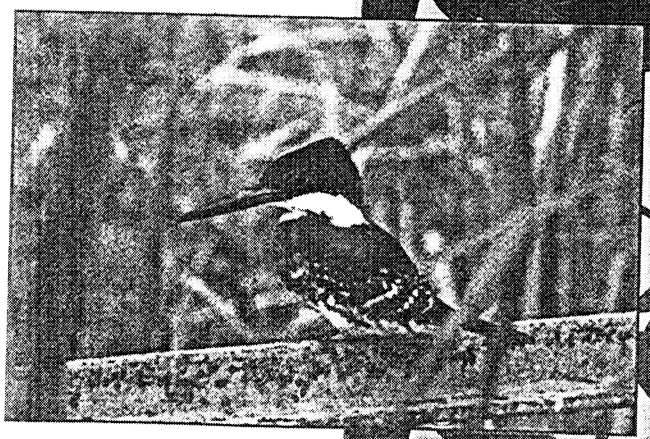
- Identifying your resources.
- Understanding what the true product is.
- Molding resources and experiences to meet customers' demands.

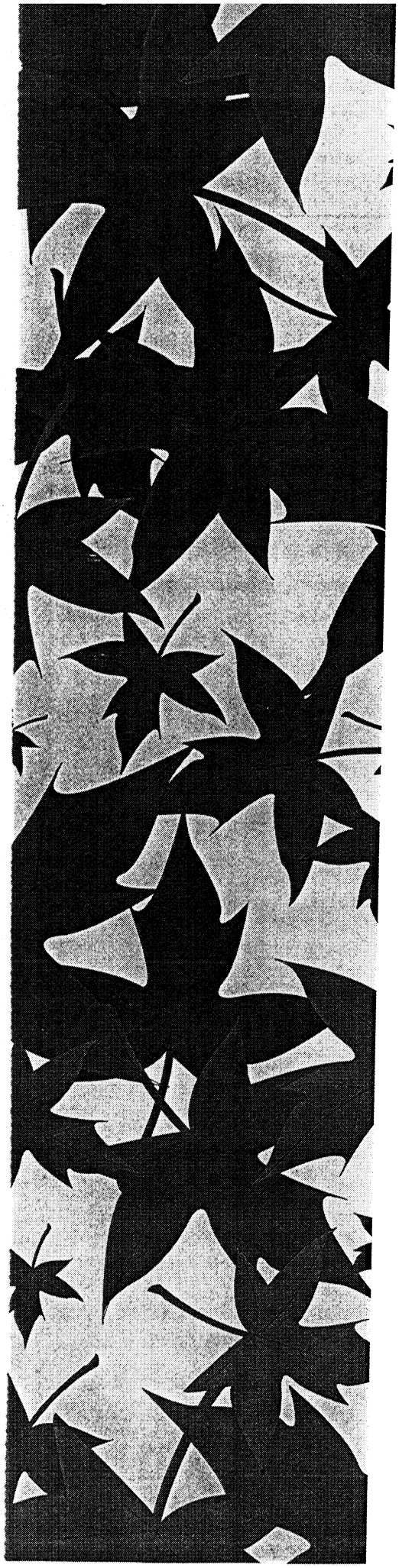
Identifying your resources means determining what it is you have to work with. To do this, list all possible resources, such as: indigenous birds on your land; facilities; business knowledge; familiarity with the outdoors; birding expertise; high quality optics; and business contacts. If you need help identifying resources, you might want to hire a wildlife biologist, wildlife consultant or expert birder to help you analyze your habitat, list the species, and evaluate your land for "birder appeal." A business consultant can help determine other resources.

Although they might not recognize it, customers of birdwatching and other nature-based recreational activities are looking for a mix of things that offers a total experience. For birders, this experience might include seeing a life bird, relaxing, enjoying beautiful surroundings, seeing new places, socializing with travel companions, and making new acquaintances. For some market segments, these and other benefits have a greater effect on customer satisfaction than the number or species of birds seen. For this reason, prospective business owners should be careful to adopt a benefits rather than a product perspective. In other words, what you have to offer is more than a product; it is an experience.

Some aspects of a birding business may be beyond human control. Weather isn't always predictable; rare and indigenous bird species may be present but not always seen; migration timing can vary. It's important to remember that while you may offer an exceptional product or service, these other factors may sometimes cause customers to have unsatisfactory experiences.

The ultimate success of a business often depends on identifying what it has to offer that meets customer demands. This seems to be especially true for the birding industry. To attract birders and their dollars, you need a rare species (or an abundance of species), a desirable atmosphere, or a special method of viewing. Your goal is to mold the resources you have with the experiences you can provide to deliver what customers want. Because not all birders are alike, your product or service may not be appealing to all birders. For examples of this, we can look again at the King Ranch and the B-Bar-B Ranch near Kingsville, Texas. The King Ranch offers a special guided tour for serious birders who want to see two rare Texas specialities—the Ferruginous pygmy owl and the Tropical parula. The tour guide concentrates on helping birders see just these two species in a minimum amount of time.





There are no rare birds to attract serious birders to the B-Bar-B, but the owners capitalize on their location along the route to South Texas and offer upscale accommodations for less devoted birders who may want a different kind of experience. Birders make up just one segment of the business's clientele. The owners recognize that their product consists of an opportunity to relax and socialize in comfortable surroundings, in addition to the birds that may be seen. Both the King Ranch and the B-Bar-B illustrate the way products should be molded from the resources and benefits you have to offer in light of the experiences customers seek.

Summary

Texas' diverse landscape and large number of bird species draw tourists and birders from all over the world. Many individuals and communities are looking for ways to profit from these visitors. Developing a birding-related business requires research, planning, business sense, personal commitment, customer relations skills, and patience. Those who succeed will recognize that this is a customer service industry; the goal is to provide an enjoyable experience for one's guests.

Sources of Information

For information on bird censuses and natural resource evaluation:

Texas Parks and Wildlife Department
Wildlife Diversity Branch
4200 Smith School Rd.
Austin, TX 78744
(512) 389-4800
http://www.tpwd.state.tx.us

Gulf Coast Birding Observatory
9800 Richmond Ave., Suite 150
Houston, TX 77042
(713) 789-GCBO
http://www.nol.net/~criley

The Nature Conservancy of Texas
P.O. Box 1440
San Antonio, TX 78295-1440
(210) 224-8774
http://www.tnc.org

For information on birding clubs:

Texas Audubon Society
2525 Wallingwood Dr., Suite 301
Austin, TX 78746-6922
(512) 306-0225
http://www.audubon.org

American Birding Association
P.O. Box 6599
Colorado Springs, CO 80934
(719) 578-1614
http://www.americanbirding.org

For information about how to develop lodging for guests:

Historic & Hospitality Accommodations of Texas
P.O. Box 1399
Fredericksburg, TX 78624
(800) 428-0368
http://www.hat.org

Texas Hotel & Motel Association
900 Congress, #201
Austin, TX 78701
1-800-856-4328
http://texaslodging.com./index.phtml

For information on the nature tourism industry:

Texas Department of Economic Development
Tourism Division
P.O. Box 12728
Austin, TX 78711-2728
(512) 462-9191
http://research.travel.state.tx.us

Texas Nature Tourism Association
812 San Antonio, Suite 401
Austin, TX 78701
(512) 476-4483
http://www.tourtexas.com/tnta

Texas Agricultural Extension Service
Recreation, Park and Tourism Sciences
Texas A&M University
2261 TAMU
College Station, TX 77843-2261
(979) 845-5419
http://agextension.tamu.edu

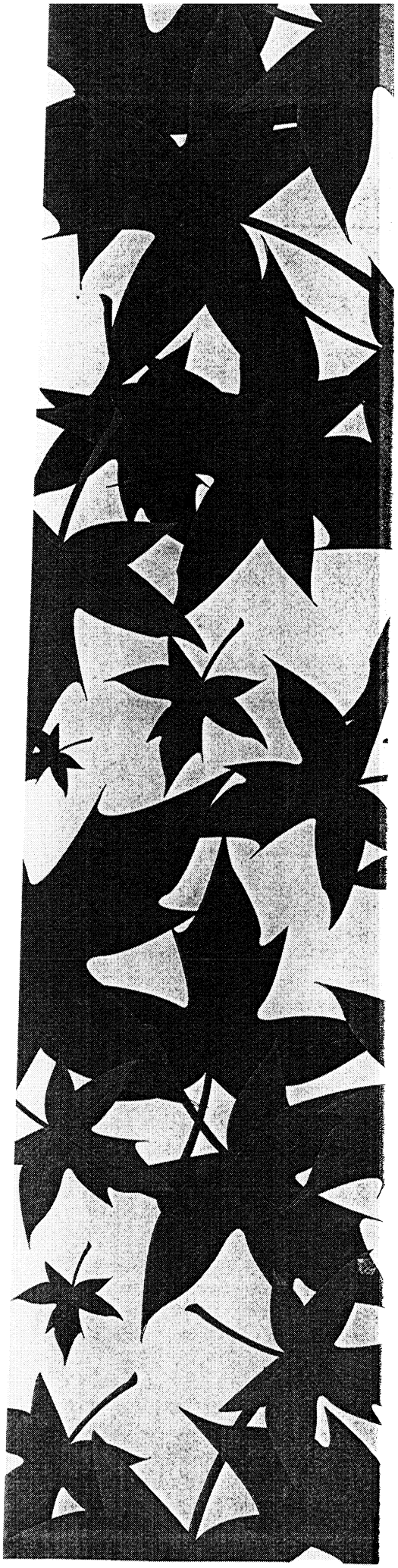
Other helpful organizations:

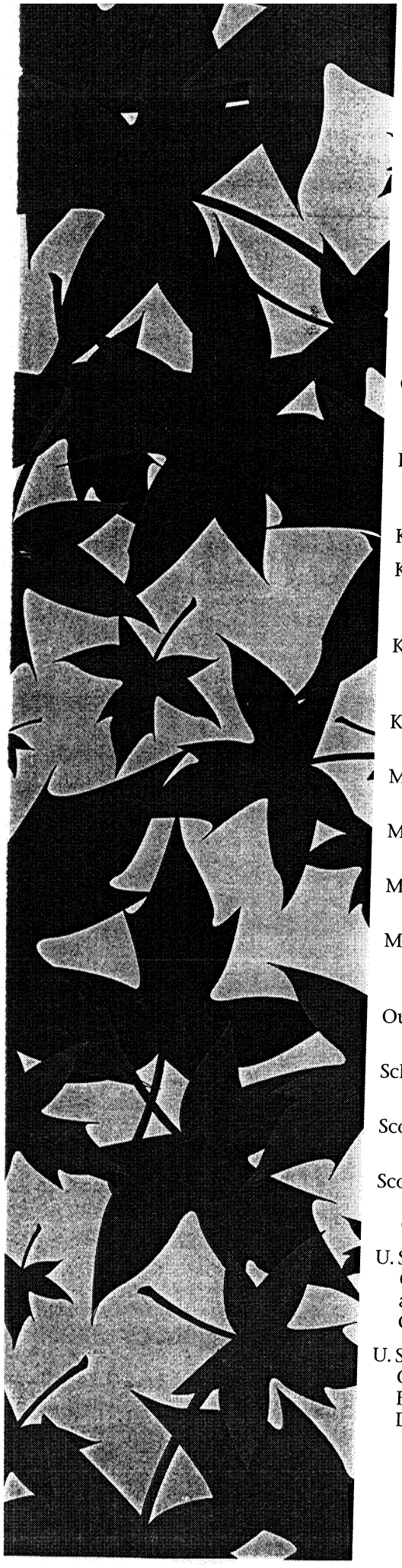
National Fish & Wildlife Foundation
1120 Connecticut Ave. NW, Suite 900
Washington, D.C. 20036
(202) 857-0166
http://www.nfwf.org

National Wildlife Federation
8925 Leesburg Pike
Vienna, VA 22184
(703) 790-4000
http:/nwf.org

United States Small Business Administration
Office of Marketing and Customer Service
409 Third Street SW, Suite 7600
Washington, D.C. 20416
(202) 205-6744
http://www.sbaonline.sba.gov

U. S. Fish & Wildlife Service
Ecological Services Field Office
Hartland Bank Buildling
10711 Burnet Rd., Suite 200
Austin, TX 78758
(512) 490-0057
http://ifw2es.fws.gov/AustinTexas





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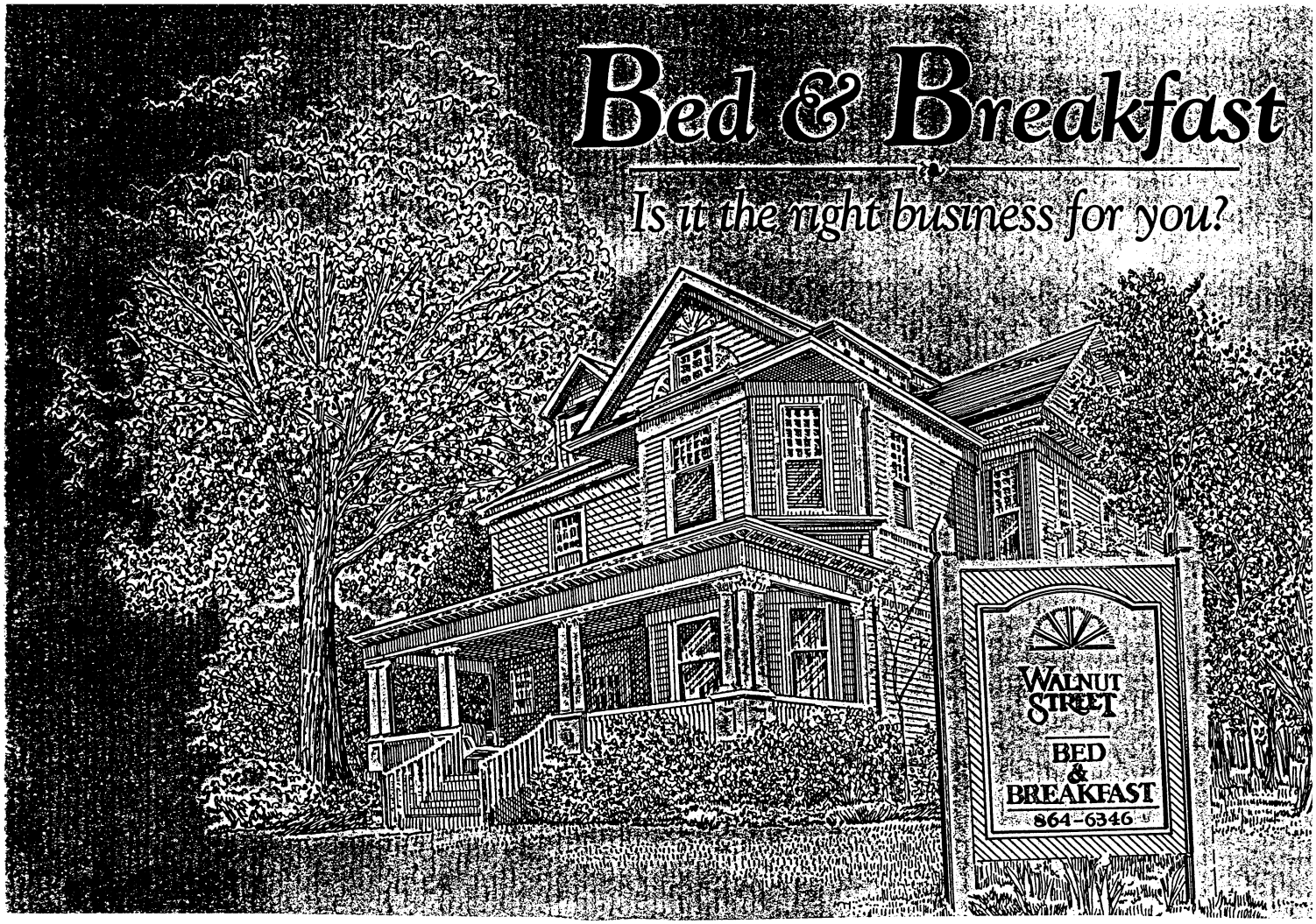

Bed & Breakfast

Is it the right business for you?

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On the cover:
Walnut Street Inn
A Bed and Breakfast
Springfield

South Dakota

FARM & RANCH VACATION

RESOURCE DIRECTORY

South Dakota Department of Tourism

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Beginning a Bed and Breakfast in South Carolina

GUIDELINES FOR DEVELOPMENT

Dr. Thomas D. Potts, Extension Tourism Specialist
Clemson University

Carole Jones Amos, Rural Development Coordinator
Community Development Division,
South Carolina Department of Parks, Recreation & Tourism

Strom Thurmond Institute
Clemson University

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BY LARRY MORRIS—THE WASHINGTON POST

Kevin Miller and Caitlin Tully, both 17, search for an exit from the Belvedere Plantation maze.

They Call It Maze. You Might Call It Corn.

August 28, 2000

By KIMBERLY SHEARER PALMER
Washington Post Staff Writer

Lynn Yealy's 19-year-old son, Kaden, was leaving for Virginia Tech the next day. Her two engaged daughters, 23-year-olds Kendra and Kiera, are starting lives in separate states.

So Yealy gave an order: We're going to get lost in a maze together.

Leaving friends and fiances behind, Lynn and Ken Yealy packed their three children into a car and off they went, into the pink and orange sunset.

They drove from their Fredericksburg home toward the nearby Belvedere Plantation, home to the Great Adventure Maize Maze, one of the largest of its kind in the country. Designer Adrian Fisher began building life-size mazes in England 20 years ago and has spread his craft to Europe, Canada and the United States. The Fredericksburg maze, which opened July 20, is the fourth Fisher has designed in this country.

The popularity of mazes, which date back to medieval times, has been growing steadily. Another cornfield maze, in Leesburg at the Temple Hall Farm Regional Park, opened Saturday. Fisher points to the romance factor: They are "wonderful places for courtship," he says, because "you can be reasonably sure no one will find you."

See MAZE, C5, Col. 1

Kamille Thorne, marketing director for the MAiZE, a Salt Lake City-based company responsible for the Leesburg creation, calls the pastime's recent popularity a "craze." She says there are more than 150 cornfield mazes in the United States, many of them started by farmers looking for new ways to make money.

For $7 each, participants at Belvedere are handed crayons, flags and blank sheets of paper. To start, guides point them to the center of the 12-acre maze, which can accommodate up to 1,000 visitors at once. They work their way out, climbing bridges and looking for clues left in mailboxes along the way. Water coolers and one portable toilet provide relief.

Lynn Yealy leads her family down a dirt path, lined with stalks twice as tall as they are.

With Celtic music blasting and the smell of freshly cut grass wafting, the family bonding begins.

The first order of business: Choose a team name, as all groups are asked to do upon entrance. Ken suggests "Lost." Too negative for a happy family event, says Lynn. How about "Sparklers"?

"Sometimes we tell the girls they have a sparkling personality," she explains.

The first assignment conquered, Team Sparklers learns its goal: to reach the top of Victory Bridge. Nine white poles scattered throughout the maze mark mailboxes that contain pieces of the maze map. Kendra uses a purple crayon—each team chooses its own color—to copy the first part of the map on the blank sheet given to them.

And just in case they gets lost, the Sparklers carry a tall blue and white flag to signal an SOS. (Ryan Fulks, 15, one of three attendants, estimates that 30 percent of teams resort to rescue by flag-waving.)

Soon after Kendra leads her family down a path, Kara Hutsell and Matt Dinehart, on their second date, enter the labyrinth and continue the medieval tradition of using a maze as a place of courtship. They call themselves the Redskins.

Hutsell's 6-year-old daughter, Jordan, leads the couple down an aisle. After just five minutes, they are lost.

"I'm totally disoriented now. I have no idea where I am. This whole map thing . . ." She trails off, shaking her head.

Caitlin Tully and her boyfriend of seven months, Kevin Miller, resort to rock-paper-scissors to make their tough decisions. The two Prince William County high school seniors were lost for about an hour and a half—long after Tully's cousin and brother had finished.

"We have no direction because the cornstalks are so high. Everything looks the same," says Tully.

Team Sparklers is having better luck. The second mailbox has been sighted. Go Team Sparklers! But now they're at a junction, and the team is divided.

"If we could just bust through this wall we'd be there," laments Kaden.

Kiera says, "We have to make a decision as a team." But Kaden doesn't hear her. He's off.

"Kaden? Where did he go?" asks Lynn. They hear him yell in the distance and take off down a corn aisle after him. They find him stuck at a dead end.

In a Maze Of Maize

BY LARRY MORRIS—THE WASHINGTON POST

The walls have ears: Brian Cresswell, 9, and his brother Geof, 12, of Dalton, Pa., plunge into the challenge—a 12-acre cornfield maze south of Fredericksburg.

MAZE, *From C1*

"From now on, when we have a team decision to make, I'll make it," says Kiera in frustration.

This isn't quite the family love-fest Lynn had planned.

Lynn starts waving the flag as the rest of the family pow-wows near the mailbox with the next piece of map.

Ken notices. "Be quiet! Tie her up!" he shouts.

Team Redskins vents similar frustration. Hutsell and Dinehart aren't yet whispering sweet nothings into each other's ears.

"It might be romantic without a screaming 6-year-old," says Hutsell.

Still, as the sun begins to set, and the rustling cornstalks cast darker and darker shadows, couples get friskier.

The maze's two bridges give lost participants a chance to reorient themselves with an aerial view a few feet above the cornstalks and to appreciate the scenery. The sun peeks through the clouds on its way out of sight, and birds fly in V-formation over neighboring farms. Soon, floodlights will be turned on.

As Hutsell expresses her frustration on top of one of the bridges, Dinehart uses the opportunity to sneak a quick kiss and to slip an arm around her, as though he were just trying to get a closer look at the map.

But there's no time to linger. It's time to get back to business. "Let's go, we're aimlessly wandering anyway," says Dinehart, taking off down the bridge.

Sir Lostalot, a k a 16-year-old Ian Fulks, Ryan's older brother, mans the bridge. If participants look sufficiently frustrated, he gives them clues.

"Sir, that's a dead end," he calls after Dinehart. Ian recommends some turns that will help him out.

Now that Dinehart thinks he knows the answer, he charges ahead, leaving his date and her daughter behind.

"Don't you just love men who think they know it all?" asks Hutsell.

Dinehart hears. "You love what?" he asks.

"Nothing, I didn't say a thing," Hutsell says. She has her own winning strategy: "I'm gonna pick up my cell phone and dial 911 and say, 'Come get me!' "

Team Redskins runs into another couple at the next mailbox, Cindy Harris and Murray Blake of Richmond. Dinehart shares his clues with them.

Blake, with his arm around Harris, thanks Dinehart and says they'll follow his advice just as soon as they copy the next clue onto their map.

"We'll be right behind you," he says. Wink wink. Smooch smooch. The sun has set, and cornfield romance is in full bloom.

Harris, a benefits analyst, had surprised Blake by telling him to show up at her house at 5:30 p.m. with a flashlight and bug spray without telling him where they were going.

"He kept saying, 'Where's your shovel?' joking that I was going to kill him," says Harris, laughing. Blake didn't need to worry—after a few minutes of wandering around in the cornfields, they had their arms around each other.

Skips, cheers and hops break out as Team Sparklers smells victory. Ken is the last to see the tall orange flag marking one of the final clues. Lynn hits her husband on the back. "Look! It's the orange flag!" Team members break into a run.

And after 45 minutes of feeling like Dorothy following the Yellow Brick Road, or a hamster getting its IQ tested, Hutsell and Dinehart cross the finish line, hand in hand, with Jordan lagging behind. Success!

Ryan Fulks makes their announcement official over the intercom: "Congratulations to the Redskins, who have conquered the castle and are now standing on Victory Bridge!"

The Small Dairy Resource Book

Information sources for farmstead producers and processors

By Vicki Dunaway

"Your search is over. A comprehensive list of resources for small dairies, along with clear concise reviews. *The Small Dairy Resource Book* will help you find what you need and tell you how to get it. This book will save you hours of searching and direct you to books you may have never found otherwise. It is an investment that you will turn to time and again."

Paul Hamby
Weatherby, Missouri
Dairy Equipment Dealer and Alpine dairy goat producer

The Small Dairy Resource Book is an annotated bibliography of books, periodicals, videos and other materials on farmstead dairy processing. The *Resource Book* is intended primarily for the family farmer who is interested in producing value-added dairy products on-farm, but also will provide Extension agents and other agricultural educators with a cohesive guide to information sources on small-scale dairy processing.

Topics include:

cheesemaking	butter
ice cream	other dairy foods
dairy processing	food safety
dairy animals	feeds & grazing
business & marketing	

The appendix lists suppliers, consultants, dairy processing courses, related organizations, interesting Web sites and more.

The Small Dairy Resource Book was developed as a product of the Hometown Creamery Revival project, sponsored by the Southern Sustainable Agriculture Research and Education (SARE) program. It is published by the Sustainable Agriculture Network (SAN), the outreach arm of SARE.

To order, please send a check or purchase order for $8 to:

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Burlington, VT 05405-0082

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Visit the SAN publication Web site: www.sare.org/san/htdocs/pubs/

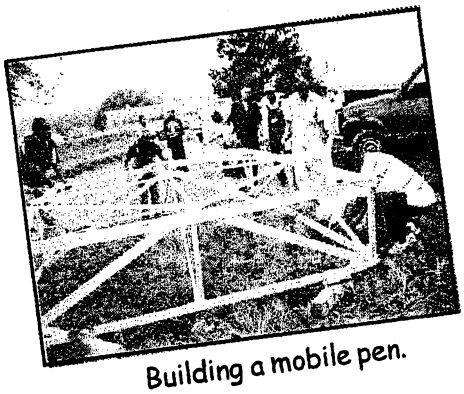
and The Hometown Creamery Revival: www.metalab.unc.edu/creamery

Mobile pens of chickens on the pasture.

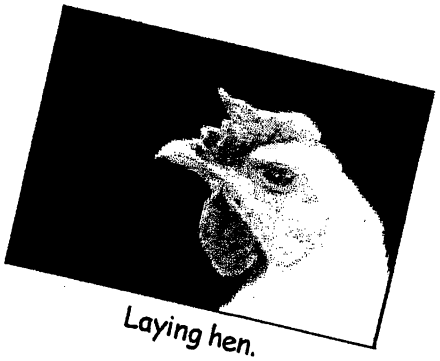
Ready to eviscerate!

Pastured Poultry

A Heifer Project International case study booklet



Building a mobile pen.



Laying hen.

Home-grown's <u>the</u> best!

The mechanical plucker.

Sponsored by Southern Region USDA Sustainable Agriculture Research & Education (SARE)

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Raising Emus and Ostriches

Special Reference Briefs Series no. SRB 97-06

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USDA, ARS, National Agricultural Library
Beltsville, Maryland 20705-2351

August 1997

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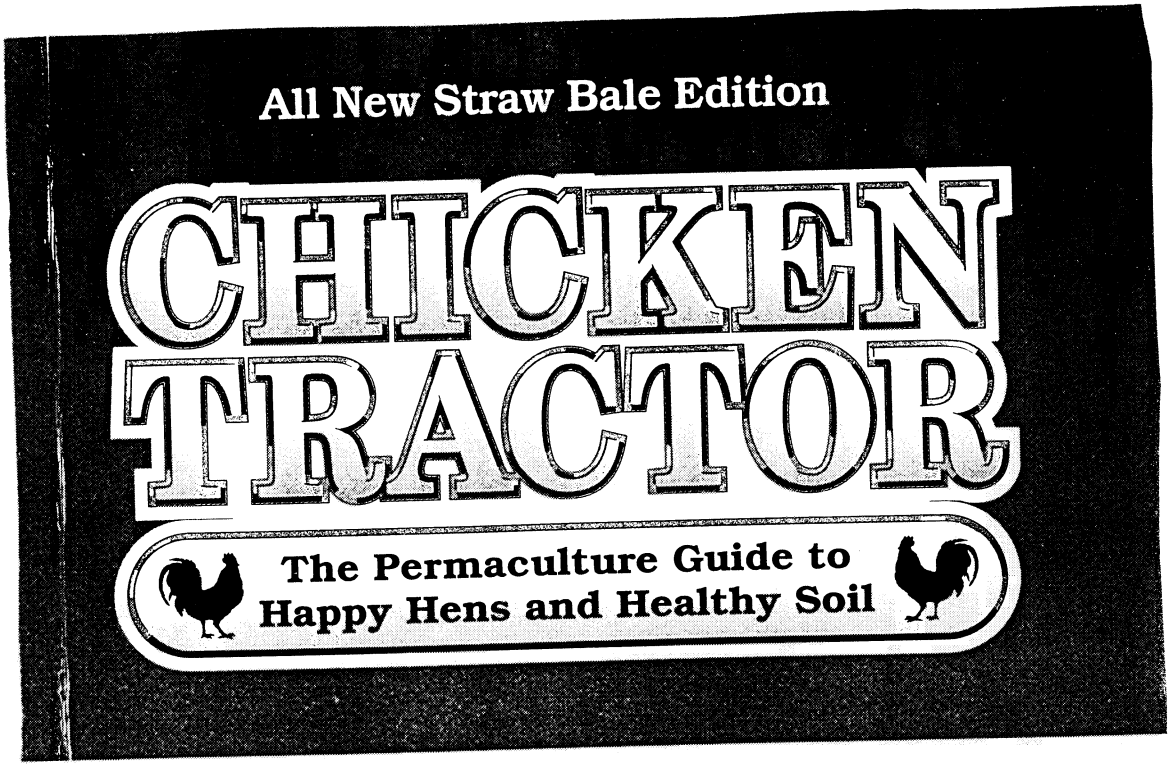
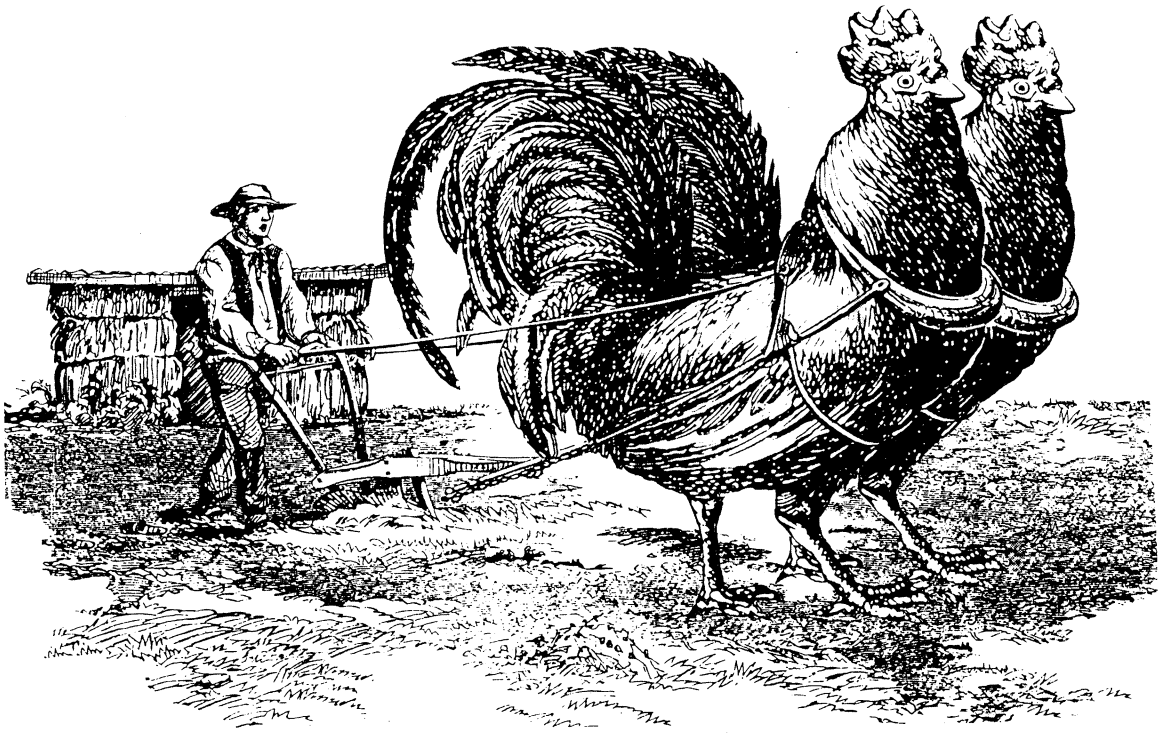


by

Andy Lee

Pat Foreman



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Ode to a Chicken Tractor

"Chicken Tractors, Chicken Tractors! I want them Everywhere!"
says Andy Lee, "I want them spreading coast to coast—LA. to Delaware.
What this country really needs — a chicken in every pot;
and with this handy method, well, gosh, that's just what you've got!"

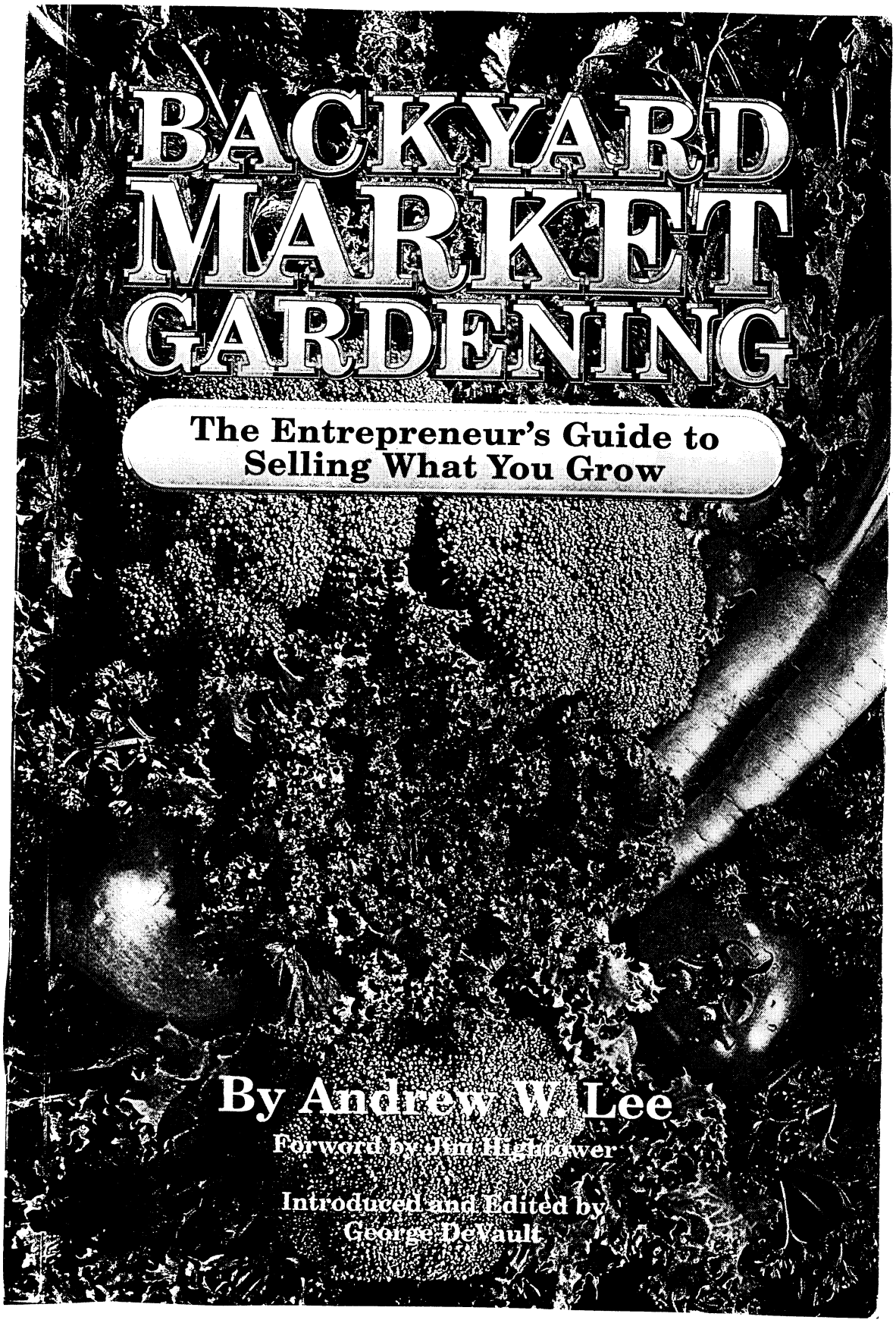
Stick all your chickens in a pen that you can move around;
Take them out into your fields and let them peck the ground.
It may seem silly, but it's not; the benefits abound.

They fertilize, they spread manure, they dig up all the weeds,
and they won't need as much to eat to satisfy their needs.
They're open range, but in a pen so they can't eat your seeds.

You'll make a profit, simple too, it's elegant and neat;
A positive and easy way to help you grow your meat.
As a system, guaranteed, the method can't be beat.

So if you want this great technique, then this is what you do:
Buy the book by Andy Lee; it just came out - it's new.
Chicken Tractor is its name. It's good, and useful too!

by Ron Macher and Paul Berg,
Small Farm Today magazine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MARKET
GARDENING
The Entrepreneur's Guide to
Selling What You Grow
By Andrew W. Lee
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The Entrepreneur's Guide to

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We're Gonna Be Rich!

Growing Specialty Cut Flowers for Market

by Frank and Pamela Arnosky

The cut flower columns in *Growing for Market* from 1995 through 1998

We're Gonna Be Rich!

Growing Specialty Cut Flowers for Market

by Frank and Pamela Arnosky

Cover photo by Robb Kendrick

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"We're Gonna Be Rich" contains articles previously published in ***Growing for Market***, the monthly magazine for direct-market farmers. For information about subscriptions and other books about market farming, call toll-free: 1-800-307-8949.

Introduction

by Lynn Byczynski
editor and publisher, *Growing for Market*

Pamela and Frank Arnosky began writing the flower columns for *Growing for Market* in January 1995 and, so far, they have never missed a month. Here's the story of how they got the job: I met Pamela at an Association of Specialty Cut Flower Growers conference in 1994, and soon thereafter began to receive faxed letters from her telling me all about their 30-acre flower farm in the picturesque Hill Country south of Austin, Texas. The letters were packed with practical know-how, but they were also very funny. They had a wonderful conversational tone that made me feel like I had known the Arnoskys, and their flowers, and the great state of Texas, for years. In my mind, I thought of Pam and Frank as the Molly Ivins and Jim Hightower of the flower world. I knew I had spotted a talent, so I called them up and proposed that they write for *Growing for Market*. Pamela told me the letters were intended only as a lure to get me to come down and do a story about them. But they agreed to try their hand at writing regularly, and so they have.

With great enthusiasm and a wry sense of humor, they have regaled *Growing for Market* readers with advice, opinions, and anecdotes about flower farming. The title of this book, "We're Gonna Be Rich," is Frank's favorite refrain whenever success comes their way. Fortunately, Frank and Pam are often successful. They are out there on the cutting edge of the cut flower business. Every year, they search out the unusual - even the unheard of - and conduct their own research to learn all they can about every flower they grow. They are constantly tinkering with their farm, adding new plants, varying schedules, erecting more greenhouses, experimenting with different post-harvest treatments and so on. Every single month they say something *new* about growing cut flowers.

Growing for Market's readers have benefitted enormously from the

Arnoskys' generosity. With no effort to protect their "trade secrets", they have boldly told the flower-growing universe about the varieties they grow, where they get them, how they grow them, and where they sell them. They have undoubtedly given a leg up to some of the other growers selling in their markets, but Pamela and Frank have preferred not to think of other farmers as competition. Instead, they tell what they know, and sincerely encourage others to consider flower growing as a way to make a living on a small farm.

They come to flower growing from strong botany backgrounds, both having attended graduate school in plant-related fields. When they bought their farm in 1990, they started out growing poinsettias and bedding plants in a greenhouse. They differentiated themselves in that market by growing their plants organically. Within a year, they did a small planting of field-grown cut flowers, and were amazed at how well-received their flowers were by florists in Austin. Then came an upscale new supermarket that was looking for bouquets, and the Arnoskys decided to expand to fill the demand. Since then, the bedding plant part of the business has almost disappeared, with just a spring crop of vegetable transplants to help cash flow and only one greenhouse of poinsettias. The cut flowers, though, just keep expanding. As of this writing, they have 10 acres of field production and six greenhouses for winter production.

The columns in this book were written from 1995 to 1998. They are arranged loosely by season, with the January columns from each of the four years followed by all the February columns, then all the March columns and so on. As you read through the columns, you get a good sense of the issues facing the cut flower grower in each season.

The columns are also indexed in the back of the book, so you can look for specific topics as questions arise. Sources mentioned throughout the book are collected alphabetically in Appendix 1.

Whether you sit down and read these columns all at once, or peruse them in small bits and pieces, you're sure to learn a great deal about cut flowers. You'll probably get a few laughs, too, and feel as though you've made some new friends.

Then, we hope you'll join the Arnoskys every month by subscribing to *Growing for Market*. Call us toll-free at 800-307-8949 to order.

- August 1999

United States Department of Agriculture

Cooperative State Research Service

Office for Small-Scale Agriculture

A Small-Scale Agriculture Alternative

Blueberries

The blueberry is delicious as a fresh fruit snack or in a variety of foods such as blueberry pies or muffins. Although most large-scale commercial blueberry operations are in either Michigan or New Jersey, highbush blueberries can be cultivated throughout much of the United States—with careful site selection and proper cultural practices.

Highbush blueberries fit nicely into small-scale farming. In the Midwest, by selecting early or late varieties, harvesting can begin in early June and last into August. Local marketing by pick-your-own (PYO) customers, at farmer's markets, or ready-picked sales to nearby stores is particularly feasible for small-scale operators in close proximity to metropolitan areas. Blueberry sales can supplement income from primary sources.

Growing highbush blueberries is labor and management intensive. Most work can be performed by hand, but specialized equipment may be beneficial. Blueberry production requires a substantial investment in time and money. Plantings require 2 to 3 years to establish and are not harvested until the third or fourth growing season. Many things can go wrong during the first years and a knowledge of blueberry biology and pest management is essential.

Without good cultural practices—including insect, weed, and disease control—plantings may be doomed even before first harvest. Ideas on pest control practices should be available through the local Cooperative Extension Service (CES).

Per-acre returns can be high. A mature planting can gross $5,000 per acre and return $3,000 or more with correct marketing, management, and growing.

Site and Pre-Planting Considerations

Blueberries should ideally be planted on a gently rolling slope to provide good air and water drainage. Good air drainage reduces likelihood of blossom damage from late spring frosts. Blueberry roots are very sensitive to standing water so they need good surface and internal water drainage. Although a sandy soil is best for drainage, heavier soils may be used if internal drainage is adequate. This may require either planting on ridges or placing tiles to improve drainage.

In choosing a site, give consideration to a water source for irrigation. If the crop is to be harvested by PYO customers, the location should be easily accessible to parking nearby.

Blueberry plants are very sensitive to soil pH and require acidic soils for success. Optimum soil pH is 4.8 to 5.2, although levels as high as 5.5 are acceptable. The soil pH can gradually be reduced through use of acid-reaction fertilizers. Soils with pH levels of 5.5 to 6.0 can be used if the soil pH is lowered using an agricultural sulfur 1 year or more prior to planting. The sulfur required to lower soil pH varies with soil type. It may be economically unfeasible to adjust the pH of some soils. Therefore, prior to planting, another soil pH test should be conducted to learn whether the soil pH has attained a satisfactory acidic reaction.

Planning should begin at least 1 year prior to planting blueberries. This time schedule allows for adjusting soil pH (if needed), tiling, ditching, and digging a pond or drilling a well. During this time, it may be possible to control perennial weeds which may be difficult to stop with herbicides registered for use on blueberries after planting. A green manure crop of rye or wheat may be grown and then turned under to improve soil tilth. Any cultivated crop grown during this preparatory year may help reduce insect and weed problems. If herbicides are used to manage weeds during the preparation of the site for blueberry production, then be aware of the time limits for degradation of the herbicide residues in the soil.

Plant Selection

Cultivars (cultivated varieties) are the keys to success and are selected a year ahead. They should be booked with a reputable nursery. The CES (Extension agent) should have information on which cultivars are best adapted for local use. A potential grower may also learn about cultivar selection by visiting other growers and from nursery professionals. Most nurseries offer rooted cuttings, 2-year-old bare-rooted fieldgrown plants, and 2-year-old containerized nursery stock.

Many small-scale operations buy containerized planting stock because of the increased survival and earlier production they may offer. If containerized stock is used, it is wise to pick up the plants at the nursery and eliminate shipping expenses.

Field Layout

Blueberries benefit from cross pollination so growers should alternate cultivars with similar flowering seasons in alternating blocks of 2 to 4 rows. Rows ideally run north to south to allow for uniform sunlight. However, any orientation is acceptable. Blueberries are normally grown with wide row spacings, with the area between rows seeded down to a perennial cover crop such as Kentucky bluegrass or fescue.

Row spacings of 10 to 14 or more feet ensure that mowing and spraying can be done by tractor, although narrower spacings will allow for equipment use during the first few years of planting. However, without at least 10-foot spacing the plants will grow large enough that a tractor can no longer be driven between the rows. Spacing within the row is commonly 4′or 6′.

Planting for PYO operations should allow for customer convenience and handling. Rows should be interrupted with cross-walks or drive alleys about every 200′. It is also helpful to arrange cultivars with similar ripening seasons together so that harvest can progress in an orderly fashion.

Planting

Planting of containerized nursery stock may occur in either early fall or early spring. Bare root nursery stock is normally planted in the spring. Fall planting should occur between late September and early October. The roots of these fall-set plants will continue to grow until soil temperatures fall below 45 °F. Spring plantings are often delayed because of wet weather. Fall-set plants are already in place and have the advantage of early spring growth, which is often missed in spring plantings due to wet weather delays. Fall-planted blueberries must be mulched prior to winter in areas in danger of frost heaving. Spring planting should begin as soon as the danger of severe frost has passed.

Blueberries are shallow rooted so the planting hole needs to be wide. Holes may be dug by hand or with an oversized tractor-mounted posthole digger. Some growers prefer to plant in a plow furrow. After the hole is dug, the plants should be planted as deep as they were in the nursery. Usually about 1 pound of moist acidic sphagnum peat moss is used per plant during planting. It is mixed with soil during backfilling of the planting hole and should be thoroughly wet prior to using. Failure to wet the sphagnum peat moss can result in it drawing moisture out of the soil and causing the newly set plants to dry out.

After planting, bare-root plants should have 1/3 to 2/3 of the branches removed. This allows the plant root system to be in balance with the shoot system and increases survival by reducing transpirational demand. Planting containerized stock reduces the need for pruning branches at planting time. Flower buds should be rubbed off to ensure that plant energy is channeled into vegetative growth.

Mulch and Irrigation
In most regions where highbush blueberries can be grown, both mulch and irrigation are essential for successful production. Mulch goes on newly set plants soon after planting and irrigation should be ready before newly set plants dry out. Many materials are suitable for mulching blueberries, but sawdust is most common. Mulch keeps soil temperatures cooler during summer, reduces weeds, and maintains soil moisture more uniformly.

Although mulch helps save moisture, it does not eliminate the need for irrigation. Blueberries are very sensitive to drought and irrigation is essential in most areas. Trickle irrigation offers the advantage of being more efficient, but it does not allow for the frost protection that overhead systems can provide. In areas where late spring frosts are of little concern, trickle irrigation is normally chosen because of its increased efficiency. Irrigation then occurs without interrupting spraying or harvesting.

Crop Management
Bird depredation can be the biggest problem of small-scale producers, sometimes causing crop losses of over 70 percent. Scare devices and exclusion by netting are commonly used to reduce losses.

Insect and disease problems may be small in areas of few blueberry plantings. The CES can provide information on weed, insect, and disease control.

Marketing the Crop
The principal small-scale market may be consumers in local communities. A high percentage of blueberries are direct marketed locally. The potential trade area for blueberries tends to be larger than for strawberries. Blueberries also offer other advantages over strawberries for PYO operations. Blueberries require little stooping. Customers find them easy to freeze, requiring little preparation other than washing, and easy to use. PYO surverys have found a trend towards an increased average age of PYO consumers.

Sales of ready-picked blueberries at the farm or local markets bring higher prices to producers from consumers who desire farm fresh produce, but do not wish to PYO.

The blueberry crop is usually sold within 60 days, depending upon weather and varieties. Weekends are usually the busiest. Coordinating sales advertising and promotion with peak harvests challenges even experienced growers.

PYO growers must be market oriented, plan far ahead, seek alternative market possibilities, train employees, and develop successful advertising, especially a good farm logo. Before starting any small-scale enterprise, a farmer should study the potential markets, trade areas, competitors, and the advertising media.

About 450 PYO customers can harvest 1 acre of blueberries (6,000 pounds). PYO blueberries are usually sold by weight in pounds and/or ounces. The scales used for sales should be inspected by the Weights and Measures Division of the State Department of Agriculture or Commerce.

A direct market business requires time to develop. Blueberries lend themselves nicely to market development because they require 6 years or more to reach maximum yields. Careful attention to a business image, including the logo, quality of fruit, and how fields are maintained, is essential. A direct marketer should exceed customer expectations. Merely raising high-quality blueberries is not enough.

Often customers enjoy the recreational aspect of a trip to a country farm as much as obtaining high-quality produce at reasonable prices. They want well marked roads; adequate parking; and friendly courteous service.

Since accidents do occur, growers must have adequate insurance. A regular farm insurance policy may not cover liability to PYO customers.

For More Information
State university and county CES personnel can often provide information from local Ag Experiment Stations which is geared to local production and marketing. For example, the University of Illinois conducts an annual "Small Fruit School" and publishes a Proceedings, which includes information on blueberries as well as other small fruit. For information write to J.D. Kindhart, University of Illinois, Dixon Springs Agricultural Center, R-1, Box 256, Simpson, IL 62985. Similar extension schools are held in Michigan, New York, Wisconsin, Ohio, North Carolina, Pennsylvania, Missouri, and other States.

Other Information Sources
Highbush Blueberry Production Guide (200 pp, color), Northeast Regional Agricultural Engineering Service, 152 Riley-Robb Hall, Cooperative Extension, Cornell University, Ithaca, NY 14853.

Small Fruit Crop Management (608 pp), Prentice Hall. Mail Order Billing Dept.,200 Old Tappan Road, Old Tappan, NJ 07657.

Growing Blueberries in Missouri (26 pp), State Fruit Experiment Station of SMSU, Mountain Grove, MO 65711.

Hints on Growing Blueberries (8 pp), Bulletin Office, 10B Agriculture Hall, Michigan State University, East Lansing, MI 42824.

Fruit and Vegetable Clip Art for Direct Marketers University of Illinois, Department of Horticulture, Dixon Springs Agricultural Center, Simpson, IL 62985.

Small Fruit Production and Pest Management Guide (111 pp), Publications Distribution Center, 112 Agricultural Administration Building, The Pennsylvania State University, University Park, PA 16802.

The Highbush Blueberry and Its Management (270 pp), The Haworth Press Inc., 10 Alice Street, Binghamton, NY 13904.

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All uses of fungicides, pesticides, and herbicides must be registered by appropriate State and/or Federal agencies before they can be recommended.

CAUTION: Fungicides, pesticides, and herbicides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife if they are not handled or applied properly. Use all products selectively and carefully. Follow recommended practices for the disposal of surplus products and their containers.

May 1994

United States Department of Agriculture

Cooperative State Research Service

Office for Small-Scale Agriculture

A Small-Scale Agriculture Alternative

Brambles

Few crops are as well suited for small-scale agriculture as the brambles—raspberries and blackberries. Significant production can be achieved on just a few acres and berries are in great demand, not only for fresh eating but for desserts, jams and jellies, and wine.

Raspberries and blackberries are very high in fiber, vitamin C, phosphorus, potassium, and magnesium and have more calcium than any other temperate fruit.

Exquisite flavor, high nutritive value, and an exotic image push brambleberry prices to $1 per half pint in rural areas and $5 in urban centers. With yields of about 5,000 lbs. per acre, a gross return of more than $13,000 per acre can be realized even with the lower price.

A wide variety of brambles includes summer-bearing red raspberries (fruiting occurs on second year canes), first to market—usually in late June or early July. Next are black and then purple raspberries. Blackberries (including Loganberries and Boysenberries) and blackberry-raspberry hybrids (e.g., Tayberries) ripen from late July through August.

Finally, from late August through frost, red raspberries are again available from varieties that produce on the tops of first year canes. A few raspberry cultivars have yellow fruit.

In all but the most severe climates, a grower can select bramble types that continuously supply the market from late June through frost.

The challenges are many. Brambles need much labor. Canes must be annually pruned and trellised; this cannot be done well mechanically.

Fresh market fruit must be hand-harvested and sold soon after picking. Raspberries and blackberries have the shortest shelf life of any temperate fruit; only special care can maintain quality.

Few commercial growers have more than 5 acres in production; and even this requires excellent management.

Assess resources first

Potential growers should assess natural, capital, and human resources and likely markets before considering brambles. Climate largely determines which types can be grown. Cold winters limit northern ranges; lack of adequate chilling during dormancy limits southern ranges. In general, blackberries are more adapted to southern and raspberries to northern climates.

The coastal Pacific Northwest offers an ideal climate—with winters and summers that are usually mild. Brambles can be severely injured when temperatures drop rapidly between late fall and early spring.

In most areas, special sites and cultivars are required. But the many cultivars will allow growers to produce at least one variety of bramble fruit. Local county cooperative extension agents can recommend varieties for a particular area.

Important for brambles is a well-drained soil. Many varieties are extremely susceptible to diseases in cool, wet soils. Artificial drainage is usually a sound investment.

Although raspberries and blackberries do not tolerate wet soils, neither do their relatively shallow root systems bear drought. Drip irrigation, with a good water source, is generally needed. See "Trickle Irrigation in the Eastern United States" ($3.25), NRAES-4, Northeast Region Agricultural Engineering Service, 152 Riley-Robb Hall, Cornell University, Ithaca, NY, 14853, and "The Basis of Trickle Irrigation," VC-23-82, Univ. of Illinois Cooperative Extension Service, Urbana, IL 61801.

The site should allow cold air to drain; in northern areas, northeast slopes minimize temperature fluctuations until spring.

Prior cropping history is important; weeds and vegetable crops can harbor verticillium wilt disease to which many brambles are susceptible. Growers should identify land for rotation before replanting old fields.

If the crop is to be marketed on a pick-your-own basis, parking space must be available nearby.

Regarding capital needs, it usually takes more than $6,000 an acre to establish brambles. Total investment may be recovered within 6 years, according to Mark Castaldi's "The Cost of Establishing and Producing Small Fruits for Pick-Your-Own and Commercial Harvest" ($3), Department of Fruit and Vegetable Science, Cornell University, Ithaca, NY 14853.

University of New Hampshire economists have developed a bramble crop budgeting template for Lotus software and a manual (NC5-30, $30), NRAES, 152 Riley-Robb Hall, Cornell University, Ithaca, NY 14853.

"Farming Alternatives: A Guide to Evaluating the Feasibility of New Farm-Based Enterprises" ($5.50), NRAE5-32, Riley-Robb Hall, Cornell University, Ithaca, NY 14853, a workbook, can help small-scale growers decide whether to invest.

Labor needs, very inconstant, are a major factor. In full production, each acre may need 10 pickers. State and Federal labor laws must be adhered to. See "Agricultural Employers Notebook," ($14) from Cornell Cooperative Extension, P.O. Box 217, Alton, NY 14413.

Market assessment

Fruit growers should explore potential markets before investing. Prices can vary considerably with supply, location, demographics, and time of year. Eastern prices are generally higher than those in the West; the large Washington-Oregon processing industry can depress prices. In the South, many consumers won't pay prices listed for exotic produce.

Dale Stokes, former president of the North American Bramble Growers Association, says **market identification is the most important component of success.**

Pick-your-own (PYO) is popular for marketing because it reduces harvest labor costs. Successful PYO operators link entertainment with harvest; many customers view picking as recreation.

Westmoreland Berry Farm, outside Washington, DC, markets blackberries both PYO and retail. The typical customer buys $18 to $20 worth of fruit. The farm is within 2 hours' drive of three marketing outlets--Washington, Richmond, and Baltimore, ideal for PYO. Owners Charles and Anne Geyer say their first 2 acres of blackberries grossed over $30,000 in their third year.

Supermarkets often buy fruit from a grower to bypass a warehouse. Such growers must pay much attention to quality and consistency, packing and cooling fruit soon after picking to extend shelf life.

Some restaurants pay top dollar for fresh raspberries and blackberries but each restaurant uses only a relatively small quantity and deliveries cost time and gasoline. Roadside stands can be popular but a diverse selection of items may be needed to justify a stand. Many growers sell to others' stands.

Besides fresh fruit, a small-scale grower can produce value-added jelly, juice, wine,

syrup, or candy. In St. Louis, Bissinger's, a small candy store, chocolate-coats raspberries in summer, hardly keeping up with demand at $32 a pound.

Sand Hill Berry Farm in Pennsylvania markets a gourmet raspberry vinegar—raspberries, apple cider vinegar, and sugar. The Tomasello Winery in New Jersey finds its raspberry wine popular.

Liquor Store magazine reports raspberry will be the next flavor rage. Raspberry-flavored products are leading sellers at many outlets. Whistling Wing Farms in Maine sells raspberry products, such as jelly and syrup, all over the world by mail order. Its bakery does well selling raspberry pies, muffins, and turnovers. Opportunities are limited only by imagination.

Site preparation.

With adequate resources and an identified market, a grower needs a year to prepare a planting site. Certain changes are difficult if not impossible to make once a planting is established.

First comes an adequate drainage and irrigation system. USDA's Soil Conservation Service (SCS) may help.

Second, perennial weeds should be eliminated through repeated cultivation (as with an organic-enhancing cover crop), herbicides, or soil sterilization.

Third, potential nematode populations should be assessed and controlled. Nematodes not only can damage plants directly but carry viruses that can decimate plantings. They are more of a problem in warmer climates and in lighter soils.

Fourth, adjust the soil chemistry for adequate nutrients and a 6.5 pH--best for brambles. Soil testing varies among laboratories; each has its recommendations for phosphorus, potassium, magnesium, and calcium. Tests may point to peculiar soil conditions. Lime or sulfur can adjust the pH value; a year or more may be required for amendments to effectively change soil chemistry.

Obtaining plants

In the early 1900's, viruses destroyed a thriving U.S. bramble industry in the East. Uninfected plant materials were unavailable for propagation. But in the 1970's, nurseries, applying tissue-culture techniques, produced brambles without harmful viruses or exposure to diseases.

Nurseries offering tissue-cultured brambles include Ahren's Strawberry Nursery, RR 1, Huntingburg, IN 47542; Congdon & Weller, Mile Block Rd., North Collins, NY 14111; North Star Gardens, 19060 Manning Trail North, Marine, MN 55047; Nourse Farms, Inc., Box 485 RFD, 5. Deerfield, MA 01373; and Champlain Isle Agro Associates, Isle La Motte, VT 05463.

Never propagate brambles from a neighbor's patch; infection with viruses from nearby wild brambles is likely.

The performance of cultivars varies considerably with location.

A high demand exists for yellow (golden) raspberries, but plants seem more susceptible to diseases than traditional red raspberries.

Cultural practices

The most complete reference is "Bramble Production Guide," $35, NRAE5-35, Riley-Robb Hall, Cornell University, Ithaca, NY 14853. It notes how each type must be treated differently.

Federal and State researchers recently have learned that:

■ Plants propagated from tissue-culture, although vigorous and virus-indexed, are sensitive to herbicides normally applied at planting. A straw mulch during the planting year or planting through black plastic may be better than conventional herbicide weed control.

■ Spreading fruiting canes apart in the row in a V-configuration significantly improves fruit yield and hastens drying within the plant canopy and makes spraying and harvesting easier.

■ New trellising systems for mechanical harvesting include use of monofilament nylon wire as strong as metal but not conductive of lightning. (Amberg's Nursery, 3164 Whitney Road, Stanley, NY 14561, is a distributor.)

■ Although raspberries are not widely grown in the South, displaced northerners will demand fresh fruit. Some recently developed southern blackberries include several erect types—no trellises needed—such as Arkansas' recently released thornless Navaho.

■ A combination of first year cane suppression, plus mowing half the planting every other year, can bring yields equal to conventional annual intensive pruning and fruiting. This also reduces labor and spray costs—half the cost of planting fruits in any one year.

■ Using a floating row cover in early spring over fall-bearing raspberries, such as Heritage, accelerates cane growth and yields. Covers in the north can minimize damage from frosts.

■ Inoculating brambles at planting with new strains of particular soil fungi and bacteria may prevent subsequent harmful infection.

■ A combination of rapid cooling after harvest, storage of fruit near 30 °F, and maintaining high humidity and carbon dioxide in the storage room prolongs shelf life.

Pests problems

Among pests, of most concern are viruses that can be transmitted by aphids, leafhoppers, nematodes, or even bees carrying pollen from wild brambles. See "Virus Diseases of Small Fruits " ($20), Ag Handbook #631, U.S. Government Printing Office, Washington, DC 20402.

Water or high humidity is essential for infection by most disease organisms, so proper pruning and trellising for good air drainage cuts disease pressure. Since most root diseases require standing water to complete their life cycle, good soil drainage minimizes these problems.

Several insects attack bramble canes, flowers, fruit, and leaves. Responsible growers scout plantings regularly, applying insecticides only when pests reach damaging levels. Avoiding locations near insect habitats helps.

The American Phytopathological Society has a "Compendium of Raspberry and Blackberry Diseases and Insects," describing with colored photographs many bramble problems—such as herbicide injury and nutritional deficiencies. ($25, APS, 3340 Pilot Knob Road, St. Paul, MN 55121)

Organizations and Newsletters

The North American Bramble Growers Association provides helpful information. Membership is $45 plus $5 per acre up to a maximum of 7 acres. (Richard Fagan, Executive Secretary, Rt. 2 Box 539, Cumberland, MD 21502)

Other sources of newsletters on small fruit crops: Bernadine Strick, Department of Horticulture, Oregon State University, Corvallis, OR 97331; Paul Otten, 19060 Manning Trail North, Marine on St. Croix, MN 55047-9723; Fruit Extension Secretary, Department of Fruit and Vegetable Science, Cornell University, Ithaca, NY 14853.

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A Small-Scale Agriculture Alternative

Bees

More than 211,000 beekeepers maintain about 3.2 million honey bee colonies in the United States. Thousands of beekeepers are small-scale entrepreneurs. Aside from the pleasures of the hobby, they keep honey bees for the production of honey, pollen, beeswax, propolis, and royal jelly.

Only in the last century have people begun to recognize the value of bees as pollinators. Pollinators include not only honey bees, but also more than 3,500 species of pollen bees in North America. The contribution of bees as pollinators of cultivated crops far outweighs the value of hive products. Although most beekeepers specialize in honey bees, some raise pollen bees for their pollination services.

Beekeeping's profitability depends on many factors, and the decision to enter this occupation should be made carefully. Beekeepers should know about bee biology, flora, and management, and should also possess business ability. They should understand that beekeeping is subject to factors beyond their control — such as market prices that fluctuate and weather elements that range from drought to floods and temperature extremes.

Entrepreneurs intent on commercializing should decide whether to be migratory or nonmigratory and select locations that offer opportunities for pollination rentals; production of honey, beeswax, or pollen; and selling of packaged bees and queens.

Although some local governments restrict placement of beehives, many beekeepers can keep their honey bee colonies in almost any urban, suburban, or rural location. Beehives can be found on rooftops and balconies in many cities. Observation beehives are sometimes seen in homes, classrooms, offices, and museums. The Insect Zoo at the Smithsonian Natural History Museum in Washington, DC, features an observation beehive. Specific publications may help in selecting a location. (See "Beekeeping and Their Neighbors" by Dewey M. Caron, Eastern Apiculture Society of North America, Inc., and "Beekeeping" from the Beekeeping Education Service, Wicwas Press, Cheshire, CT 06410/$1.50 to nonmembers.)

A potential beekeeper may find helpful information in many places. Most States have county agents and Extension entomologists whose responsibilities include beekeeping. Some State universities even offer college credits for beekeepers either as residents or by correspondence. All 50 States and Puerto Rico have beekeeping organizations that meet regularly to exchange the latest information. Many groups also put on workshops for potential beekeepers. National and regional beekeepers' groups meet annually. "Who's Who in Apiculture," published yearly in the April issue of Bee Culture, (referenced below under "Beekeeping Publications"), lists organizations, dealers, and government information sources.

A would-be beekeeper should learn as much as possible about beekeeping before purchasing bees and bee equipment. Observing honey bees close up with an experiencod beekeeper is an excellent way to learn about beekeeping.

Those First Honey Bees

A beekeeper can get started by:

- Purchasing an established beehive.
- Buying new bee equipment and packaged bees with queens from bee supply companies. (See "Who's Who in Apiculture.")
- Obtaining bee equipment and capturing a swarm.

Beekeepers can collect swarms by making their interest known to apiary inspectors, Extension agents, police departments, beekeepers, and others who might receive swarm calls.

Information on availability of bees and bee equipment also can be obtained from beekeeping groups and trade journals.

Honey Bee Management

Cardinal points to keep in mind when managing bees:

- Bees need food to survive: honey or sugar syrup as a carbohydrate source, pollen or pollen substitutes for protein, and water as the universal solvent.
- The bee colony will need lots of comb space for storing food and rearing brood. Lack of adequate space could lead to swarming, which could reduce honey production.
- For successful wintering, a colony should have a young queen, a large cluster of adult bees, 40 to 60 pounds of honey, and several combs of pollen. Each colony should have a two-story standard hive that includes a brood chamber and a honey super — the removable section where the bees store their honey.
- Starvation is a principal cause of colony losses. If bees are short of honey, they should be fed a syrup of two parts granulated sugar to one part water. Lack of pollen can be compensated for by purchasing pollen substitutes from bee supply dealers.

Insecticides

The occasional pesticide spraying of isolated plants or gardens may kill only a few bees; but when entire fields and orchards are sprayed or dusted, the resultant bee loss could be devastating. In such cases, beekeepers will usually see a large accumulation of dead and dying bees at hive entrances.

Beekeepers who place hives on growers' property should mark each beehive with their name, address, and telephone number so they can be notified in advance about spraying. Beekeepers who maintain bees on their own property need to communicate closely with neighboring agricultural operations where the bees are likely to be foraging. With a few days' warning, several things can be done to minimize the effects of a spray. First, decide whether the pesticides would harm honey bees. If so, here are some alternatives:

- The beehive may be moved to a temporary location at least 2 miles from the spray area.
- The hive entrance can be draped with damp burlap. This protects the beehive from effects of a direct "hit." The burlap cover should stay on only for the duration of the application.

- The hive may be left in place and some loss of bees accepted.

The best way is to work with the farmer and the pesticide applicator in developing programs that safeguard pollinating insects. Some general guidelines are:

- Insecticides should not be applied to blossoms; honey bees visit not only blossoms on cultivated crops, but also those of orchard ground-cover and noncultivated plants.
- The safest time to apply insecticides is late afternoon after bees stop foraging. Early morning applications are also less dangerous to bees than those in mid-day.
- An insecticide may be selected that has the least impact on nontarget insects and animals.

Diseases and Pests

Bees, like all creatures, are subject to infectious diseases. To lessen the spread of disease and minimize harm, beekeepers should learn as much as possible about healthy, normal colonies so they can recognize signs of diseases.

The most common brood diseases of honey bees are American foulbrood, European foulbrood, and chalkbrood. Among adult bees, Nosema disease is one of the most serious. Two parasitic mites, *Acarapis woodi* and *Varroa jacobsoni*, recently replaced more traditional adult and brood diseases as the most serious ailments.

If disease is suspected, the county Extension agent, a more experienced beekeeper, or the State apiary inspector can help. "Who's Who in Apiculture" (mentioned above) lists State apiary inspectors.

Here are a few simple rules for avoiding diseases in honey bees:

- Do not feed honey from an unknown source; it may carry organisms that cause American foulbrood disease.
- Buy packaged bees and queens only from reputable dealers.
- Buy used bee equipment only after consulting with the State apiary inspector.
- Look for signs of diseases each time the beehive is opened. Early detection can avoid costly replacements.

Beekeepers also have been keeping an eye on the range expansion of Africanized honey bees. As of November 1994, Africanized honey bees are established in Texas, Arizona, New Mexico, Puerto Rico, and California. Subject of many scary media stories, these bees are more likely to sting in defense of their nests than are the domestic European honey bees. However, a chance encounter with an Africanized bee foraging on blossoms is no more likely to result in a sting than is an encounter with a domestic honey bee.

In 4 years, Texas has recorded only one fatality from stings of Africanized honey bees. All the stinging incidents attributed to Africanized honey bees originated from feral colonies — those not managed by a beekeeper. Destroying feral colonies of honey bees in areas where Africanized honey bees are known to exist appears to be a good strategy for reducing the impact of Africanized honey bees.

Keeping European honey bees by requeening is strongly recommended in areas where Africanized honey bees are known to exist. Only queens from non-Africanized areas or certified European queens should be used for requeening. Printed materials, slides, and videotapes on Africanized honey bees are available in many languages from State and Federal Extension agents.

Products of the Hive

Honey, the most popular beehive product, can be marketed in many ways. The simplest is merely to cut out pieces of the comb containing honey. This "cut comb" may be wrapped with plastic or enclosed in a plastic sandwich box. Liquid honey is extracted from combs by centrifugal force with specially built extractors. The equipment needs make extraction impractical for many beginners.

Pollen and propolis — the resinous substance bees use to fill holes and gaps — are additional sources of income. However, small-scale entrepreneurs should make sure they have a market. Beeswax is a useful byproduct, but not for beekeepers with just a few colonies. Production of royal jelly is labor-intensive, and markets are limited.

Beekeeping Publications

Beekeeping periodicals and books abound. Many county Extension agents or State universities have publications dealing with beekeeping and bee supply companies. See "Who's Who in Apiculture" (mentioned above) for State universities with beekeeping specialists.

U.S. periodicals with the largest circulation are:

- American Bee Journal, 51 South Second St., Hamilton, IL 62341/$16.20 a year.
- Bee Culture, 623 W. Liberty Street, Medina, OH 44258/$16.50 a year.
- The Speedy Bee, P.O. Box 998, Jesup, GA 31545-0998/$17.25 a year.

Because there are so many beekeeping books, a newcomer may want to borrow books from a library or another beekeeper before deciding which to buy. Two books in most beekeepers' libraries are:

- "ABC and XYZ of Bee Culture," A.I. Root Co., P.O. Box 706, Medina, OH 44258/$25.
- "The Hive and the Honey Bee," Dadant & Sons, 51 South Second St., Hamilton, IL 62341/$36.00.

Prepared by H. Shimanuki and S.W.T. Batra of the Bee Research Laboratory, Agricultural Research Service, for USDA's Office for Small-Scale Agriculture (OSSA), Howard W. "Bud" Kerr, Jr., Program Director, Ag Box 2244, Washington, D.C. 20250-2244. Telephone 202-401-1805, Fax 202-401-1804.

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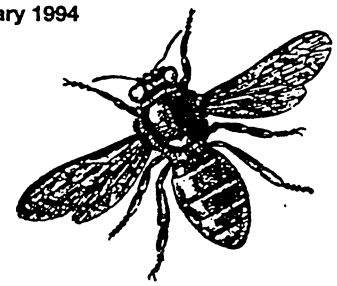
All uses of fungicides, pesticides, and herbicides must be registered by appropriate State and/or Federal agencies before they can be recommended.

CAUTION: Fungicides, pesticides, and herbicides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife if they are not handled or applied properly. Use all products selectively and carefully. Follow recommended practices for the disposal of surplus products and their containers.

January 1994



United States Department of Agriculture

Cooperative State Research Service

Office for Small-Scale Agriculture

A Small-Scale Agriculture Alternative

American Ginseng

Roots of cultivated American ginseng (Panax quinquefolium L.) sold for $40 to $43 per pound in 1992, but this high-value crop is difficult to grow and requires a great deal of time, labor and money. Nearly a dozen fungi can attack the plants and roots, damaging or wiping out an entire crop worth $75,000 per acre, which may have taken 3 or 4 years to reach harvest maturity.

Meanwhile, China has been purchasing seed from American growers to produce Chinese-grown American ginseng. Insiders speculate that the combination could saturate the future ginseng market.

Ginseng has become a significant cash crop export since the discovery of a wild variety nearly 280 years ago in Canada. A Jesuit missionary, traveling with a group of Mohawks north of Montreal, stumbled upon the plant in the early 1700's. Realizing its potential trade value, the Canadian Jesuits searched for more. In 1718, a cargo of wild ginseng roots was shipped to southern China and sold for $5 a pound. Today the price is between $150 to $280 a pound.

The China trade remained secret until American colonists learned of the herb's high price. "Sang" hunters searched the forests of western Pennsylvania, West Virginia, Kentucky and Tennessee. Ginseng quickly became a valuable trade export to the Orient, until over-harvesting threatened the native crops. Today, ginseng still grows wild, mainly in the cooler Appalachian Mountain areas, but over-harvesting causes serious scarcity.

Unlike the early 1900's, today's harvests are closely regulated through the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Under the CITES, import and export permits help prevent international trade from threatening survival of wild species. Some countries also levy ad valorem import taxes.

Cultivated roots and underground rhizomes do not need export permits in the United States, but all shipments must have an "Artificially Propagated Plant Certificate" issued by the U.S. Fish and Wildlife Service of the U.S. Department of the Interior. Federal law requires States to issue regulations on the harvesting and sale of ginseng, and to keep records of exports. On Federal property, ginseng hunters must apply for permits and dig only in designated areas.

MAJOR PRODUCERS

Internationally, the United States produces the most cultivated American ginseng, followed by Canada. There are nearly 1,300 growers in Wisconsin — the major growing state — 300 in Ontario and 100 in British Columbia. Growers are also scattered throughout New York, Kentucky, North Carolina, Tennessee, Oregon and Washington.

Wisconsin was actively involved in the harvest and export of wild ginseng in the mid nineteenth century. By the 1860's, the threat of extinction forced State governments to devise protective measures and Wisconsin growers began cultivating American ginseng under artificial shade. Today, these growers annually produce more than 1 million pounds, nearly 90 percent of the total cultivated U.S. crop.

In 1993, Wisconsin growers harvested nearly 1.7 million pounds of ginseng roots, valued at close to $70 million. Prices are based on market conditions and root quality, weight, size and color.

Currently, expanding Canadian production is reported to be nearing 1 million pounds annually. Ontario produces the largest percentage in fields formerly used to grow tobacco.

The "American Ginseng Trends" newsletter (Future Concepts, Inc., P.O. Box 1982, Wausau, WI 54402-1982) covers all aspects of the international industry, including harvest overviews, political issues, research updates and market reports.

HIGH-RISK INVESTMENT

According to Jennifer Parke, University of Wisconsin professor of plant pathology, the high risk comes mainly from disease. Parke coordinates disease studies at Wisconsin's Ginseng Research Gardens, which encompasses nearly 2 acres of plants ranging from seedlings to three-year-olds. Parke and her team focus on three main research areas: chemical controls for Phytophthora root rot, Alternaria leaf and stem blight and seedling diseases. In addition to publishing findings annually, the researchers offer summer tours of the Gardens and plan disease workshops for growers. (For more information, contact Jennifer Parke, Department of Pathology, University of Wisconsin, Madison, WI 53706; telephone 608-262-6531.)

James A. Duke, a botanist and author on herbs, and a long-time expert on medicinal plants at the U.S. Department of Agriculture's (USDA) Agricultural Research Service (ARS), Beltsville, MD, suggests planting goldenseal, a bitter medicinal herb, among ginseng roots to reduce rodent damage.

New crops require a great deal of human labor. Even as growers are protecting their ginseng crops from disease, insects, and thieving field mice, they must also hand-weed continuously to kill weeds. The fall season is even busier when ripe berries are handpicked for new seeding from each mature plant.

Conservative estimates place monetary investments at as much as $200,000 during the 3 or 4 years before a real profit is earned. Duke warns would-be ginseng growers that starting ginseng from expensive seed can be frustrating. The seeds need 18 months to germinate and if they become too dry, they may never grow. Duke's article on ginseng in the 1978 "Yearbook of Agriculture" provides additional information for prospective growers. USDA published Farmers Bulletin No. 2201 on "Growing Ginseng" (1973) is out of print, but may be found in a few libraries around the country.

Growers must also deal with security and protect their fields from shovel-wielding thieves in the night. Some States have made it a felony to steal ginseng from another's property.

Occasionally, geographic location is a problem. Ginseng requires winter chilling to break dormancy of the overwintering bud produced at the peak of the rhizome at the beginning of each growing season. The most favorable temperature and soil moisture conditions are on north- or east-facing slopes. A sloped site helps provide needed drainage, while wet conditions cause root rot. Ideal soils are loams with much organic matter. As ginseng tolerates only short periods of exposure to sun, light intensity should be no more than 15-25 percent of full sunlight.

In the wild, deeply rooted deciduous trees are welcome neighbors; coniferous or shallow-rooted trees, like maple, offer serious competition for water. Depending on such factors, wild roots may need 7 to 20 years to reach a desirable size.

Secrets to successful ginseng production are protected carefully between growing regions or even growers, but conferences open up communication. One new gathering is the International Ginseng Conference, sponsored by the Simon Fraser University, Burnaby, British Columbia, Canada V5A 1F6; telephone: 604-291-4910. "The Challenges of the 21st Century" was chosen as the theme for the 1994 conference in Vancouver, B.C., July 17-20.

The Illinois Specialty Growers (ISGA) Convention and Trade Show is an annual event for growers of fruits, vegetables, ginseng and other herbs. (Contact ISGA at 309-5572107.)

Every August, Ginseng Day attracts growers, equipment manufacturers and other international industry members to Marathon

County, WI. The trade show offers information, new products and demonstrations on the latest technologies and equipment. (For information contact Jack Cramer, Rib River Ballroom, 3237 Hwy. 29, Marathon County, WI 54448; telephone 715-443-2060.)

GINSENG VARIETIES

Varieties of American ginseng fall into three categories. Cultivated ginseng requires the most human labor and disease and pest control. Wild plants thrive solely with the help of Mother Nature, while woods-grown categories fall somewhere in between.

W. Scott Persons, author of "American Ginseng: Green Gold" (Bright Mountain Books, 38 Springside Road, Asheville, NC 28803), says "Woods-grown ginseng is for growers who want to avoid the costs, time investments, disease, and supplydemand fluctuations associated with cultivated ginseng. While woods-grown roots may reap a high reward, risks include theft and disease."

Woods-grown ginseng can be divided into woods-cultivated and wild-simulated. The former is the more labor intensive, but can bring as much as 1,200 to 1,500 pounds an acre. The woods-cultivated method may use low plantings of seedlings, seeds, or berries, artificial shade, mulching, drainage ditches, pesticides, rodent-trapping and fertilizers. With the wild- simulated methods, seeds or berries are thinly scattered by hand in an undisturbed woodland environment with favorable growing conditions.

Wild roots are darker in color than cultivated ones, appear more gnarled, and usually show more of the concentric annual growth rings that indicate age. Cultivated roots are generally a light cream color, smooth, and thicker. Generally, they taste about the same, but are larger, heavier and more uniform in size than wild ginseng roots. Yet the latter sell for a much higher price, often more than double the others.

Some Asians consider older, well-formed old roots of higher value because they resemble wild Oriental ginseng. They believe wild roots, which grow more slowly and are harvested older (20 years or more) than cultivated ones, absorb more nutrients from the soil. In 1988, dried wild ginseng roots sold for as much as $280 per pound, while quite a few growers of cultivated ginseng received less than $30 per pound.

SOUTHEAST ASIAN MARKET

In 1991, nearly 1.3 million pounds of American ginseng were consumed in China, mainly in the southeast regions. Over the past several years, Chinese consumption of American ginseng increased by 20 percent. Consumption in other southeast Asian countries could expand at this same pace.

Ginseng has gained a strong following as more people become concerned about preventive health measures and add supplements to their diets. For centuries, Southeast Asians have claimed ginseng as a source of good health. Due to its availability and lack of side effects, American ginseng is becoming increasingly popular in Asia. Its products are sold as dried root, powder, slices, extract, teas, and sodas. Ginseng is added as a food ingredient to many other products.

Buyers from as far away as Malaysia, Singapore, Hong Kong, and Taiwan travel to Wisconsin every October to compare roots and negotiate prices. If growers are not visited individually, they have the option of displaying their roots at area showrooms, including Ginseng USA, 315 South 4th, Wausau, WI 54401; the Ginseng Board of Wisconsin, 16H Menard Plaza, Wausau, WI 54401; and Marathon Feed, 409 Pine, Marathon, WI 54448.

Local businesses buy and export American ginseng year round through several major Wisconsin companies, including the Progenix Corporation, 1013 North Third Avenue, Wausau, WI, and Hsu's Ginseng Enterprises, T6819 Hwy. W, Wausau, WI. Roots from both firms are sold in bulk or processed into graded roots, powder, extracts, and capsules. They also are sold to U.S. retailers.

In his eight-page booklet "American Ginseng" (American Botanical Council, P.O. Box 201660, Austin, TX 70720, 512-331-8868), Steven Foster looks at the discovery, distribution history and research on American ginseng.

AMERICAN MARKET

Ginseng product sales are increasing in the United States as more American consumers become health conscious and look for "natural" foods and methods to supplement diets. American ginseng is among herbal supplements included on the GRAS (Generally Recognized As Safe) "list."

Health food stores and many Asian stores in the U.S. offer an array of ginseng products: capsules, extracts, teas, sodas and facial creams. "North American Cooking with Ginseng" (available from the Progenix Corporation) features ginseng in more than 150 traditional Western recipes.

Future American ginseng research by Western scientists encourages the American market. Some researchers link the active ingredient in American ginseng, a ginsenoside called Rh2, to reversal of some cancer-forming processes. If additional research confirms the medicinal value of ginseng, the market certainly would expand. According to some authors, global additional markets need to be identified if American ginseng is to remain a lucrative industry.

Ginseng is a member of the Araliaceae botanical family. American ginseng's scientific name, Panax, derives from the Greek words "pana" (meaning "all") and "axos" (for "cure"). The word ginseng (or Jen-shen) originally stemmed from two Chinese characters meaning man and body. The Chinese name is often translated in Western publications as "man-shaped root" or "manroot." However, Professor S.Y. Hu, a botanist at the Arnold Arboretum at Harvard University, prefers the term "man-essence." According to Hu, it was derived from "the fanciful resemblance of the root to the human body," and from "the belief that this root represents the essence or elixir of the earth crystallized in a human form" (Joseph Hou, 1978; S. A. Graham, 1966).

Asian species include Japanese ginseng (Panax japonicus), sanchi or tienchi ginseng (Panax notoginseng). While Siberian ginseng (Eleutherococcus senticosus) is a member of the Aralia family, it is not in the genus Panax. Folklore about Asian ginseng maintains that it has internal warming properties (Yang) while American ginseng is believed to be a cooling tonic (Yin).

Information Sources

Sources of information about ginseng can be found in some libraries, while the following books and articles either devote a chapter to ginseng or focus on it as their main topic:

"Facts About Ginseng: The Elixir of Life," Florence C. Lee. Copyright 1992, Korea Ginseng Research Institute. Available from Future Concepts, Inc., P.O. Box 1982, Wausau, WI 54402-1982.

"Ginseng: A Concise Handbook," James A. Duke. Copyright 1989, Reference Publication.

"Ginseng: the Magical Herb of the East," Stephen Fulder. Copyright 1988, Thorsons Publishers, Inc.

"An End To Ageing?" Stephen Fulder. Copyright 1983, Destiny Books.

"Ginseng, What It Is ... What It Can Do For You," Ben Charles Harris. Copyright 1978, Keats Publishing, Inc.

"Ginseng: The Myth & The Truth," Joseph P. Hou. Copyright 1978, Wilshire Book Company.

By Rebecca Zunker, Assistant Editor, "American Ginseng Trends" newsletter, and George B. Holcomb, Office of Communications, U.S. Department of Agriculture (USDA), for USDA's Office for Small-Scale Agriculture (OSSA); Howard W. "Bud" Kerr, Jr., Program Director, Ag Box 2244, Washington, DC 20250-2244. Telephone: 202-401-1805; Fax: 202-401-1804.

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United States
Department of
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Cooperative State
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Office for
Small-Scale Agriculture

A Small-Scale Agriculture Alternative

Dessert Vines

Improvements in disease resistance of watermelons open up new possibilities for small-scale entrepreneurs who want to produce them for local markets. It could mean a comeback for watermelons, which were consumed at the rate of about 17.9 pounds per capita in the 1950's. The rate dropped to only 12.8 pounds in the 1970's.

Among those with more hardiness to disease are the miniatures—icebox size melons of 5 to 10 pounds. Meanwhile, hybrid triploid varieties are being produced without seeds. Some triploids average 15 pounds. Consequently, small and seedless melons may show up in many markets.

As to the minimelons, Lawrence A. Risse, a marketing specialist with the Agricultural Research Service (ARS) of the U.S. Department of Agriculture, says new varieties, Mickylee (averaging 10 pounds) and Minilee (weighing 7.5 pounds) could become big sellers here and abroad. Risse is with the ARS Export and Quality Improvement Research unit, Orlando, FL 32803. (Telephone: 407-897-7326)

Growers say that besides their resistance to the common diseases of anthracnose and Fusarium wilt, minimelons are firmer, crisper, and sweeter than other watermelons. Whether size gives them a marketing advantage over their 20- to 25-pound cousins is a question. Supermarket dealers can make more money per melon by selling slices of large melons. The small ones average more rind per pound than the big ones. But the new minimelons reportedly hold up well in shipping, even without refrigeration. They were developed in Florida under James M. Crall, University of Florida faculty member at the Central Florida Research and Education Center (CFREC) 5336 University Ave., Leesburg, FL 32748. (Telephone: 904-787-3423.)

Dr. Crall says that while small-scale entrepreneurs may not be able to compete with big commercial melon growers in supermarkets, they can retail direct at highway or shopping mall spaces or sell to smaller stores.

Yield of the smaller melon usually equals that of larger size melons—anywhere from 1 to 3 tons an acre, depending on available moisture and soil quality. They bear in about 82 days.

Mickylee and Minilee seeds are available at prices ranging from $2.50 to about $4 per ounce from some seed dealers. If not available locally, and while supplies last, they may be obtained by mailorder (with mailing costs varying from 50¢ to $1.25 per ounce) from seed retailers, including the Kilgore Seed Company, 1400 West First Street, Sanford, FL 32771 (telephone: 407-323-6630); H.G. Hastings Company, P.O. Box 115535, Atlanta, GA 30310 (telephone: 1-800-334-1771); Willhite Seed Company, P.O. Box 23, Poolville, TX 76076 (telephone: 817-599-8656), or Otis S. Twilley Seed Company, P.O. Box 65, Trevose, PA 19047 (Telephone for a minimum of $25 orders only: 1-800-622-7333 outside Pennsylvania or 1-800-232-7333 inside the State. For other calls, telephone 215-639-8800). Twilley also has a 65-day miniature with yellow flesh. Some dealers will give or sell a useful catalog to prospective customers.

Retailers not yet having these varieties may be able to get them from either Petoseed Company, Inc., 1905 Lirio Street, Saticoy, CA 93004, or Hollar and Company, Inc., of P.O. Box 106, Rocky Ford, CO 81067, the two major distributors handling the miniatures originating in Florida.

As for the seedless or hybrid triploid watermelons, the Twilley Seed Company handles two varieties called Fummy and Quality. They bear fruit in about 90 days. Seed cost is $49 per ounce—about 500 seeds—plus the needed pollinators. Seeds from nonseedless or diploid varieties have to be planted as pollinators with the triploid seeds in order to produce melons.

The Hastings Company has had one variety of seedless hybrid, Tri-X 313. Seed for this variety sells for $9.95 per ounce. One melon grower reportedly has bought rights to this product, and will market melons only on an exclusive basis.

The Petoseed company has developed three seedless varieties: Jack of Hearts, King of Hearts, and Queen of Hearts. One retail seed company handling the Jack of Hearts is Earl May Seed & Nursery Company, 208 N. Elm Street, Shenandoah, IA 51603. Only limited quantities are available at $1.75 per packet of 10 seeds.

Two Japanese seed companies are also reportedly offering seedless varieties. Takii & Company of Kyoto, Japan, has Jupiter (like the Sugar Baby) and Laurel (a Crimson Sweet type). Sakata Seed Company of Yokahama, Japan, has one named Nova.

Northrup King Seed Company of P.O. Box 1827, Gilroy, CA 95021 (telephone: 408 – 847-4242) may have a new variety of seedless available in 1989.

Some growers advise that for good germination, seeds from hybrids should not be stored outside a refrigerator for more than 3 months before planting.

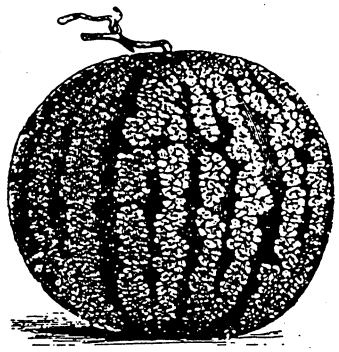
Germinating triploids requires special care. That's one reason, along with cultural and climatic factors, why companies may make no guarantee that fruit will be produced in a "seedless" condition. Unless a grower can find a local experienced person to consult, each grower may have to test out the varieties to learn which suits his or her conditions. County Extension agents often have useful knowledge to share.

Experts recommend that the triploids be started in pots or pellets of peat in greenhouses or with some other temperature control method. The pots or pellets should first be soaked in water thoroughly, then allowed to drain for 24 hours before planting. The seeds should first be treated with Captan to prevent their getting damping off disease and dying.

Two seeds should be planted ½ inch deep in each pellet or pot, with pointed ends toward the sky. Sometimes the seed coats hang tough around an emerging seedling; they should be removed from the cotyledon or seed leaf with care whenever spotted.

When about 10 percent of the seedlings have sprouted, the plastic covering should be removed, and they should be watered as needed to keep them moist. The greenhouse temperature should be lowered to 75 degrees.

Sprouts should be thinned by cutting off the weaker ones or possibly transplanting them to another pot or pellet. The plants should be ready for field culture in about 3 weeks or when they show two or three leaves. They should not be left inside the green-



house after three leaves appear. The cooler temperatures and good light of outdoors should keep them from becoming spindly; that is, elongated and weak. Even then, the early fruit of most triploids may have a tendency to form "hard" seeds, according to some advisers.

Some hybrids have a production period averaging 90 days, somewhat longer than many other varieties, but, according to experts, they can be grown anywhere in the United States so long as the temperature precautions described above are followed.

Both the miniatures and the diploids ship well; but the miniatures have a shorter growing period, usually about 82 days, and need somewhat less care.

Cantaloupe and Others

Another vine-producing dessert fruit is the cantaloupe, of which there are many varieties in various parts of the country. Hybrids are recommended for disease tolerance and quality. The nearest Extension agent is likely to be able to recommend good varieties for his or her area, and will give instructions on growing them. Production time varies from 70 to 90 days.

Three varieties of national worth that are cited by Gary W. Elmstrom, director of the Leesburg, Florida, center mentioned above are Mission, Magnum .45, and Easy Rider. Northrup King has a new variety that is sutureless; that is, it has no seams and thus is better shipping. Twilley also retails a sutureless variety called Ambrosia.

There are also hybrid Crenshaw and honeydew melons available. Dr. Elmstrom recommends a cross between the Crenshaw and the honeydew that originated in Central America. Called Mayan Sweet, its flesh is whitish rather than green.

Another melon worth investigating is MaryGold, a casaba developed by Dr. T.J. Ng of the University of Maryland (Department of Crop Physiology, MD 20742). With a canary yellow rind, it has white flesh and is described as having an excellent sweet taste. It is said to do well in Maryland and surrounding States, hence, it may have a broad range. Its shape is round to oval; the rind has no netting and is slightly wrinkled. It is not a hybrid; hence, it reproduces from its seeds. Seeds are available from Hollar and Company (mentioned above), and possibly other distributors.

County Extension agents may give tips on marketing, but they can't provide the extra labor that may be needed if a grower plants more than his family and available laborers can harvest, haul, and sell.

One way to help with the labor problem is to use plastic row covers and mulch systems so as to stagger planting dates, thus getting some melons developed and harvested ahead of the regular season. Spreading labor needs may also help in market competition. Booker T. Whatley's "How to Make $100,000 Farming 25 Acres," describes how. The book is sold by the Rodale Institute ($17.95, softcover; $24.05, hardcover), 222 Main Street, Emmaus, PA 18049.

Dr. Whatley also tells how producers can build their own buyers' club by selling memberships. He suggests this for combinations of crops, but it could be done solely with dessert vines. A producer might also build a delivery route. Participation in a club requires consumers to use leisure time; many people want to shop at one supermarket once a week.

Pleasant and harmonious customer relations may be the most important part of succeeding with dessert melons, as with any high-value crops. It may take as much time and energy selling as growing and harvesting combined.

Direct marketing, as Whatley recommends, means doing as well with people as with crops. "Socializing with customers" was a primary reason for direct marketing at farmers' markets, as given by more than 90 percent of 21,000 marketers in a study by USDA's Economic Research Service.

The question, "Is Your Farm Suited to Pick-Your-Own?," is taken up by J.W. "Bill" Courter in "Adapt 2," the publication growing out of Successful Farming magazine's 1987 conference on ag diversification at Kansas City, MO. The publication contains the proceedings of the two-day meeting and is available for $12.95, postpaid (at P.O. Box 10652, Des Moines, IA 50336).

An Extension specialist at the University of Illinois, Dixon Springs Agricultural Center, Simpson, IL 62985, Court suggests it may be better for the grower to harvest melons and display them at a stand, noting that customers may damage crops or cause excessive losses when not supervised.

Ranson Blakely, a marketing consultant (P.O. Box 449, Dryden NY 13053), has two companion reports in "Adapt 2" on "Direct and Roadside Marketing," noting 14 "cautions for direct marketers," and on "Farmers' Markets: Steps to Success." He emphasizes the need to keep track of competitors' prices and quality, and says that before doing any price cutting, a seller must advertise to be effective. He prefers the accent on serving quality-conscious shoppers rather than trying to catch fickle bargain hunters.

Also in "Adapt 2," Curtis Stutzman, economist and program developer for Rural Diversified Enterprise Center (Kirkwood College, P.O. Box 2068, Cedar Rapids, IA 52406), has recommendations in an article called "Determining Your 30-Mile Markets."

For those select producers at some distance away from big cities, but who want to wholesale through specialty marketers, much knowhow is required about packing and shipping requirements.

In response to such needs to know, the Export Services Branch of USDA's Office of Transportation (410 McGregor Building, Washington, DC 20250-4500. Telephone: 206-653-6317) has a "Tropical Products Transport Handbook" available at no charge. It discusses maintaining fruit and vegetable quality during transportation, especially emphasizing cooling practices needed. It provides growers, shippers, carriers, and receivers of fruits, vegetables, plants, and flowers facts about standards and ways to reduce postharvest losses. A Spanish version is called "Manual de Transporte de Productos Tropicales." A summary of recommendations is given for 120 fruits and vegetables. Import regulations are described briefly.

A warning about insurance needs is also found in "Adapt 2" in a chapter on "Insurance and the Diversified Farmer," by Don R. Cook, an Indiana insurance merchant. And Roy Ferguson, a farmer (10726 S. 68th East Avenue, Tulsa, OK 74133), describes "Developing a Multiyear Business Plan" and "Obtaining Lender/Investor Capital." The local USDA Farmers Home Administration office, found in most counties, can give information on whether there is a need for a USDA loan and if so, how to obtain a USDA loan to help get started in the melon business. Another source of information, supported by USDA as an aid to help farmers, Extension agents, and rural community developers, is the organization, Appropriate Technology Transfer for Rural Areas (ATTRA), Agricenter International, 7777 Walnut Grove Road, Box 17, Memphis, TN 38119 (Telephone: 1-800-346-9140).

Prepared by George B. Holcomb of the Office of Information, U.S. Department of Agriculture, for USDA's Office for Small-Scale Agriculture (Howard W. Kerr, Jr., Program Director). The address is: OSSA, Cooperative State Research Service/~~Office of Grants and Program Systems~~, Room 3228, Aerospace Building, USDA, Washington, DC 20250-2200 (Telephone: Area Code 202-~~447-3640~~ 401-1805

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United States
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A Small-Scale Agriculture Alternative

Exotic Fruits

Certain potentially high-demand tropical or other exotic fruits growing in Florida or California also have varieties that will bear fruit farther north. But potential small-scale northern enterprisers should not buy seeds or seedlings from anyone until checking them out carefully with a horticulturist at their county or State Extension office.

Even in Florida, which produces many kinds of exotic fruits, there are a few unscrupulous promoters who try to market unsuitable tropical fruit trees. "Enthusiastic amateurs," says Dr. Robert J. Knight, Jr., of a Florida branch of the Agricultural Research Service, U.S. Department of Agriculture (USDA), may unwittingly buy cultivars of fruits such as rambutan (*Nephelium lapaceum*), durian (*Durio zibethinus*), and others with no chances of success producing fruit commercially in that State.

The growing demand for specialty fruits in most large cities means skilled small-scale entrepreneurs may compete with strong competitors from New Zealand and Central and South America if they select varieties carefully and master their marketing homework. The fruits discussed here may come from many parts of the world. Most aren't commercially feasible in the United States other than parts of Florida, California, or Texas and sometimes in Hawaii and Puerto Rico.

However, there is a move along a southern belt of South Carolina and on west to risk planting some hardier varieties of fruits such as the kiwi. But the kiwi situation is "very iffy, commercially," according to L.D. Holmes, whose 16 acres may be the biggest kiwi orchard in the east that is north of Florida. He has at least $160,000 invested in trellises and irrigation equipment for the Hayward variety. So far, too many freezes have cost him too many crops to consider his acreage a success.

He markets through Seald Sweet Growers, Inc., with headquarters in Tampa, Florida. Kirk McCreary of Seald Sweet says marketing is not easy because the firm is not able to get enough volume to supply most chain stores. And the competition from California is formidable.

Dr. Judith Caldwell (Department of Horticulture, Clemson University, Clemson SC 29631) and Janice McGuinn, Extension agent in Charleston County, are still wary about recommending investments in kiwi vines in their State. They also note that prospects for controlled atmosphere storage are in the offing, which could make California producers even more competitive.

Frieda Caplan, U.S. pioneer in marketing the kiwifruit (also once known as Chinese gooseberry) in the early 1960's notes that kiwi was not an overnight success. Caplan, founder of the Los Angeles family specialty produce firm known as Frieda's Finest, said it took 14 years for her and other marketers and growers to acquaint food journalists and consumers with the fruit and another 6 years to reach the point where California kiwi growers have 11,000-plus acres.

Despite the fact that U.S. per capita fruit consumption has been rising, the experts caution any small-scale entrepreneur who might want to emulate kiwi success and launch some other little known fruit, such as the feijoa.

"For other specialties to develop like kiwi fruit has," Kaplan told a trade publication writer, "growers must know how to manage their crops so that they can achieve a reasonable profit even at lower prices."

While some fruits do well in one State and not in another, a few, like the feijoa, a native of South America, have also been adopted successfully by New Zealanders, Floridians, and Californians. With some protection, it too can be cultivated farther to the north; but according to latest reports it hasn't, possibly because damaging fruit flies love it so.

U.S. growers have an advantage over overseas producers in that many fresh fruits are barred from entry into the United States because of the fruit fly problem. Many fruits may be imported from some countries or the State of Hawaii only if frozen or processed, as in puree. If frozen, they are given an initial quick-freezing at subzero temperatures, with subsequent storage and transport at no higher than 20 degrees F.

Market experts emphasize that growers must understand how to harvest, pack, store, and transport their crop so the consumer will receive a product of high quality 7 to 10 days after harvest. Retailers must not experience excessive spoilage or moisture loss while displaying new items. All know customer satisfaction is the key to repeat sales.

Talk With Marketers

Potential growers of any fruit are advised to talk with retailers and intermediate marketers before starting to produce.

Entrepreneurs actually growing quality fruit can contact marketers such as the mail-order house known as Bear Creek Operations, Inc. (P.O. Box 9000, Medford, OR 97501); Caplan (P.O. Box 58488, Los Angeles, CA 90058), or Roland Chicas, Chicas and Associates (P.O. Box 788, New York, NY 10035), a New York specialty-produce distributor looking for a few good exotic fruit producers.

For other marketing ideas, growers might also check information from Dr. Booker T. Whatley, or Nancy Lee Bentley. Whatley produced the book, "How to Make $100,000 Farming 25 Acres." (Rodale Institute, 222 Main St., Emmaus, PA 18049. $17.95 softcover, $24.95 hardcover.) And Bentley authored "Windows of Opportunity: The Market for Specialties and Organics." (The Food Circle, P.O. Box 62, Cabery, IL 60919. $25.) A useful book, possibly found in some libraries, is "Handbook of Tropical and Subtropical Horticulture," published by the Department of State in 1970.

In selecting marketable fruits, potential producers should check with their local Extension agents on what to grow. Floridians, for example, will know that some Asian fruits with "no possibility of serious cultivation in Florida," as Knight noted, are breadfruit (*Artocarpus communis*), mangosteen (*Garcinia mangostana* L.), pulasan (*Nephelium mutabile*), and probably rambai (*Baccaurea dulcis*), duku, tampoi, and champedak (*Artocarpus interger*).

In Puerto Rico, on the other hand, breadfruit may well have great commercial potential, and mangosteen and rambutan can also thrive, according to Ismael Reyes Soto of the University of Puerto Rico. Other tropical fruits in order of potential in Puerto Rico, he says, are guanabana or soursop (*Annona muricata* L.); Jobo de la India (*Spondias dulcis*-Parkinson); quenepa, also known as quenep, kenep, mamon, mamoncillo, limoncillo, and, in English, Spanish lime (*Melicoccus bijugalus* - Jacq. or *Melicocca bijuga*, L.); nispero, also known as sapote, chicozapote, chicle, sapotillo, zapote colorado, and, in English, sapodilla, dilly, and naseberry (*Manilkara sapotilla* Gilly); and tamarindo. He also has a list of others

of possible potential importance.

To compete with big Florida and California growers now dominating tropical fruit production, growers elsewhere must study matters other than market potential. They may also have to form, or at least join, a marketing cooperative for the advantage of being able to market enough to interest chain stores, which buy in large lots.

Tropical Reference

Potentially saleable fruits of the tropics number in the hundreds. One major reference, the 247-page *Perennial Edible Fruits of the Tropics: An Inventory*, by Franklin W. Martin, Carl W. Campbell, and Ruth M. Ruberte, describes many. (The handbook, available at some libraries, may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, for $12 plus 94 cents for fourth class postage.)

Timely sources of information include the rare fruit councils. The Rare Fruit Council International, Inc., of Florida publishes an 8-page monthly newsletter from 13609 Old Cuttler Road, Miami, FL 33158.

The California Rare Fruit Growers, Inc., at Fullerton Arboretum, California State University, Fullerton CA 92634, has about a dozen chapters and 2,600 members.

Another data source is the specialty crop program of Claude Sweet of the Horticulture Department of MiraCosta College, One Barnard Drive, Oceanside, CA 92056. Sweet authored the 96-page *All About Citrus & Subtropical Fruits*, published in 1985 by Ortho Books, 6001 Bollinger Canyon Road, Bldg. TB120, San Ramon, CA 94583. (It costs $7.95, including postage, plus State tax if any.) It tells how to grow more than a dozen subtropical fruits, and includes a chapter on container plantings for northern growers.

Sweet also is building a national computer data base on plants, especially the tropicals. He has considerable data stored, and hopes to collect marketing data so growers can compare profit and risk potentials of various crops.

Exotics of Potential

Alphabetical according to scientific name so as to reduce confusion, below are tropical or 'exotic' fruits that certain distributors might handle.

Annona cherimola Mill. ("Cherimoya" in English; "anon" and "chirimoya" in Spanish.) A high-value crop, it demands great management skill to produce the uniformly shaped, high quality fruit the market demands. Grading and packing requires full attention. It must be handled gently and properly stored to reach the consumer in good shape. Production is likely to be confined to California.

Annona squamosa x A. cherimola. ("Atemoya" in English and Spanish.) Atemoya is a hybrid cross developed by Floridians as an alternative to the Cherimoya. Just coming into production in Florida, it may have good potential, according to Dr. Campbell, tropical fruits specialist for the Florida Extension Service with the University of Florida. It is one of few exotic fruits sold by mail order.

Annona squamosa. ("Sugar apple" or "sweetsop" in English; "anon," "rinon," or "anona blanca" in Spanish.) Sugar apple may have only local commercial production potential but may be useful for home gardens in hot tropical lowlands. It will survive a light frost.

Averrhoa carambola L. ("Carambola" in English and Spanish, and also "starfruit" in English.) Carambola acreage is growing in Florida, according to USDA Scientist Knight. A tree will bear fruit two or three times a year. Some see it as the next kiwi.

Calocarpum sapota Merr. ("Mamey sapote" in English or Spanish.) The Campbell book says this is one of the most notable and talked about fruits, with a rich and distinctive flavor. Its popularity grows in Florida.

Casimiroa edulis La Llav. et Lex. (White sapote" in English and "zapote, matasano, sapote blanco" in Spanish.) While very perishable, the taste and flavor of white sapote compares well with the cherimoya. It is more adaptable to California than to Florida, tolerates a variety of soil conditions, seasonal dry periods, and frost.

Feijoa sellowiana Berg. This pineapple guava, Caplan says, has potential "much smaller" than that of the kiwi.

Litchi chinensis Sonn. ("Lychee' or "litchi" in English and "lichi" in Spanish.) Although this fruit is very perishable, it can command a premium price. Domestic varieties bear irregularly in Florida; new ones brought from Australia and Hawaii by Miami researcher Ed Johnston of the Fairchild Tropical Garden's Tropical Fruit Program may be better.

Passiflora adulis Sims or *Pasiflora edulis Sims f. flavicarpa Deg.* (The first is "purple passion fruit" and the second is "yellow passion fruit." In Spanish, both are named "maracuya," "granadilla," or "parcha.") Demand rises; purple passion fruit promises much to California but not to Florida, where the mean temperature is too high. Disease-resistant varieties are needed.

Psidium guajava L. ("Guava" or "common guava" in English and "guayaba" in Spanish.) Guava is highly perishable. Growers need varieties that are tastier and can be marketed with proper promotion.

Tamarillo. Grown in a limited way in California, tamarillo does poorly in humid, hot areas like Florida. It merits consumer education.

Health, Labor Problems

All fruits, of course, require much work to keep vines or trees healthy. Then, there is the problem of harvesting hands. They are not easily found, but migrant labor can sometimes be available through a larger organization that a grower can join, such as a marketing cooperative.

To keep up with fruit prices, operators may want to check with USDA's Agricultural Marketing Service (AMS). Its Fruit and Vegetable Division has a Market News Branch, headed by W.H. Crocker, Room 2503-S, AMS, USDA, Washington, D.C. 20250. AMS may be able to provide a recent listing from Los Angeles, San Francisco, or New York of latest prices for certain fruits regularly supplied. To calculate what the farmer's price will be, deduct about 30 percent from the quoted price, Caplan advises.

USDA's National Agricultural Library (NAL, Beltsville, MD 20705) has a Reference Division that can provide a bibliography of information about fruits.

Another source for a bibliography is the Produce Marketing Association (PMA, 1500 Casho Mill Road, Newark, DE 19714-6036).

To help growers, shippers, carriers, and receivers learn the standards and to reduce postharvest losses and expand the markets for highly perishable, high-value fruits (and vegetables), the Export Services Branch of USDA's Office of Transportation (410 McGregor Building, Washington, DC 20250-4500) has a Tropical Products Transport Handbook available at no charge. A Spanish version also is available.

Prepared by George B. Holcomb of the Office of Information, U.S. Department of Agriculture, for USDA's Office for Small-Scale Agriculture (Howard W. Kerr, Jr., Program Director). The address is: OSSA, Cooperative State Research Service/~~Office of Grants and Program Systems~~, Room 3428, Aerospace Building, USDA, Washington, DC 20250-2200 (Telephone: Area Code 202 + ~~447-3640.~~ 401-1805)

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United States
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Agriculture

Cooperative State
Research Service

Office for
Small-Scale Agriculture

A Small-Scale Agriculture Alternative

Foliage Plants

Foliage plants come in all shapes—rounded, spread, upright, cascading or weeping, oval, and mounded. They can be maintained in dishes, terrariums, hanging baskets, totem poles, large individual pots, troughs, or boxes. They can range in height from a few inches to 20 feet or more in large patios or entries. They cover a wide color range and may or may not have flowers.

Ten States dominate sales in the highly competitive indoor foliage plant industry. Florida leads. Acreage in production in Illinois soared some 2,500 percent over 10 years. The other significant producing States are California, Texas, Ohio, Pennsylvania, Michigan, New York, New Jersey, and Massachusetts.

Acreages and values of foliage plants, generally tropical, have grown over recent decades. From 1970 to 1980, foliage sales increased 834 percent.

A small-scale entrepreneur who is a good marketer might make substantial profits every spring on a part-time basis by growing certain foliage plants in a 3,000-square-foot greenhouse, according to Dr. Davis S. Koranski, floriculture specialist at Iowa State University. The least costly greenhouse could be used, he said, and plant sales could gross from $9,000 to $18,000. Seeds or cuttings, labor, and other costs should not total more than 40 to 50 percent of gross, he said. His estimates apply to the northern tier of States; farther south, lower heating costs could boost returns.

An enterprising marketer could emphasize individualized personal service and fresh ideas. Talented growers sometimes branch out into interiorscaping, the newest service in the nursery business. Competitors include many large grower-firms, some of which do their own retailing with mail-order sales.

Key book sources of data on foliage plants include *Interior Plantscapes: Installation, Maintenance and Management,* by George H. Manaker, and the highly technical *Foliage Plant Production,* edited by Jasper N. Joiner. Both were published by Prentice-Hall, Inc., Englewood Cliffs, NJ 07632 in 1981.

Many Sources

Other sources of information on foliage plants, their production and marketing, include county Extension agents; wholesale florists; State nurserymen's associations; experts at State universities; U.S. Department of Agriculture's (USDA) National Agricultural Library (NAL) with its AGRICOLA computer data base (Horticulutre Information Center, NAL, Beltsville, MD 20705); the Society of American Florists (1601 Duke Street, Alexandria, VA 22314), which has a growers' division; the information center of the Producer Marketing Association (PMA); and major private commercial magazines, such as *GrowerTalks.* The latter's publisher is George J. Ball, Inc. (250 Town Road, West Chicago, IL 60185). A year's subscription costs $19. A colorful cyclopedia, *Tropica,* by Dr. Alfred Byrd Graff, sells for $125 at Roehrs Company (19 Prospect Terrace, P.O. Box 125, East Rutherford, NJ 07073). It has about 7,000 color photos.

PMA's information specialist, Julie E. Stewart (1500 Casho Mill Road, Newark, DE 19714-6036) can provide a bibliography on foliage plants at a minimum charge for nonmembers of $20 per search plus $10 for up to 10 printed pages and $1 per page for anything over 10 pages. Her latest foliage plant bibliography is 5 pages long. It includes items dealing with prices, consumer buying trends, shipping temperatures, and marketing ideas.

PMA also has a Floral Marketing Division which annually produces *Floral Marketing Directory & Buyer's Guide* ($20). Foliage plant producers are part of the floral industry. Besides listing floral growers and suppliers, the guide notes supermarkets that buy floral items and may provide consumer interest survey information. It also may describe the latest boxing or shipping standards and list floral holidays.

Other published information sources include the *Produce Marketing Almanac,* issued every year by PMA; the *Packer* newspaper; *Produce News; Florists' Review; Produce and Floral Retailing; Nursery Business-Retailer;* and *Florida Foliage.*

Many local libraries can supply addresses and sometimes copies of the above or other publications that discuss foliage plants. Local newspapers and general magazines often provide indications of trends in foliage plant decoration.

The NAL's Horticulture Information Center can provide potential entrepreneurs with a bibliography. It lists articles and books, such as *Practical Horticulture: A Guide to Growing Indoor and Outdoor Plants,* by L. W. Rice and R. P. Rice; and *The Greenhouses,* an annual.

Quarantine Laws

If plant growers make interstate shipments of plants and soil, they must remember State and Federal plant quarantine laws. Penalties apply to violators. Growers should seek information from their State plant regulatory official at the State department of agriculture or USDA officials with the Animal and Plant Health Inspection Service (APHIS, Plant Protection and Quarantine, Regulatory Services Staff, Federal Building, Hyattsville, MD 20782).

Marketing foliage and foliage plants is basic to success, as indicated by Koranski. If beginning entrepreneurs can find a large floral retailer or jobber with whom to become associated as a supplier of plants, they will have solved some marketing problems. Sometimes growers also can find retail florists who have a need for seasonal plants such as forsythia, forced peach blossoms, spirea, and pussywillows, to mention a few, as well as plants such as ferns that are used the year round.

A grower also might work out a sales arrangement with the owner of a local store with a large parking lot where plants can be displayed.

For those who would like 11 pages of ideas for use in marketing, Allen C. Bjergo, community development specialist with the Montana State University Cooperative Extension Service (1018 Burlington, Room 200, Missoula, MT 59801), has developed "Your Marketing Plan Outline," available free on request. (He also has "Earn

Extra Money From Your Farm or Ranch" and "Financing Your Ideas.")

Meanwhile, in Florida, where one grower said 95 percent of foliage plants are grown on speculation, some marketers are trying to beat the competition and interest new customers, either retailers or final consumers, by moving away from the "bread-and-butter mainstays" among foliage plants. These include *Schefflera Aboricolas* ("Hawaiian elf"), *Dracaenas marginata* and *D. fragrans massangeana* (corn plant), *Ficus benjamina,* (rubber trees), and *Chrysalidocarpus lutescens* (Areca or "butterfly" palms). Such growers look for harder-to-grow but attractive plants, or new ones. With fresh items, they also may avoid the problem of selling plants at 1970 prices.

A couple of the more colorful plants such growers are introducing are the hibiscus and the croton. Other, harder-to-grow varities include the *Dracaenas detrmensis* 'Janet Craig' and 'Warneckii.' A few producers are developing new cultivars.

Competition Stimulates

Pressured by competition, growers also look for other ways to save, by:

- Selling directly to the public as well as to retail sales outlets and interiorscapers.
- Doing interiorscaping in addition to growing.
- Establishing inventory control.
- Scheduling production on the basis of past sales.
- Maintaining low sales overhead.
- Mechanizing to reduce labor.

Some nurseries join others to combine marketing, billing, shipping, and retailing.

For those interested in doing direct marketing to consumers, a 32-page 1981 publication, *Direct Marketing by Farmers to Consumers: Some Legal Implications,* is an information source. It discusses employment regulations and marketing liabilities such as warranties in direct marketing. By D. L. Uchtmann and J. T. Archer, it was published by the University of Illinois and may be obtained for $1.50 from the Agricultural Publications Office (54 Mumford Hall, 1301 W. Gregory Drive, University of Illinois, Urbana, IL 61801).

2 Acres Enough

Foliage plant nurseries range in size from backyards to 60 or 70 acres. One successful Florida grower said "you could make money" with 2 acres, with properly controlled overhead.

A North Carolina grower, self-described as a nonworkaholic, is surviving on a full-time basis with 30,000 square feet and nine greenhouses, a prefabricated portable hut, and a coldframe. In the Deep South some growers shade plants and don't build greenhouses. In Northern States, however, sturdy, well-insulated greenhouses are essential for full-time foliage operations.

Insulation and heating methods change. Coverings that hold in infrared light for use as a heat source are recommended in certain areas. Solar energy also is often used as a heat source.

Joiner's book, *Foliage Plant Production,* illustrates how to achieve greenhouse efficiency and set up a systems approach that allows expansion. Many growers recommend movable benches to make best use of space.

Costs for several types of greenhouses range anywhere from $10 to $40 per square foot.

In his book, Joiner says, "Polyethylene houses or steel frame and fiberglass covered houses would make best use of investment funds where a 10 percent minimum return on an investment is required." He cautions that "availability of investment funds is usually a major problem."

Joiner's book also analyzes yield per square foot of greenhouse space for various foliage plants such as philodendrons, pileas, dieffenbachia, aglaonema, ferns, hoyas, and Norfolk Island pine.

Many Problems

Pest challenges facing foliage producers are those of any greenhouse manager. *'GrowerTalks'* in June 1987 profiled 10 of the worst greenhouse problems, namely: Among insects, whiteflies, thrips, spider mites, mealybugs, and leafminers; and among diseases, powdery mildew, *Xanthomonas, Rhizoctonia, Fusarium,* and *Phytophthora.* The biological-controls approach to pests is usually recommended by USDA and State Extension and university specialists when possible, and *'GrowerTalks'* also calls for its study, calling it the "technology of tomorrow."

A feature of Joiner's book is a 10-page table listing symptoms and possible causes of foliage plant problems, ranging from nutrient deficiency to inadequate light and humidity, chilling, plant spacing, air pollution from gas, and many pests.

Besides various botanic gardens around the country, another location where potential growers might see some useful foliage plants is the U.S. Botanic Garden, administered through the Office of the Architect of the Capitol, just west of the U.S. Capitol at Independence and First Streets, SW, Washington, DC 20024.

Prepared by George B. Holcomb of the Office of Information, U.S. Department of Agriculture, for USDA's Office for Small-Scale Agriculture (Howard W. "Bud" Kerr, Jr., Program Director). The address is: Office for Small-Scale Agriculture, Cooperative State Research Service/Office of Grants and Program Systems, Room 635, Hamilton Building, Washington, DC 20250.

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A Small-Scale Agriculture Alternative

Herbs

The term "herbs" has many meanings. The most accepted one is "plants that are not used solely as vegetables or ornaments." Herbs are multiple-use plants useful for culinary, cosmetic, industrial, medicinal, landscaping, decorative, and fragrance purposes.

They include vegetables such as garlic, flavoring items such as red peppers or mint, decorative flowers such as roses, various oilseed shrubs, ground-cover plants such as lemon thyme or perennial chamomile, edible flowers such as nasturtiums, trees such as the linden or bay, and plants such as chrysanthemums that may be intercropped and used as an alternative to pesticides.

Herbal processed products include fresh and dried flowers; leaves, barks, roots, and seeds — dried, ground, or dissolved powders; essential oils (as distinguished from petroleum or synthetic oils); and oleoresins, naturally occurring mixtures of oil and resin. Some other products are condiments, spices, or food seasonings; teas; dyes; cosmetic products; and so-called health foods.

The competition is intense in producing and marketing herbs, and producers range from giant corporations to small-scale entrepreneurs and hobbyists. Regardless, there are opportunities for new herb producers as the market expands.

The world market is extremely volatile, with prices ranging from less than $1 a pound for some herbs to more than $100 a pound for others. Political situations in third world countries (where much of the world production is found) causes shortages, and prices fluctuate widely. Increasing commercial herb production in the United States will help maintain some equilibrium in supplies and the stability of sellers' prices.

Consumer and producer interest in herbs is increasing. A decade ago it was difficult to find books on herbs. Today there are dozens of books published on all aspects of the subject. Increasing consumer interest has created more competition in herb production by growers.

National and regional herb trade associations provide information and support to their members. The Herb Growing and Marketing Network (P.O. Box 245, Silver Spring, PA 17575; 717-393-3295) publishes *The Herbal Connection*, a bimonthly trade journal, and *The Herbal Green Pages*, an annual resource guide with more than 5,000 herb-related listings; the International Herb Association (1202 Allanson Rd., Mundelein, IL 60060; 708-949-4372) holds an annual conference in various parts of the United States, and the American Herbal Products Association (P.O. Box 2410, Austin, TX 78768; 512-320-8555) represents manufacturers of herbal health food and over-the-counter products.

Regional groups are represented by herb organizations in several States. Often these groups are organized by the State Departments of Agriculture. States that have existing support groups are: North Carolina (North Carolina Herb Association, c/o Jeanine Davis, 2016 Fanning Bridge Rd., Fletcher, NC 28732), Delaware (DHGMA, c/o Dr. Art Tucker, Delaware State Univ., Dept. of Ag & Natural Resources, Dover, DE 19901-2275), Pennsylvania (PHBN, c/o Barb Will, RD 7, Box 1, Somerset, PA 15501), the Ozarks (OHGMA, c/o Pam Robinson, 3249 S. Erie, Tulsa, OK 74135), Texas (THGMA, c/o Deborah Cox, Rt. 8, Box 567, Brownsville, TX 87520), Illinois (IHA, c/o Lowell Lenschow, 1701 Towanda Ave., Bloomington, IN 61701), Michigan (MHBA, c/o Judy Larison, 135 E. 120th St., Grant, MI 49327), Kentucky (KHGMA, P.O. Box 123, Washington, KY 41096), West Virginia (WVHA, Rt. 1, Box 263-SS, Weston, WV 26452), Virginia (VHGMA, P.O. Box 1176, Chesterfield, VA 23832), Hawaii (HHA, P.O. Box 62150, Honolulu, HI 96839), Montana and the surrounding region (Great Northern Botanicals Association, P.O. Box 362, Helena, MT 59624).

A number of groups serve specific interests within the industry: medicinal (American Botanical Council, P.O. Box 201660, Austin, TX 78720; Northeast Herbal Association, P.O. Box 146, Marshfield, VT 05658-0146; American Herbalists Guild, Box 1683, Soquel, CA 95073), and ornamental (Association of Specialty Cut Flower Growers, MPO 268, Oberlin, OH 44074).

For the small-scale entrepreneur, the best chance of competing may be in plant sales. With interest in gardening at an all-time high and no diminishing of interest in sight, gardeners are searching for a wide variety of herbs for cooking, landscaping, and alternative health needs. A prospective producer might consider starting a mail order business. Many home gardeners and others market herbs that way. Herb plant sales are increasing every year, and the enterprising grower who combines knowledge and service along with plant sales is doing well.

Fresh-Cut Herbs

Culinary herbs are well suited to small-scale production because of unique growing conditions and intensive labor needs. Production can be on small acreage, marginal land, and without heavy machinery or with modified equipment. Potential markets are in selling fresh-cut herbs to restaurants, at local farmers' markets, and through some specialty grocers. Much about pricing and marketing fresh-cut herbs can be learned from the Agricultural Marketing Service (AMS) of the U.S. Department of Agriculture (USDA).

AMS provides reports on prices and supplies of "miscellaneous herbs," which are fresh-cut and whose leaves are usually used for flavoring, such as arugula ("rocket salad"), basil, chives, cilantro (also known as coriander, parsley, and Spanish or Chinese parsley), chervil, dill, marjoram, mint, oregano, rosemary, sage, savory, sorrel, tarragon, thyme, lemon thyme, and watercress. Also listed as an herb is the confusingly named anise, which is a close relative of fennel, bulbous fennel, Florence fennel, or finocchio. Its bulbous lower section is generally boiled like a vegetable; its leaves are not used for flavoring, as is the case with anise hyssop, a kind of mint. (A third anise, sometimes classed as an umbelifera because of its relationship to dill, angelica, and celery, is Pimpinella anisum, a flavoring seed producer.) Some herbs used for their roots, such as ginger, are listed by AMS as oriental vegetables, but the horseradish (root) is sometimes listed as an herb. Herbs such as garlic, onions, parsley, and hot peppers also are priced but are listed as plain vegetables. The weekly National Wholesale Herb Market News Report is available from the Fruit and Vegetable Market News, Attn: Jacquelline Davis, Market Reporter for Herbs, USDA-AMS, 230 South Dearborn St., Rm. 512, Chicago, IL 60604;

312-353-0111. The annual price for the weekly report is $120, but a monthly update at $10 is also available. The report covers 18 terminal markets around the country and provides prices and shipment sizes of 20 or more different culinary herbs. Most of the commercial fresh-cut herbs in this country currently come from California, Texas, or Florida. Some items come from other States, and some are imported at very competitive prices.

A lack of knowledge of particular herb cultivation systems, difficulties with correct seed labeling, and lack of regulations concerning pesticides, herbicides, and fungicides are major production problems.

Seeds are another concern for herb growers. Although imported seeds and seeds supplied by bulk suppliers are the main sources for the industry, there is an urgent need for the production of high-quality, reliably identified seed sources.

Processed Herbs

Non-food herbs are another potential market. Outlets include pharmaceutical and industrial uses, the fragrance industry, and dried herbs/flowers for arrangements and craftwork. Marketing for the pharmaceutical/industrial segment is specialized, competitive, and can require a substantial investment. Considerable specialized knowledge of dehydrating, processing, and extracting, is often required, and specialized machinery may be needed. Keen foreign competition exists, as import prices are often low. Because of the instability of the world market, however, many companies are looking for reliable U.S. suppliers. Growers must establish close working relationships with buyers. Information on U.S. trade and the world situation for many processed products from herbs and spices may be obtained from circulars sold by USDA's Foreign Agricultural Service (FAS). For information on subscription prices, contact FAS, Information Division, Room 5074-S, Washington DC 20250-1000. Telephone 202-720-7115; Fax 202-720-3229. Dr. James A. (Jim) Duke, a botanist at USDA's Agricultural Research Service Germplasm Introduction and Evaluation Laboratory, Beltsville, MD 20705, suggests study of the *Chemical Marketing Reporter* (Schnell Publishing Company, 100 Church St., New York, NY 10007) for the latest continuing data on processed herb prices and dealers. Copies of the annual *Oil, Paint and Drug Chemical Buyers Directory*, which lists dealers, is also for sale from the publisher.

Varietal Selection

Among many challenges in the herb business is varietal selection. Some seeds do not produce the crop desired. For example, "oregano" seeds sold by some companies may not produce plants of culinary use quality. While many kinds of lavender may be grown from seeds, they will not produce quality oil. Dr. Duke and Thomas DeBaggio, an herb grower in Arlington, VA, and author of *Growing Herbs*, advise that many herbs should be started from cuttings.

Growing Methods

There is a limited amount of commercial growing information in print. The quarterly *Journal of Herbs, Spices & Medicinal Plants* emphasizes the latest research in production and quality control. Dr. Lyle E. Craker, a plant physiologist at the University of Massachusetts, is the editor. Individual annual subscriptions are $28 per volume ordered from The Haworth Press, Inc., 10 Alice St., Binghamton, NY 13904-1580. Other sources for information on production, marketing, and manufacturing are the proceedings from the National Herb Growing and Marketing Conferences. Copies of the proceedings from 1986-1988 are available from the Extension Office, Center for New Crops, 1165 Horticulture Building, Purdue University, West Lafayette, IN 47907. The 1989-1994 proceedings are available from the International Herb Association. Information on Purdue's International Training Program in Medicinal and Aromatic Plants is also available.

Although many herbs flourish outdoors, prospective producers should seriously consider a greenhouse for year-round production as well as early season propagation. Construction costs will vary depending on location and equipment. Seeking expert advice before construction is essential.

Other Information Sources

Other sources of herbal information include the Alternative Farming Systems Information Center at USDA's National Agricultural Library (NAL), Room 304, 10301 Baltimore Blvd., Beltsville, MD 20705-2351 (301-504-6559); the Cooperative Extension Service office in your county; and your State university horticulture specialists.

Persons wishing to view more than 100 varieties of living herbs should visit the USDA's National Arboretum at 3501 New York Avenue NE, Washington D.C. (202-245-2726). Janet Walker is curator of the Arboretum's National Herb Garden. It is one of the largest such formal gardens in the world and has been sponsored by the Herb Society of America's Potomack Unit since 1965.

There are hundreds of books on herbs, but most deal with growing herbs on a gardener's level. Selections that include more detailed material for both the growing and business aspects are: *Growing Herbs* by Thomas DeBaggio from Interweave Press; *Herbal Renaissance* by Steven Foster from Gibbs-Smith; *Park's Success with Herbs* by Gertrude Foster and Rosemary Louden from Park Seed Company; *Growing Your Herb Business* by Bertha Reppert from Storey Communications; *Herbs for Sale* and *Profits from Your Backyard Herb Garden* by Lee Sturdivant from San Juan Naturals (Box 642S, Friday Harbor, WA 98250). Two trade journals that deal with commercial enterprises are *The Business of Herbs* (Rt. 2, Box 245, Shevlin, MN 56676) and The Herbal Connection.

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United States
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Cooperative State
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Office for
Small-Scale Agriculture

A Small-Scale Agriculture Alternative

Northern Nut Growing

Northern Nut Growing

It is not generally known that delicious nuts of many varieties may be grown in the most Northern areas of the United States. Butternut and hazel have always grown wild in Minnesota and Wisconsin. The exotic almond and northern pecan thrive in Michigan and New York. Northerners can be very successful with nut trees and this article will get you started in the right direction.

Butternuts, hazels, heartnuts, and Korean and Siberian nut pines are some of the hardiest nut trees. Almond and sweet chestnut require the more favored sites in the Northern States.

Growers have had occasional disappointments transplanting nut trees due to the long tap root. All of the tap root must be secured to assure successful transplanting. Spring transplanting, rather than fall transplanting, usually gives the best results. However, heartnut, chestnut, and hazel are some of the best choices for fall transplanting. Most nut trees are suitable for a wide range of soils although chestnut and almond require sandy loans.

Good water drainage is essential for many nut trees. Areas with poor air drainage become frost pockets in both spring and fall and should be avoided. Sites prone to extreme drought should not be considered. The addition of peat moss may make all the difference in difficult instances.

Young trees are always easier to establish in the presence of nearby, but not overshadowing, windbreaks. Generally, nut trees require full sun. The Persian (Carpathian, English) walnut prefers north-facing slopes, whereas the northern pecan prefers a south-facing slope.

Although average planting is 20 feet apart, small bush types (hazel) are planted 10 feet apart. Full-sized trees (northern pecan) are often thinned to as much as 40 feet apart in their senior years. The optimum height for transplanting is 2-4 feet.

Contrary to popular belief, several trees (hazel and chestnut), may produce nuts in as few as 3 years from transplanting. They respond to fertilizing, irrigation and other good growing techniques. On favorable sites, the trees will reach ages of 50-200 years and will grow on rough lands unsuitable to annual crops.

Fortunately, many nut trees are substantially free of insects and diseases, and may not require chemical protectants.

Most nuts are harvested by allowing the crop to fall to the ground. Then they are collected, cleaned and dried to about 6 percent moisture for common storage of 1 to 2 years.

Nut tree plantings may be started from nursery stock or nuts may be seeded directly on the sites selected. Usually seed nuts are sown 2-3 inches deep in the fall. Specialty nurseries offer improved types of trees which are known as cultivars.

Sweet Chestnut

The "sweet" in the title is used to distinguish edible chestnuts from the ornamental horse chestnut (Aescalus hippocastanum), which produces similar appearing, but bitter, nuts unsafe for human consumption. The four sweet chestnut varieties are: the American chestnut (*Castanea dentata*); the European chestnut (*Castanea sativa*); the Japanese chestnut (*Castanea crenata*); and the Chinese chestnut (*Castanea mollissima*).

Among these four species there are some differences in nut size and leaf format. One of the most significant differences is blight resistance. The American is the most susceptible, while the Chinese is the most resistant.

Chestnuts have been a staple food in Europe and Asia for centuries. Now that blight resistant oriental types are available and have sufficient cold hardiness, chestnuts can be reintroduced into North America on a commercial scale. There is also ample opportunity to hybridize the four major sweet chestnuts to achieve combinations of size, consumption quality, and high production.

The general characteristics and requirements for the several sweet chestnuts are:

- A season length of 100-140 frost-free days, requiring 2500 plus heat units (base F) to fill the kernels. Winter hardiness may extend to -15°F to -30°F.
- Nut sizes range from 10-200 nuts to the pound. Kernel percentages range around 85 percent, unusually high compared to most northern nuts. Chestnuts are starchy rather than oily and the nuts are stored at 100 percent moisture until consumed. If allowed to dry, they may become moldy, hard, and inedible.
- Chestnuts prefer rich sandy loams, but may also do well on coarse sands. Near perfect drainage is necessary. They respond well to fertilizers, mulches, trickle irrigation and full sunlight. In areas troubled by chestnut weevil, worms will be present in the nuts. Check with your state agriculture department for acceptable control applications.
- Well sited chestnuts grow quickly and are healthy. A vigorous seedling may grow from seed to 20 feet in 10 years. Trees achieve mature size after 40-80 years and range from 30-90 feet tall, often with spreading crowns. Some may live to over 150 years.
- Chestnuts on marginal soils are susceptible to manganese deficiencies, apparent in excessively yellow leaves and slow, spindly growth. This problem is usually corrected with foliar sprays of manganese.
- Chestnuts generally bloom in July. In most years, this relatively late bloom season protects them from spring frosts. A minimum of 3-5 trees are required for good cross pollination. Both grafted and seedling chestnuts will bear nuts in the third year from planting. If 1 or 2 year old chestnut grafts develop nuts, they should be cut off as excessive early bearing weakens trees and makes them susceptible to winter damage.
- Protection should be provided from both deer browsing on young chestnuts and rodents girdling around the base of trees in winter.
- Harvest is from mid-September to early October and chestnuts may be used as lawn ornaments if the fall drop of burrs is not troublesome.
- Chestnut is one of the highest yielding of all nut trees bearing 1,000-4,000 pounds per acre or 50-100 pounds per tree. At current prices of up to $3 per pound (wholesale/retail), profits are possible.
- Cultivars of chestnut include many old favorites such as Orrin, Layeroka Paragon, Abundance, Colossal, and Nanking. Newer cultivars are available from specialty nurseries and have shorter season requirements and larger nuts. *(Greg Miller, Empire Chestnut Co., 3276 Empire Rd., SW, Carrollton, OH 44615)*

Eastern Black Walnut

Black walnut is grown commercially in the United States for timber and nuts. The rich, dark-grained wood is one of the most valuable in North America. The pungent tasty kernels are especially favored for baking. The trees are vigorous, fast growing and spread over large tracts from southern California to the Carolinas, and west of the Mississippi River in Iowa, Nebraska and Kansas.

The characteristics and requirements of black walnut include:

- A season length of 100-140 frost-free days. The trees require 2600 plus heat units (base 50 F) to fill the kernels. Winter hardiness may extend to -30 °F to -40 °F. Nut sizes range from 10-100 nuts per pound. Kernel percentage of nuts varies from 15-35 percent. Black walnut shells are very tough to crack.

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- Although black walnuts prefer open-textured bottom lands, they will grow on many upland locations and in clay loam. Medium to good water drainage will give best results. Usually 3-5 different cultivars or seedlings are required to provide adequate cross pollination. The trees require 4-8 years from planting to produce commercial crops. Harvest is from mid-September to late October.
- Black walnuts are slightly less attractive to deer and rodents than other trees, but they also require winter protection.
- If nothing else is grown nearby, black walnuts make a good lawn tree. It is a competitive species, requiring space and full sun.
- The trees respond well to special fertilizers, mulches and irrigation. They will probably do better than most trees when planted on a "wild" basis with very little seasonal care.

Some of the better cultivars for northern climates are Emma K, Sparrow, Ohio, Stabler, and Sparks 127. (*Archie Sparks, Box 98, Beaver, IA 50031*)

Persian Walnut

The Persian walnut (*Juglans regia*) is similar to and closely related to the eastern black walnut, with one very important difference: the shells are thin. The kernels are mild and delicious and easily extracted. Some of the notable characteristics of this valuable tree include:

- Nuts which ripen from mid-September through early October in the Northern States. Winter hardiness extends to -40° F. Caution: Winter frosts may be a serious problem.
- Nut sizes range from 20-60 nuts per pound. Kernel percentages are from 35-65 percent.
- Persian walnuts grow on a wide range of sites if the soil is reasonably rich, open-textured and well drained. A vigorous seedling may grow from a nut to a tree 25 feet high in 10 years. Mature trees reach 60-80 feet and may live for 150 years.
- The trees bloom in early May and are often at risk from spring frosts. Several trees of different types are needed for cross pollination. Grafted trees may bear nuts in as little as 3-5 years from planting.
- Persian walnuts must be protected from all rodents and predators.

Many growers in the North have worked with Persian walnuts, so a wide range of cultivars are available. They will produce nuts just like the ones purchased from a grocery store. (*Ernie Grimo, Grimo Nut Nursery, RR3, Lakeshore Rd., Niagara-on-the-Lake, Ontario LOS 1J0,* Canada)

Shagbark Hickory

Those who collect hickory nuts from the wild are aware that they have the most deliciously delicate flavors of all the nuts. Currently, only those who are familiar with collecting in the wild have access to these wonderful nuts as they are not available commercially. In spite of not being well known, hickories are widely grown in North America. Their crops ripen toward the end of September from southern Canada to the Carolinas and from Connecticut to Missouri. Some of their pertinent characteristics include:

- Winter hardiness may range as low as -40° F. The hickory is one of the few nuts which prefers clay soils, although occasionally they are found in sandy soils.
- Nut size varies from 50-150 per pound and the kernel percentage ranges from 30-50 percent.
- The trees are remarkable for their straight, central leader growing habits. The wood is strong, tough and hard. A hickory can be grown from seed to 25 feet high in 10 years. Mature trees may reach 90 feet high and live 200 or more years. First bearing may occur at 6-12 years from planting and several trees are needed for cross pollination.

Shagbark cultivars recommended for planting include: Yoder No. 1, Porter, Weschecke, Grainger, and Walters. The shellbark or kingnut hickory trees are closely related to the shagbarks, but are somewhat bigger and faster growing. Recommended shellbark cultivars are: Fayette, Henry, and Totten. (*Charlie Thatcher, 1267 Gill Hall Rd., Clairton, PA 15025*)

Filberts

The filbert *(Corylus avellana)* and the closely related hazels (*C. Americana and C. comuta*) are known as the little nuts which grow everywhere in North America. The familiar round nut is a favorite with all kernel eaters. It is also a nut of commerce in the United States and millions of pounds are produced every year. Some of its more salient points include:

- Winter hardiness may drop to -50 F. Some of the *C. comuta* grow within sight of the Artic Circle. The hazel or filbert will grow in a wide range of soils, even with imperfect drainage. Most hazel/filbert types grow in bush form. A notable exception is the Turkish tree hazel, which can grow higher than a 2 1/2 story house. Vigorous seedlings may grow from a seed to bushes 6-20 feet high in 10 years.
- The bushes are very precocious and start bearing nuts 3-4 years after planting. Nut size ranges from 100-200 to the pound.
- Kernel percentage varies from 20-55 percent. Hazel nuts are a favorite food of birds and rodents.
- Bush life may be limited to 30-40 years or even less where the filbert blight is a problem. Blight may be a limiting factor in growing the species and should be cut out of the bushes at the early stages of infection.
- Hazel/filberts bloom from December to April in North America, and they have a rather odd reproduction style. Several different types should be planted together to ensure cross pollination.

Cultivars proven for satisfactory nut production include: Barcelona, Duchilly, Reed, Potomac, Buchanan, Willamette, Casina, Winkler and Graham. (*Harry Lagerstedt, The Peace Place, 34151 Electric Rd., Corvallis, OR 97333*)

Northern Pecan

Pecans (*Carya illinoensis*) are generally regarded as a southern nut. However, wild native pecans have been growing along the banks of the Mississippi River as far north as the Illinois/Wisconsin border. Recent explorations in these areas have discovered a new line of nuts which can truly be called Northern pecans. They grow successfully in most of northern America and more favorable parts of southern Canada. The characteristics of the Northern pecan include:

- Winter hardiness may extend to -30° F to 40° F. A season of 130-150 frost-free days is required at 2900 plus heat units (base 50° F) to fill kernels. Nut size ranges from 60-200 nuts per pound. Kernel percentage of the nuts varies from 35-55 percent. Harvest is from mid-September to late October.
- Pecans prefer a deep, high organic soil, but may perform well in a wide range of soil types, including clay. A vigorous seedling may grow from a seed to 30 feet high in 10 years; achieve full size of 60-90 feet high by 30-50 feet wide after 60-80 years; and may live over 200 years.
- Northern pecans flower/pollinate in May/June and several trees are required for cross pollination. Grafted trees will bear in as little as 5 years from planting, whereas seedlings may require 7-12 years.
- The trees are healthy, vigorous, productive and have fewer pest problems than many of the other nut trees in the North. Wildlife may browse on young pecans, so some protection may be required. The trees need a high level of nutrients and may show zinc deficiency in more alkaline soils. Pecans which set many narrow, weak crotches should be given formative pruning. They make excellent shade/lawn trees, as well as orchard trees.

Some of the pecan cultivars grown throughout the South (Georgia-Texas) include: Stuart, Schley, Success, Desirable, Mahan and Wichita.

Cultivars for the middle latitudes (Kentucky-Missouri) include: Major, Colby, Peruque, Posey, Green River and Hirschi.

Some of the best choices for the most northern tier of American states and southern Canada include: Cornfield, Carlson #3, Snaps Early, Snag, Best's Early, Theresa Foster, and Lucas.

Many of the most Northern cultivars will be difficult to find outside of the cottage industry nurseries. The nut size of the northern pecan is about half that of the familiar southern pecan. However, the flavor of the true northern pecan is unbeatable. (Doug Campbell, Campberry Farm, RR1, Niagara-on-the-Lake, Ontario LOS 1JO, Canada)

Further nut tree information is available from the Northern Nut Growers Association (NNGA). Write: Tucker Hill, Secretary, 654 Beinhower Rd., Etters, PA I7319-9774. Telephone: 717-938-6090. Annual membership in NNGA is $15.00 and may be obtained through: Kenneth Bauman, Treasurer, NNGA, 9870 South Palmer Rd, New Carlisle, OH 45344.

Under the guidance of Doug Campbell, this publication was prepared for USDA's Office for Small-Scale Agriculture (OSSA), Howard W. "Bud" Kerr, Jr., Program Director, Ag Box 2244, Washington, DC 20250-2244. Telephone: 202-720-5245; Fax: 202-205-2448.
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Cooperative State Research, Educatation, and Extension Service

Office for Small-Scale Agriculture

A Small-Scale Agriculture Alternative

PEPPERS

Peppers (*Capsicum* sp.) exhibit a wide variety of shapes, sizes, colors, and tastes. These sweet and pungent peppers should not be confused with the "black pepper" (*Piper nigrum*) that is produced from the dried unripe fruit of a vine grown in India and Ceylon. Confusion over the term dates back to Christopher Columbus, who discovered *Capsicum* plants in the New World in 1493. The hot varieties that Columbus introduced to Europe were soon widely grown, dried, powdered, and used as a substitute for black pepper.

Peppers are an excellent source of vitamins A and C. Low in calories, peppers are used widely as both a vegetable and a spice. Peppers are also used as ornamental house plants. Mature pods can be dried and used in flower arrangements. Pungent pods have been used for medicinal purposes and in repellent sprays to deter dogs and people.

Pepper Classification

Peppers can be classified botanically or by pungency characteristics. The genus *Capsicum* (family Solanaceae), which includes both sweet and pungent peppers, has approximately 20 separate species. The five domes ticated species include hundreds of cultivars. Four of the five species (*C. baccatum*, *C. frutescens*, *C. chinense*, and *C. pubescens*) were domesticated in South America, while *C. annuum* was primarily cultivated in Central America. The latter includes most of the common sweet and pungent peppers grown in the United States.

The pungency of a pepper depends on the amount of capsaicinoids it contains. The dominant and hottest capsaicinoids are capsaicin and dihydrocapsaicin. These alkaloids are produced primarily by glands in the placenta tissue along the pod wall. Seeds are not sourcesof heat, but can absorb the capsaicinoids during processing. Environmental factors that can affect pungency include water stress (increases pungency) and cool growing conditions (decreases pungency).

Pungency in peppers is generally measured with the Scoville Organoleptic Test. Developed by Wilber L. Scoville in 1912, this test uses a panel of five human heat samplers to taste and evaluate extracts of pungent peppers in alcohol and sugar water. Pungency readings are recorded in multiples of 100 "Scoville Units"; at least three tasters must agree on the ratings between 0 and 10. Recently, human tasters have been replaced by high-pressure liquid chromatography (HPLC). A spectrofluorometer is used to measure capsaicin levels (parts per million) in samples of powdered pepper combined with ethanol and sodium acetate.

Pungent peppers are generally called "chile," which refers to both plants and pods. Chile is a Spanish form of "chilli"—the Aztec word for these plants. The term " chili," on the other hand, is generally used to describe a prepared food, "chili con carne" (chili withmeat). Chile-based "salsas" have replaced ketchup as America's number-one condiment. The State of New Mexico is the leading producer of chile (34,500 acres in 1992).

Pepper Types And Uses

(Capsicum annuum var. *annuum)* Most commercial pepper cultivars—including sweet bell peppers and long, green chile cultivars—occur in this species of pepper. Although pungent peppers are predominant in Latin America, Asia, and the southwestern United States, sweet bell peppers are by far the most popular pepper in the United States. Sweetness is controlled by a single recessive gene that eliminates the capsaicin.

Sweet Peppers

Bell—Fruit 3"-4" wide, 4"-5" long; sweet, large, blocky-shaped; hollow with thick flesh and 3 or 4 lobes; normally harvested at mature, green stage, although some may turn yellow, red, or brown when mature; pungency rating #0; can be stuffed or used in salads, relishes, or cooked vegetable dishes; most popular pepper in temperate countries; popular varieties include Bell Boy, Gypsy Hybrid, and California Wonder.

Pimento—Fruit 2" wide, 3" long; sweet, slightly pointed, conical-shaped with thick walls; pungency rating #0; red when ripe; used as olive-stuffer, in fresh salads, pimento cheese, and sandwich spreads; popular varieties include Early Pimento, Pimento Select, and Perfection.

Sweet Wax—Fruit 1" wide, 2"-6" long; conical; yellow when immature, with waxy gloss, turning orange to red when mature; pungency rating #0 (may be more pungent); maybe pickled, made into relishes, or used fresh in salads; popular varieties include Sweet Banana and Hungarian Sweet Wax.

Cherry—Fruit 2" in diameter, produced on upright stems; cherry- or globe-shaped with three cells; orange to deep-red color; pungency rating #1 (may be more pungent); mature green or colored pods used as pickled garnish; also used as ornamental plant; popular varieties include Sweet Cherry, Red Cherry Small, and Red Cherry Large.

Pungent Peppers

New Mexican (previously called "Anaheim")—Long, green/red chile type; fruit 1"-2" wide, 4"-10" long; relatively thin flesh; harvested either in mature green stage or mature red stage, although some varieties may turn yellow, orange, or brown; pungency may range from sweet to hot; red pods can be ground into powder; both red and green pods can be used in sauces and salsas; green (peeled) may be eaten fresh or may be canned or frozen; used in all types of Mexican-style dishes from casseroles to candies; colored pods can also be used in "ristras" (ornamental strings of dried pods) or combined with dried flowers in harvest wreaths; popular varieties include NuMex R-Naky (pungency rating #1), N.M. 6-4 (pungency rating #2), NuMex Big Jim (pungency rating #2), Española Improved (pungency rating #3), and Sandia (pungency rating #4).

Ancho (wide)—Fruit 3"-4" wide, 3"-6" long; heart-shaped with marked depression at base of pod; immature dark-green pod turns red to almost black in mature dry stage; fresh green pods called Poblano (people); pungency rating #3; very popular in Mexico; fresh pod peeled and stuffed with meat or cheese (relleno) or used in casseroles; dried form used insalsas, sauces, and "moles" (special sauce mixed with other ingredients such as chocolate, garlic, and coconut); popular varieties include Ancho 101, Poblano, and Mulato.

Cayenne—Fruit 1/2"-1" wide, 5"-10" long; mature dry red pods become very wrinkled; very pungent (rating #8); grown mostly in India and Asia, although some is grown in Louisiana and New Mexico; dried pods ground into powder for use in hot sauces; fresh green and red pods used in salsas and salads; popular varieties include Hot Portugal, Ring of Fire, and Hades Hot.

Jalapeño—Fruit 1"-1½" wide, 3" long; conical with tapered blunt tips and thick flesh; immature dark green fruit turn red at

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maturity; most varieties highly pungent (rating #5); used fresh, in salsas, canned, pickled, or on nacho (corn) chips; smoked fruit called "chipotle"; popular varieties include Jalapeño, Jalapeño M, and TAM Jalapeño (mild).

Serrano—Fruit ½" wide, 1"-4" long; grow erect (pendant); slightly curved or conical; immature dark-green fruit turn brown, yellow, or orange when mature; very pungent (rating #6-7); mostly grown in Mexico; fresh green pods used in various vegetable dishes and salsas; most popular U.S. variety is Hidalgo (multi-virus resistance).

Pasilla (little raisin)—Fruit 1" wide, 6"-12" long; cylindrical with undulating shape; immature dark-green fruit mature to dark brown; pungency rating #3; very flavorful; used in powdered forms in moles (especially chocolate mixtures) and sauces.

de Arbol— Fruit 3/8" wide, 2"-3" long; elongate, pointed; mature pods dark red (translucent); pungency rating #7; grown mostly in Mexico for soups, stews, sauces, chile oils, and vinegars.

Chiltepin *(Capsicum annuum* var. *avicularе)*—Fruit ¼"-½" in diameter; round, generally pea-shaped; borne erect; (wild form); domesticated Piquin has somewhat longer fruit (bullet-shaped); pungency rating #8-9; not grown much commercially in United States; used as spice for soups, peas, lentils, beans, and stews; fresh fruit chopped and used in salsas; popular domesticated variety is NuMex Bailey Piquin; available from Enchanted Seed (505-233-3033).

Tabasco (Capsicum frutescens)—Fruit 3/8" wide, 1½" long; immature yellow pods turn orange to red when mature; pungency rating #8; pods borne erect; most widely known for use in Louisiana Tabasco Sauce (pods crushed, salted, fermented in casks for 2 1/2 to 3 years, strained, and vinegar added); fresh pods also used in salsas, dried pods used in stir-fry dishes (Sauce source: McIlhenny Co., Dept. 94-4, Avery Island, LA, 70513).

Habanero (Capsicum chinense)—Fruit 1"-2" wide, 1"-2½" long; sets 2 to 6 fruit per axil; oblong with undulating shape; some varieties pointed at end, while others are flattened; immature green pods turn red, orange, yellow, or white when mature; orange is preferred color; most pungent chile known (pungency rating #10); has a unique flavor; also called "Scotch Bonnet" or "Scot's Bonnet"; used in salsas, bottled sauces, and barbecue seasonings; one of the hottest known Habaneros is a red (Red Savina) developed by Frank Garcia, Jr. of GNS Spices in Walnut, California (909-594-9505).

Ají(Capsicum bccatum)—Fruit 3"-5" long (great diversity of size and shape); elon-gate; mature pod turns orange-red, yellow or brown; generally quite pungent (rating #8); pod is erect when immature and becomes pendant with increased size and weight; pods become yellow at some stage in their development (common name is "aji amarillo"); grown mostly in South America; unique flavor; used in salsas and as spicing for potatoes, chicken, and fish.

Rocoto (Capsicum pubescens)—Fruit round, similar to cherry type; vary in size; mature color is yellow, orange, or red; seeds are black; pungency rating #8-9; difficult to grow in United States; used in salsas.

Paprika Peppers

Other peppers of importance include those grown for "paprika," which is not considered a variety of pepper (in United States), but a food product. Paprika is a sweet to mildly pungent red seasoning used primarily for red food coloring. Peppers developed for paprika are bred for dark red color, little to no pungency, and ease of dehydration. Peppers grown for paprika in the United States should not be confused with the more pungent Hungarian Rose paprika used in Hungarian cuisine.

Pepper Culture

Peppers are a warm-season crop and require growing conditions similar to tomato and eggplant. Because peppers are highly susceptible to frost, transplanting should be delayeduntil after the last frost in spring. Cool soil temperatures will delay emergence and retard growth, so direct seeding and transplanting peppers in the field should be delayed until soils warm.

Plant growth and fruit set are maximized when daytime temperatures range between 65 and 85 °F, with nighttime temperatures of 60-70 °F. Blossoms may not set if temperatures drop below 60 °F or rise above 90 °F. Under ideal conditions, mature green peppers will be ready for harvest 45 to 55 days after pollination. Cool weather will delay maturity.

Peppers prefer a well-drained loam or sandy loam soil with a pH of 7.0 to 8.5. Green manure crops such as winter rye, planted in the fall and soil-incorporated a month before planting peppers, will help increase the water-holding capacity and nutrient retention of sandy soils and the aeration and drainage of clay soils. The amount and types of fertilizer to apply for maximum pepper production should be based on a soil analysis and recommendations from your county Extension agent.

In colder climates, peppers are best established from transplants. Purchase stocky, healthy transplants for best results. Peppers grown in the greenhouse for transplanting require 6 to 8 weeks from seeding to transplanting size. Space plants in the field 8"-14" apart in rows 30"-36" wide. Transplanting is best done in the early evening to reduce shock. Water immediately after transplanting.

In warmer areas with longer growing seasons, peppers can be direct-seeded. Plant seeds 1" apart and ¼" deep. Plants can be thinned when seedlings have four or more true leaves. Planting technique and plant spacing will vary from region to region.

Especially in northern climates, peppers may benefit from the use of black plastic mulch to help warm the soil early in the season. The black plastic can be replaced with organic mulches when the weather warms. Organic mulches such as straw, dry grass clippings, and leaves help cool the soil during hot weather.

Use of floating row covers in the early spring can help get seedlings off to a strong start. Row covers allow light in while warming the atmosphere around the plants. To prevent damage from wind, support row covers with wire braces that arch over the plants. Outside edges can be anchored with soil. Although most modern row covers allow air circulation, it is best to remove the cover in warm weather. Row covers also help screenout many insect pests, such as the beet leafh-opper, which spreads curly top disease.

Harvest green bell peppers before they change color (except those harvested specially as colored peppers). Fruit should be fully developed, crisp, and firm when squeezed. Long, green, pungent varieties harvested for green chile should have a similar feel. Most pods can be broken off the plant easily if pods are mature. Chile peppers harvested for red color can be climates) or harvested when fully ripe and hung up by their stems to dry. In more humid areas, mechanical dehydration may be necessary.

Where To Learn More

Peppers are becoming more and more popular. If you want to learn more technical information about peppers, you may wish to attend either the International Pepper Conference or the Annual New Mexico Chile Conference (contact Javier Vargas, 505-525-6649). Or you can write to the Chile Institute (Box 30003, Dept. 3Q, NMSU, Las Cruces, NM 88003).Suggested reading on chile: T*he Whole Chile Pepper Book* and *The Whole Chile Pepper* magazine (contact Dave DeWitt, P.O. Box 4278, Albuquerque, NM 87196).

Other seed sources for peppes include: Plants of the Southwest (800-788-SEED), Nichols Garden Nursery (503-928-9280), The Pepper Gal (305-537-5540), Twilley Seeds (800-622-SEED), Shepherds (408-335-6910), and Petoseed (805-647-1188).

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United States Department of Agriculture

Cooperative State Research Service

Office for Small-Scale Agriculture

A Small-Scale Agriculture Alternative

Pumpkins

The pumpkin reigns as king of the vegetables. The pumpkin was already a staple in the American diet long before the first Thanksgiving feast at Plymouth Rock, Massachusetts, in 1621. Pumpkins were cultivated by native American tribes long before Europeans ever set foot on American shores. Archaeologists have found pieces of pumpkin stems, seeds, and rind in the ancient ruins of the cliff dwellers in the Southwestern United States. For native Americans, pumpkins were a vital part of an existing multiple cropping system of corn, beans, and squash. Those seeds were usually planted together in the same hill, sometimes accompanied with a fish for fertilizer. The combination of these vegetables was the staple of many of the native diets and still is today in certain areas of Latin America. Pumpkins were eaten roasted, boiled, and stewed by native American tribes. Not only was the pumpkin grown for its food and feed value, but it also served as a living mulch, helped keep maize fields free of weeds, and discouraged raccoons from eating the corn.

Since that first Thanksgiving feast, pumpkins have become a tradition on American Thanksgiving tables, served primarily in the form of pumpkin pie. The native Americans showed the Pilgrims how to dry pumpkin meat and grind it into meal for year-round use. Colonists used this new vegetable, not only for pie, but as feed for animals (roasted seeds) and as a prime ingredient in other foods. For example, stewed pumpkin was mixed with corn meal for bread, and a simple pumpkin pudding was made by slicing off the top of the pumpkin, scooping out the seed and fibers, and filling the cavity with milk. The whole pumpkin was then baked until the milk was absorbed. The pumpkin and its relative, the winter squash, were very easy to store for winter use.

The irony is that today the American pumpkin is not known for its nutritional value, but as a decorative jack-o-lantern synonymous with Halloween. One can only speculate that the first jack-o-lantern was created as a result of efforts to prepare pumpkin pudding.

Washington Irving wrote about the pumpkin in "The Legend of Sleepy Hollow," and more recently, Charles Schultz has rekindled American folklore with the Great Pumpkin in "It's the Great Pumpkin, Charlie Brown."

The medieval French name "pampion" means sun-baked squash and is derived from the Greek word "pepon," or a large melon. The English modified "pampion" to "pompkin," which was finally changed to "pumpkin" by the American colonists.

The pumpkin's scientific names are Cucurbita maxima, represented by such varieties as "Atlantic Giant," "Big Max," "Mammoth," and "Boston Marrow," and *Cucurbita pepo*, represented by "Connecticut Field," "Howden's," and similar varieties.

NUTRITIONAL VALUE

The pumpkin is very high in fiber and vitamin A and contains plenty of beta carotene, which has recently received credit for cancer-preventing qualities. Also, high-fiber diets may prevent overeating, a great concern in American diets. One cup of mashed pumpkin contains approximately 50 calories, yet it ranks among the most nutritious of domestic produce. It contains over 2,500 units of vitamin A, considerable quantities of B complex and C vitamins, along with generous amounts of phosphorus, potassium, calcium, and iron. The smaller pie-sized pumpkins, including "Connecticut Field," can be substituted in virtually any recipe calling for winter squash.

PLANTING CONSIDERATIONS

To grow healthy pumpkins, the soil should be well drained with a pH of 6.0 to 6.5. It is best to get a soil test done first. Check with your local Extension Service office. Otherwise, if commercial fertilizers are used, broadcast 500 to 1,000 pounds of 5-10-10 per acre before planting. This equates to approximately 5 quarts per 100 feet of row, spread out 3 feet wide over the row. Sidedress at 3 and 6 weeks after seeding with 20 to 30 pounds of nitrogen and 60 to 100 pounds of potassium (approximately 1 pint of 13-0-44 per 100 feet of row). Sidedress fertilizer 6 to 8 inches from the plants on both sides of the row. Equivalent nutrients can also be provided from organic materials.

Pumpkins require ample amounts of potassium for good dry-matter production. If misshaped pumpkins develop, check the boron level or add 1 pound of actual boron (5 pounds of Solubor) per acre to your fertility program. Boron deficiency is likely to occur on sandy soils.

According to Robert J. Rouse, Wye Research and Education Center, University of Maryland, Queenstown, pumpkins can be seeded too early if one is not careful. Pumpkins should not be seeded in the mid-Atlantic region in May. They will make it, but will need to be sprayed over a longer period of time. June is more appropriate. During summer, the days to maturity can vary from 90 to 120, depending on the variety of pumpkins planted and the temperature. According to your marketing strategy, 90-day pumpkins can be planted as late as the first week in July and still make a crop by October. However, pumpkins planted late in the season are more subject to disease and do not yield as well as those planted earlier. Mid-June is the normal planting time. Spacing pumpkins depends on varieties and vine size. If you are planting on a hill system — the easiest for organic growers since the compost and animal manure only needs to be worked into the hills — plant three to four seeds per hill and then thin to one plant per hill. For larger acreages, 2 to 3 pounds of seed per acre should be sufficient for achieving 3,000 to 4,000 plants per acre. Higher rates of up to 4 to 5 pounds/acre may be required for bush varieties. Plants should be spaced 3 feet apart and at least 6 feet between rows.

Cover crops can really help, particularly hairy vetch. Kill the cover crop and then seed or plant in the residue. By killing or mowing the vetch before it forms seeds, which is the end of May in the mid-Atlantic region, in June one can then use no-till seed or, on a small scale, transplant through the mulch by using a bulb planter or spade. Vetch mulch gives a nice carpet and minimizes soil contact on fruit.

Variations to this monocrop planting system are used by some growers. Ed and Kathy Schaefer, who operate Bellevue Berry and Pumpkin Ranch near Omaha, Nebraska, utilize oats or rye as a cover crop in the spring, and then plant 2 pounds of pumpkin seed per acre in the grain with some ornamental corn. Some

of their 35 acres of pumpkins are planted through 4-foot-wide plastic mulch with 10-foot-wide strips of rye or oats in-between the plastic. This is done because the same fields have been continuously cropped in pumpkins for the last 10 years. Care needs to be taken not to plant a row of pumpkins in the same location each year. A combination of sorghum and sudangrass is strip-cropped for frost protection, especially in those fields in which pumpkins are cut and left for pick-your-own harvesting in late October.

To reduce disease problems, most research data suggests rotational cropping, if possible, by planting pumpkins once every 3 to 7 years. For those growers who do not have this amount of acreage flexibility, it is important to clean the field thoroughly after harvest and to fall plow as deeply as possible. If this is done, choose land that is not highly erosive and, weather permitting, plant a winter or early spring cover crop to protect the soil and help minimize crop pest build-up problems. Growers must be aware that certain crops can carry over diseases (e.g., peppers are subject to phytophthora and so are pumpkins), so they should not be planted in the rotations. Nor should other cucurbits such as watermelon, cantaloupes, cucumbers, and squash. Pollinating bees are also critical for successful pumpkin production. In vine crops, the recommendations are one to two honey bee colonies per acre.

Popular pumpkin varieties include: Small sizes: "Munchkin," "Jack-Be-Little," "Sugar Pie," "Spookie," and "Oz." Medium sizes: "Spirit Hybrid," "Jack O'Lantern," "Autumn Gold," and "Happy Jack." Large sizes: "Aspen," "Connecticut Field," "Pankow," "Howden," "Jackpot Hybrid," "Wizard," and "Big Autumn." Very large sizes: "Prize Winner," "Atlantic Giant," "Big Moon," and "Big Max."

MARKETING STRATEGY

A marketing strategy is critical for those contemplating growing pumpkins so they can sell what they sow. One needs to assess whether to wholesale pumpkins or direct market them. Farm location, zoning, insurance, labor supply, and willingness to work with the public are just a few of the factors that should be considered. For those who want to market direct to consumers, one can choose from roadside markets, farmer's markets, on-farm markets, U-pick activities, and community-sponsored agricultural farms. In addition, there is a growing practice to couple some of the market activities with entertainment agriculture, which encompasses hayrides, harvest festivals, and group farm tours.

A farm that markets direct to the consumer needs to project a positive and safe farm image (including overall farm neatness); offer a variety of quality pumpkins; and have adequate equipment, signing, advertising, and access roads. Customers will also require restroom facilities and adequate parking.

Bellevue Berry and Pumpkin Ranch customers enjoy free hayrides to the pumpkin fields, western cookouts, a Haunted Barn, and a kids' "How the West Was Fun" play area. Other pumpkin growers throughout the United States have various marketing strategies, including fall festivals, food-fests and other farm-focus themes. Some growers, like Skip Jackson at the Iron Kettle Farm in upstate New York, construct elaborate pumpkin scarecrow exhibits and sell pumpkins next to their farm market. Butler's Orchards, located in the Maryland suburbs near Washington, DC, allows customers to drive their cars to the pumpkin fields and offers a festival environment in the center of the farm with decorated pumpkin figures, apple butter preparation, food provided by local churches, and live entertainment. The most successful retail farm marketers are innovators. Farmers who build entertainment into their pumpkin sales can draw customers to their farm markets. Some farms, like the Berry Farm in Mathews, Virginia, focus almost exclusively on educational farm experiences for school groups. During their visits, students learn about farm animals, how pumpkins grow, and other crops. Doug Carrigan of Carrigan Farms in Mooresville, North Carolina, offers fall school tours focusing on either pumpkins or apples.

ORGANIZATIONS AND NEWSLETTERS

According to several vegetable and fruit specialists, there are no national organizations or associations focusing specifically on pumpkin growing. Pumpkin work at the University of Maryland, Wye Research and Education Center, is highlighted in "Agent Update" by Robert J. Rouse, WREC, P.O. Box 169, Queenstown, MD 21658. Much of the information on mid-Atlantic pumpkin work is also featured annually in the Proceedings of the Mid-Atlantic Vegetable Workers Conference.

Farmers contemplating growing and marketing their own pumpkins should check with their local Extension Service offices. An annual pumpkin meeting is hosted by Ray Samulis, Burlington County Cooperative Extension Agent, 49 Rancocas Road, Mt. Holly, NJ 08060-1317 (telephone 609-265-5050). Most States have fruit and vegetable grower associations, which may also have important grower information. The North American Farmers' Direct Marketing Association hosts an annual conference. In 1995, it will be held in Knoxville, Tennessee. Audiotapes of presentations are sold, and in past years there have been presentations on pumpkins and entertainment farming. For more information, contact Richard Reese, Audio Productions, 8806 South Lake Stevens Road, Everett, WA 98205 (telephone 1-800-356-2834).

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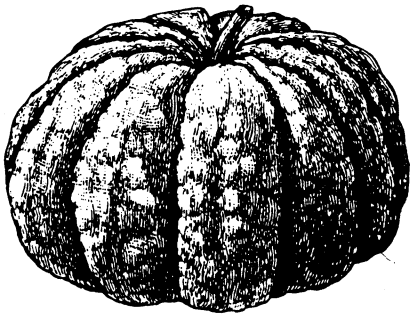

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A Small-Scale Agriculture Alternative

Specialty Corns

Five hundred years ago, Columbus was one of the first Europeans to set eyes on maize—foundation of most great Western Hemisphere civilizations, including those of the Incas, Mayans, and Aztecs. In the April 1992 Organic Gardening magazine, Shepherd Ogden says, "sweet corn is the most American of vegetables." His article has tips for growers.

In 1540, Coronado noted maize or corn growing under irrigation among Native Americans of the southwestern part of what is now the United States. Corn largely kept the Pilgrims alive during the harsh winter of 1620 on the East Coast. The oldest known remains of corn cobs may be in Tehuacan, Mexico, dating back 7,000 years. Most corn historians consider a wild grass called Teosinte one of modern corn's primary ancestors.

Corn is one of the most diverse grain crops. Nature by itself and man working with it have produced many types of corn. Corn is generally classed as to kernel endosperm characteristics. Endosperm refers to a seed's nutritive tissue, surrounding and absorbed by the embryo. The six most common corn types include flint, flour, dent, pop, waxy, and sweet. A seventh is called pod or tunicate corn, which may have endosperms like the other six. Pod corns differ from the others in that each individual kernel is enclosed in a glume or husk.

Popcorns are basically small-kerneled flint types. Waxy corn carries a gene which results in the production of 100 percent amylopectin, i.e., starchy pectin.

Sweet Corn

Standard sweet corn at the immature, milky stage contains about 10 percent sucrose, while field corn in the same stage has about 4 percent. After harvest or if left on the stalk too long, sucrose in standard sweet corn is rapidly converted to starch.

Unlike dent corn, sweet corn is not grown for feed or flour, although USDA researchers have developed a technique to produce a high-fiber, no-calorie flour from pericarps that surround kernels, holding them on the cob.

Sweet corn kernels often have a wrinkled, glassy appearance resulting from a sugary gene which retards the normal conversion of sugar to starch during endosperm development. Kernel colors vary, sometimes being mixed both white and yellow.

William "Bill" Watson, president and owner of the Liberty Seed Company (P.O. Box 806, New Philadelphia, Ohio 44663; 1-800-541-6022 or 216-364-1611), is doing a write-up of the many sweetcorn developments of the past decade. He says there has been more change in the past decade than in the preceding 25 years.

To compete and find a nearby niche (like a restaurant or roadside stand) for their sweet corn, entrepreneurs should explore the potentials for moving high-sugar varieties of corn to consumers within a day after harvest. The need for speed is because kernels at room temperature can lose as much as 50 percent of their sucrose by 24 hours after harvest.

Development of sweeter varieties of standard sweet corn was done by selections within homozygous "SU1" genotypes. One selection—Silver Queen—became the standard against which other standard sweet corn varieties were compared. Later supersweet SH2 varieties, i.e., "sugary enhanced (SE)" or supersweet "shrunken (SH2)," have 2 to 3 times as much sucrose as standard sweet corn at harvest! What's more, sucrose levels stay relatively high 48 hours after harvest.

Growers of the SH2 gene sweet corn must be careful not to plant it within 250 feet or more—depending on prevailing winds—of any other kinds of corn because pollen may be picked up from neighboring corn, which will dilute the sweetness, making kernels undesirably tough and starchy.

One exception to the distant planting rule is Kandy Korn, whose sugar-enhanced SE gene produces a variety for farmers that, like other SE varieties, requires no isolation. (Abbott and Cobb, Inc.; 1-800-345-SEED. Asgrow; 616-323-4000)

Growers for the roadside trade usually sell high-sugar corn of the SE variety because it's easier to grow; those who ship to the more distant markets lean toward the supersweet varieties to meet the competition.

The seed count is about 2,500 to 3,500 a pound for regular sweet corn. The count of the shrunken gene types is considerably higher.

Andy and Tannie Daniels are successful sweet corn growers at Route 4, Box 73, Columbus, NE 68601. Their story is reported in the Successful Farming magazine's publication, ADAPT 3, 1991. (P.O. Box 10652, Des Moines, IA 50309-3023, at $12.50. 515-284-2852)

The Daniels note that roadside stand work is hard, the season is not long, and the returns may grow slowly. To pick corn at the peak time, they usually pay high schoolers or others the minimum wage.

Roadside prices for sweet corn vary widely. Discounts for quantity are urged. The freshness increases the value (price) over grocery store pricing. Don't undercut grocery stores. The Daniels also advise adding other vegetables, such as tomatoes and cantaloup, after establishing a customer base.

They recommend SE varieties over the others for reasons noted above, plus disease control. The sweeter the variety, the more susceptible it is to disease, usually. The Daniels say plant early, with not too many varieties so as to avoid confusing customers.

Growers should check with the county agriculture Extension agent to learn the best planting dates, varieties recommended locally, and disease and pest control methods that reduce or eliminate chemicals.

The supersweets are just as good for freezing as the others. There are many varieties. Every catalog will have some.

Other marketing details have been emphasized in previous factsheets and are in the ADAPT books and not repeated here. It needs repeating, however, that entrepreneurs not wishing to waste money should determine an exact and committed market before they buy or plant any seed.

Popcorn

Popcorns are generally either pearl or rice types. Pearls have smooth, rounded crowns, while rice types are pointed. Color varies. Heating the kernel turns the moisture inside the soft starch in the center into explosive steam that can turn the kernel inside out. The greater the expansion, the higher the quality. Moisture content should be 13.5 to 14 percent for best results. Varieties differ as to quality, which also includes flavor, tenderness, absence of hulls, color, and shape.

Shape can vary from mushroom-spherical to butterfly. The confection industry usually prefers the spherical—easier to coat with flavors or syrups. The butterfly-shaped popcorn has a better "mouth feel" and is preferred for on-premises sales, as in theaters.

For more information, contact the Popcorn Institute, 401 N. Michigan Ave., Chicago, IL 60611. (312-644-6610)

Hi-Lysine Corn

Corn is a major staple in many underdeveloped countries. As dent corn is a relatively poor source of protein, many consumers have to supplement their diets with other protein sources like beans.

Most of the protein in corn is zein, which cannot be efficiently digested by humans and other nonruminant (single stomached) animals like pigs and chickens. Zein exists at the expense of lysine and tryptophan, which tend to be very low in dent corn. Lysine and tryptophan, two of eight essential amino acids that nonruminants can't synthesize on their own, must be obtained from food they eat.

In 1963, scientists at Purdue University found that the corn strains containing opaque-2 (O2) genes contained lesser amounts of zein and greater amounts of lysine and tryptophan in their endosperms than dent corn. Opaque-2 kernels, however, appear dull and tend to have soft textures and very little hard endosperm. It makes them difficult to harvest and subject to attack by various pests. Opaque-2 varieties also tend to have lower yields and must be isolated from other corns to retain protein quality. For more information, contact Crow's Hybrid Corn Co., P.O. Box 306, Milford, IL 60953. (815-889-4151)

High-Oil Corn

The highly polyunsaturated and high linoleic acid content of corn oil makes it an excellent energy and essential fatty acid source for both humans and livestock. Livestock feeders may be interested in varieties with greater oil contents. Such varieties have more calories, bringing greater gains per feed unit.

Most hybrid dent corns will average between 3.5 and 6.0 percent oil. Varieties with oil contents greater than 6.0 percent tend to have lower yields.

Oil quality is dependent on the amounts of unsaturated and saturated fatty acids it contains. Oils high in linoleic acid and low in oleic, palmitic, and stearic acids are preferred for human diets. For information on breeding high-oil corn, contact John Dudley, Agronomy Department, S-112 Turner Hall, 1102 South Goodwin Avenue, University of Illinois, Urbana, IL 61801. (217-333-9640)

Waxy Endosperm Corns

Waxy endosperm hybrids contain 100 percent amylopectin starch; the normal dent corn ratio is 72 percent amylopectin and 28 percent amylose. The waxy (wx) mutant was found in China in 1909 but was not fully developed until 1936 when researchers from Iowa State University noted its unique properties and started developing hybrids.

Steers make better gains when fed waxy endosperm corn rather than dent corn. The stability and clarity of amylopectin starch make it highly suitable as a food thickener. For more information on food processing aspects, contact Edith Munro, Corn Refiners Association, 1100 Connecticut Avenue NW., Suite 1120, Washington, DC 20036. (202-331-1634)

Blue Corn

Atole, tortillas, corn chips, and other corn products have been the backbone of most traditional and present-day Native American and Mexican American cuisines. Blue corn and other flour corns historically represented the major kernel type of corn ground into "harinas" (flour and meals) in the American Southwest. But dent corns, both white and yellow, now dominate the market. However, the blue corns are finding new market outlets.

Although Pueblo tribes have historically grown many different colored corns, blue corn is one of the most important, both as food and for religious purposes.

Unlike most commercial yellow hybrid dent corns that can yield 8,000 to 10,000 pounds of grain per acre, blue corn is open-pollinated and characterized by relatively low yields of 1,000 to 4,000 pounds per acre. It also tends to lodge, making machine harvest somewhat difficult.

Blue corn has a coarser, sweeter, and nuttier taste than other corns grown for flour or meal. Its grainier consistency results in a somewhat denser tortilla than those made from white or yellow corn flour.

Research of the New Mexico Cooperative Extension Service found blue corn, like Opaque-2 corn, higher in lysine than either white or yellow dent corn varieties used in tortillas. Most blue corn varieties were also found to be high in iron and zinc.

Blue corn flours and meals have traditionally been used in making tortillas and corn chips. Native American products less well known include piki or paper bread, chaqueque (similar to corn meal mush), atole (corn meal drink), and nixtamal or lime hominy used in making stews.

Newer products include pancake and muffin mixes and corn flakes. For more information, contact George Dickerson, New Mexico Cooperative Extension Service, address below. (505-275-2576) Seed source: Rose Seed Company, San Jon, NM 88434. (505-576-2241)

Corn Cob Corns

Although most corn grown in the United States is for grain or silage, at least one hybrid variety is grown for making corn cob pipes. Cobs should be at best 1 1/2 inches in diameter and long enough to make at least two bowls (2 inches each). The diameter of the cob should be relatively uniform.

Cobs should be woody and sufficiently hard to keep smoking tobacco from burning through the bowl. For more information, contact Harry Minor, the Agronomy Department, Extension Service, Waters Hall, University of Missouri, Columbia, MO 65211. (314-882-2001)

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Specialty Flowers

Flowers provide an allure that has been used by man to transcend the seasons and evoke emotion. Dried or fresh, certain specialty flowers can stimulate not only the eyes but also the sense of taste or smell, empowering new marketing opportunities for small-scale enterprisers.

Such flowers can be marketed fresh, dried, sugarcoated, in bulk, as singles, or by the pound, ounce, or sometimes gram. This exciting market, although subject to whims of designers, chefs, or fashion, continues to grow to meet demands.

For small-scale operators, recognizing unique marketing opportunities provides an entry into this competitive marketplace. Once there, an ability to provide consistent, dependable service with high-quality products can provide sustainable income. Growers of specialty flowers service specific needs in the floral industry. These spinoffs include rare cut flowers, edible flowers for garnishes or salads, potpourri mixes, and medicinals.

All must meet consumer expectations that are often reflected in production, packaging, and presentation. Examples of new products can be suggested by articles in national magazines such as *Gourmet*, *Bon Appetit*, or *Food and Wine*. Small-scale entrepreneurs should become acquainted with members of the local chefs' association or state restaurant association.

Read Trade Journals

One management tool taught at the Small-Scale Agriculture Program at the University of Maryland Eastern Shore (Princess Anne, MD 21853) is that the grower must become aware of the customers' competitive environment. Products may be anticipated by reading the customers' trade journals. Specialty products, such as flower garnishes, mixes, or specialty packaging, focus attention on customers' operations and expand and strengthen a market base. Stan and Susan Devoto of Sebastopol, California, learned at a local farmers' market how specialty flowers could be a marketing aid. In *The Furrow* (John Deere, 1400 13th Street, East Moline, IL 61244-1493), they explain how 15 different varieties of edible flowers were mixed in ready-to-eat salads. "You need something different to get noticed," Susan said.

Susan used the edible flowers to catch eyes and open the way for their other produce at the local farmers' market.

Gourmet Chefs Pay Heed

The many flowers that can be packaged for gourmet chefs and discerning grocery shoppers include old favorites like calendula, chrysanthemum, dianthus, dandelion, geranium, hibiscus, lily, nasturtium, pansy, rose, and blue violets. Others include certain herb flowers like mint, sage, basil, and bergamot and even vegetable flowers such as pumpkin, okra, and squash. Many are outlined in Claire Clifton's "Edible Flowers," 1984. (McGraw-Hill Publishing Co., P.O. Box 400, Highstown, NJ 08520/$10.95) Flowers are harvested early in the day and kept moist at refrigeration temperatures.

Wholesale packs of pansy blossoms protected with shrink-wrap plastics retailed for $17 per hundred at the 1988 Mid-Atlantic Food Exhibition. Other presentations are discussed in "Specialty Food Packaging Design," Association for the Specialty Food Trade, 1989. (PBC International Inc., 1 School St., Glen Cove, NY 11542/$59)

Production techniques found in James Crockett's "Crockett's Flower Garden," 1981 (out of print but may be found in some libraries), are restricted to organic practices, without pesticides. Production and variety selection are affected by planting schedules, species selection, and chefs' tastes.

Farmer David Aydelotte of Salisbury, Maryland, explains, "Chefs using my field-grown mint flowers and herb flowers are constantly looking for new garnishes. That is the real challenge, to keep them interested in what I'm producing.

"Many chefs are looking for a social event, a story that goes with the food," Aydelotte says. "Sequence plantings every two to four weeks are used to maintain production of annual flowers. Many are affected by day length and temperature but growers use fertilization and watering to lengthen the flowering periods."

Presentations can be developed from books such as:

- "Cooking with Flowers," by Jenny Leggatt, 1987. (Out of print; consult your local library.)
- "Cooking from the Garden," by Rosalind Creasy, 1988. (Sierra Club Books, 730 Polk St., San Francisco, CA 94109/$35)
- "The Forgotten Art of Flower Cookery," by Leona Smith, 1985. (Pelican Publishing Co., Inc., 1101 Monroe St., Gretna, LA 70053/$14.95)
- "Gourmet Bouquet," by Julia Weinberg, 1977. (New Win Publishing, Inc., P.O. Box 5159, Clinton, NJ 08809/$10.95)

Candied Flowers

Reviving the Victorian technique of candying flowers generated a marketing opportunity for Jo and Rob Pendergraph of Midlothian, Virginia. As Jo explained in the *Delmarva Farmer* newspaper, each petal is painted with egg white and sprinkled with granulated sugar. After the sugar has crystalized, flowers are stored in air-tight containers. The candied flowers sell for $45 per hundred at a major department store in New York City.

Edible flowers to brighten up custom salad mixes include chives, nasturtiums, pansies, and bergamot. "Most chefs are

paying $9 per dozen for edible flowers flown in from California," Pendergraph adds.

Competition Fierce

The competition is even fiercer in the dried flower market. This is where volume growers can stockpile quantities and provide a stiff marketing challenge. Producers listed in the "1990 Organic Wholesalers Directory/ Yearbook," published by California Action Network (P.O. Box 464, Davis, CA 95617; $25), can often suggest trends for your area.

Carol Kopolow, reference librarian at the U.S. Department of Agriculture's National Agricultural Library (NAL), has prepared listings of journal articles, books, and associations providing information on "Marketing of Floricultural Products in the United States," "Agri-Topics on Dried Flowers," and "Agri-Topics on Cut Flowers: Production and Marketing." To request copies, write to USDA/NAL, Reference Branch, Room 111, Beltsville, MD 20705 and enclose a self-addressed gummed label.

Current production practices of both wild-gathered and commercially grown flowers are discussed in the 207-page proceedings of the "Commercial Field Production of Cut and Dried Flowers Symposium," hosted by the American Society for Horticultural Science and the Center for Alternative Crops and Products. Presentations covered marketing, economics, production, and handling of dried and fresh cut flowers and decorative plants. (The book costs $20 per copy, from Nancy Breneman, Extension Special Programs, 405 Coffey Hall, 1420 Eckles Avenue, University of Minnesota, St. Paul, MN 55108.)

In *The Business of Herbs,* Paula Oliver (Ed.) focuses on the potpourri market blends and supplies. Including both herbs and flowers, this publication provides classified ads for both buyers and sellers. (Northwind Farm Publications, Route 2, Box 246, Shevlin, MN 56676/ six issues per year/$20) Sample ingredients are outlined in Clarence Meyer's "Potpourri and Incense Recipes," 1986. (Meyerbooks, P.O. Box 427, Glenwood, IL 60425/ $3.95)

Information on producing dried flowers can be found in Hiller, Malcolm, and Hilton's "The Complete Book of Dried Flowers," 1987 (Simon and Schuster, Inc., 200 Old Tappan Road, Old Tappan, NJ 07675/$22.95 plus State sales tax); and similar books found in regional libraries.

"Spend about a year doing research. I think that is very important for anyone getting into any type of business, including specialty cut flowers and bedding plants," grower Brian McCreight explained at a Delaware horticultural exposition. "Experimentation is part of the learning process, and we usually try 10 to 15 new varieties of flowers every year.There are two 'musts' if you grow flowers outdoors. Facilities for cooling are essential, and so is irrigation."

The Association of Specialty Cut Flower Growers (ASCFG, 155 Elm St., Oberlin, OH 44074; annual membership: $55) was recently established by growers and educators across the country to improve the industry through conferences, information, research, and education. Judy Laushman, executive director, distributes "Gatherings-The Cut Flower Quarterly," the association's newsletter. Regional directors, such as Leonard Perry for the Northeast Region (University of Vermont, Plant And Soil Science Department, Hills Building, Burlington, VT 05405-0082), help coordinate Extension and research information.

Another Major Problem

One major problem domestic growers face is importation of floral products. Despite such intense competition, some established growers, such as Kitayama Brothers (Watsonville, California), have not only survived but thrived. Kitayama Brothers expanded over 50 percent with new production greenhouses from 1986 to 1989.

Demand is good for mainstream cut-flower species such as snapdragons, lilies, alstroemeria, irises, and delphiniums. But any new production volume can depress prices.

In *The Furrow* magazine (June 1989), Kee Kitayama adds, "A few acres of any cut-flower crop can flood the market. We try to grow not only ones that we hope will be in short supply but ones that also will be profitable."

Recognizing trends and gaining production experience become necessary tools in this industry. Information appears in marketing publications, such as:

- "Floral Marketing Directory and Buyer's Guide," Floral Marketing Division, Produce Marketing Association, P.O. Box 6036, Newark, DE 19714-6036 ($25 a copy for members, $50 for nonmembers).
- *Florist* (12 issues a year/$24), *Trends* (once a year/$7.50), and "Florist Buyer's Directory" ($4 a copy), Florist Transworld Delivery Association, P.O. Box 2227, Southfield, MI 48037."
- *Flowers &,* Teleflora Inc, Teleflora Plaza, Suite 260, 12233 West Olympic Blvd., Los Angeles, CA 90064 (12 issues per year/ $28).

Growing expertise, innovative technologies, and production supplies can be found in industry publications such as:

- *The Flower Market,* going to 20,000 floral-related businesses (growers, grocery chains, wholesalers, retailers, and trade suppliers), 780 North Fourth St., San Jose, CA 95112 (12 issues a year/$15).
- *Nursery Manager* or *Greenhouse Manager*, Branch-Smith Publishing, 120 St. Louis Avenue, Fort Worth, TX 76104 (each: 12 issues per year/$24).
- *Greenhouse Grower,* Meister Publishing Co., 37733 Euclid Ave., Willoughby, OH 44094 (14 issues per year/$25).

Other information sources can also be found in the "Directory of Small-Scale Agriculture." (Order No. 001-000-04539-3, Superintendent of Documents, United States Government Printing Office, Washington, DC 20402/$5.50 per copy)

Prepared by Thomas S. Handwerker, Small Farms Research Leader at the University of Maryland-Eastern Shore, and George B. Holcomb of the Office of Public Affairs, U.S. Department of Agriculture, for USDA's Office for Small-Scale Agriculture (Howard W. "Bud" Kerr, Jr., Program Director). The address is Office for Small-Scale Agriculture, Cooperative State Research Service, Room 342-D, Aerospace Building, USDA, Washington, DC 20250-2200. (Telephone: 202-447-3640 or Fax: 202-475-3179)

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United States Department of Agriculture

Cooperative State Research Service

Office for Small-Scale Agriculture

A Small-Scale Agriculture Alternative

Specialty Mushrooms

If you enjoy cultivating the unusual, specialty mushrooms offer many possibilities. The term "specialty" refers to any mushroom, except the white button mushroom commonly found in supermarkets. Specialty mushrooms include shiitake, oyster, enoki, wine cap, maitake, and pompom among many others. Selling large quantities of any of these mushrooms may be a challenge unless you are near a large ethnic population (e.g., Asian American) that has enjoyed these delicacies for centuries. Smaller quantities can be sold locally in farmer's markets as part of a pick-your-own fruit and vegetable operation, to gourmet restaurants, to health food stores and to local grocery stores. While production of the common button mushroom is a possibility, it is already widely available in grocery stores, and new growers will be competing with large-scale producers in established markets. However, small-scale cultivation of specialty mushrooms could be a profitable addition to a farming enterprise.

About Mushrooms

A mushroom is neither a plant nor an animal, but has properties of each. Modern taxonomists give the fungi, including all mushrooms, a kingdom all their own. Most mushrooms have a "common" name and a "scientific" name. The latter identifies the genus, species, and sometimes the variety of mushroom for the experts. This eliminates confusion since one common name can apply to several different species. Scientific names usually appear in italics with the genus capitalized.

Like plants, mushrooms begin with a "seed," which is actually a microscopic spore. The gills or pores beneath the cap of a parent mushroom produce spores and a single mushroom produces thousands. The wind can easily transport a spore until it comes to rest in a suitable environment and then germinates and grows into a mat of root-like filaments called hyphae. The mat of hyphae is called the mushroom's mycelia. Unlike plants, this outgrowth of a single spore cannot produce a mushroom. Instead, like animals, a sexual union is necessary. In mushrooms, that union occurs when a hyphae from one spore contacts a hyphae of a compatible spore. After joining, the mycelia is capable of producing mushrooms, the fruit of the fungi.

Mushroom cultivators typically use already-growing mycelia called spawn, rather than growing their mushrooms from spores. The spawn can be purchased from several sources or produced in-house on grain. When the spawn is ready to use, each grain kernel has enough living mycelia to begin mushroom growth when introduced to the growing medium or "substrate."

Environmental conditions are the key to cultivating mushrooms. The hyphae may not grow if the substrate is not correct. If nutrients are not sufficient or the weather is not appropriate, healthy mycelia may not bear fruit. Some mushrooms will produce fruit under a wide range of conditions while others are very specific in their needs. Some even require a symbiotic relationship with specific tree species before they will fruit. Mushroom cultivators must understand the requirements of the species they want to grow. After identifying environmental needs, the grower determines whether to grow a particular species outdoors or in a controlled environment. Typically, investments in climate- controlled rooms will be much greater than investments in outdoor growing space. Mycologists are regularly discovering ways to cultivate new species. Let's look at the attributes of a few specialty mushrooms and their requirements.

Shiitake *(Lentinula edodes)*

Shiitake mushrooms are very popular in Japan. American production of shiitake has increased faster than any other specialty mushroom. Until recently, worldwide production of shiitake was second only to the common button mushroom. Shiitake grow best with certain hardwood species, especially ironwood and oak. Other substrates with a corncob or straw base and several additives can produce shiitake, but have not proven as good a substrate as the hardwood species. Depending upon the climate, shiitake may grow on logs outdoors. Indoor growers typically use a substrate composed of sawdust and several additives. Current wholesale market prices for shiitake range from $3.50 to $8 per pound, depending upon quality and size. Growers typically get from $4 to $6 per pound for their best mushrooms.

Oyster *(Pleuratus spp.)*

There are several species of oyster mushrooms that are widely cultivated internationally. Major production increases in China recently moved the oyster mushroom to second place in terms of worldwide production. Some of the more common species include the Indian oyster, tree oyster, golden oyster, pink oyster, and the abalone mushroom.

Unlike the shiitake mushroom, oyster mushrooms grow prolifically on a variety of substrates including most hardwoods, paper, cereal straws, coffee grounds, corncobs and sugarcane bagasse, among many others. If you have an agricultural or wood waste product in your area, you can probably find a variety of oyster mushrooms that will grow on it.

Oysters are most commonly grown indoors in specially constructed growing rooms, which sustain the necessary climatic conditions. They need high humidity and warm, not hot, temperatures. Many growers convert existing barns, stables or sheds, or buy an inexpensive greenhouse that can be insulated. Humidity is provided via misters or commercial-scale humidifiers. Heating comes from whatever inexpensive source is readily available. Most mushrooms, including oysters, require light during their life cycle and daylight fluorescent bulbs seem to work well.

Other mushrooms require a sterilized substrate. A boiler and an autoclave large enough to sterilize commercial quantities of substrate are quite expensive. Oyster mushrooms are so prolific that the mycelia outgrows most contaminants. Thus, pasteurization is generally sufficient. For a chopped straw substrate, pasteurization can be accomplished in a hot (160o F) water bath for a couple of hours. After cooling, the spawn is mixed with

the straw. One technique for growing oysters uses plastic bags from a roll of tubing usually 8 to 14 inches in diameter. The grower cuts a length of tubing, ties a knot in one end and stuffs the inoculated straw into the bag. When the bag is nearly full, a knot is tied in the other end and the bag is hung in the growing room. Holes are punched in the bag to allow the mycelia to breathe and to provide a place for the mushrooms to pop out.

Oyster mushrooms have several advantages and only a few drawbacks. They are easy to grow using agricultural waste as a substrate. If straw is used as a substrate, the remaining composted material can be used as a feed for cattle or hogs or as a soil amendment after the mushrooms are harvested. On the cautionary side, oysters produce numerous spores which trigger allergies in many people. Usually a respirator is required for lengthy stays in the growing room. Marketing opportunities may be limited since oysters have a relatively short shelf life of approximately 1 week. Finally, they attract mushroom gnats more than most other species. Current wholesale prices range from $2 to $4 per pound.

King Stropharia or Wine Cap
(Stropharia rugoso-annulata)
This mushroom is good for outdoor growing. It can be easily cultivated in a shady bed of hardwood chips and/or straw. Some gardeners use beds in cold frames to produce crops from summer to fall. These mushrooms grow to enormous size, weighing 5 pounds or more. Unfortunately, these huge specimens are usually filled with fly larvae and unsuitable for human consumption. However, the larvae-infested mushrooms do make great fishfood! Obviously, the younger mushrooms are the desired edible for people.

Since these mushrooms have not been widely commercialized, there is no established market. However, there is the opportunity to combine stropharia with other products of a small farm for sale at a farmer's market or vegetable stand. Expect prices in the $5 per pound range. They also have the advantage of turning your waste woodchips or sawdust into a rich compost while providing mushrooms for several years.

Shaggy Mane *(Coprinus comatus)*
The shaggy mane is not typically produced on a commercial basis as it becomes an undesirable mass of black ink within a few hours of harvesting if it is not cooked immediately. Inclusion in a pick-your-own operation may be profitable if customers are carefully taught how to handle this species.

The main advantage is that it is easy to grow and you may already have some growing wild on your farm. It even shows up as a contaminant for growers of other mushrooms, like the oysters. To encourage its growth, you need only inoculate a bed made up of a soil/sawdust, manure/sawdust, or straw/manure mixture and keep it wet. Research from China indicates that this mushroom may suppress the growth of certain types of cancers.

Maitake *(Grifola frondosa)*
The maitake—or hen-of-the-wood—is different. It comes from a group called the polypores. Rather than distinct individuals, this mushroom produces a large clump of interwoven "leaves." It grows wild on dead or dying hardwood trees or stumps in the Northeastern and Mid-Atlantic States. Growth can be induced by inoculating a suitable log or stump with its mycelia. An advantage is that the Maitake can recycle old stumps into forest soil. The major disadvantage is the 3 years it may take to produce any fruit.

More Information
This factsheet only hints at the possibilities of growing specialty mushrooms. You may already have delicious species, like some of those mentioned above or common meadow mushrooms or even giant horse mushrooms, already growing on your farm. The details needed for cultivation have not previously been well understood or easily available to the public. Continuing experimentation has led to more accessible information. In addition to the publications that specifically address shiitake cultivation, as noted in the factsheet entitled Shiitake Mushrooms from the Office for Small-Scale Agriculture (OSSA), the following selections may be helpful:

For a quick overview of several species:
Organic Gardening Magazine - November 1993

For a more detailed discussion on growing many mushroom species outdoors:
"Mushrooms in the Garden" by Hellmut Steineck. A 152-page book published by Mad River Press. ISBN: 3-8001-6122-2.

For details on both outdoor and indoor cultivation:
"The Mushroom Cultivator - A Practical Guide to Growing Mushrooms at Home," by Paul Stamets and J.S. Chilton. A 415-page book published by Agarikon Press.
ISBN: 0-9610798-0-0.

For more details on more species:
"Growing Gourmet and Medicinal Mushrooms," by Paul Stamets. A 552-page book published by Ten Speed Press.
ISBN: 089815-608-4.

For a comprehensive mushroom guide with over 1,000 color photographs:
"Mushrooms of North America," by Roger Phillips. A 319-page book published by Little, Brown and Company. ISBN: 0-316-70612-4.

For a monthly update on prices, marketing information, and production techniques:
The Mushroom Growers' Newsletter
P.O. Box 5065
Klamath Falls, OR 97601

Published monthly, 6 - 8 pages, $24 annually.

By Jerry Haugen, P.O. Box 5065, Klamath Falls, OR 97601; George B. Holcomb (Retired), Office of Communications, U.S. Department of Agriculture, for USDA's Office for Small-Scale Agriculture (OSSA); Howard W. "Bud" Kerr, Jr., Program Director. OSSA's address: Ag Box 2244, Washington, DC 20250-2244. Telephone: 202-401-1805; Fax: 202-401-1804.

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Specialty Potatoes

The potato, one of the most important food crops, came under cultivation by South American "Indians" more than 2,000 years ago. Potatoes, of which there are hundreds of varieties in every shape, size, and color, were carried to Europe around 1500. From Europe they were introduced into the British Colonies in North America.

In 1992, the potato is one of several food crops featured in the Smithsonian Institution's National Museum of Natural History's exhibition "Seeds of Change," commemorating the 500th anniversary of Columbus' first voyage. For many years, the potato had its own Potato Museum, in Washington, D.C. (Also see *The Incredible Potato*, *National Geographic Magazine*, May 1982.)

Interest is increasing in the yellow-fleshed and other uncommon varieties—specialty potatoes. Yellow-fleshed potatoes are the rule rather than the exception in most countries. Some specialty potatoes available in the United States for many years were long considered of little commercial value. Now, however, with increased consumer demand, domestic potato breeders have begun to release some excellent yellow-fleshed varieties.

In Washington State, nearly 200 specialty potato varieties and clones have been tested; some varieties appear with pink or purple flesh and skin colors ranging from buff to red. Many have given yields greater than 'Russet Burbank.' Erik J. Sorensen, Washington State University Cooperative Extension, Franklin County Courthouse, Pasco WA 99301, has results from test trials.

With per capita fresh potato consumption static or declining, the variety offered by specialty potatoes can add to sales. Despite hurdles, they have a bright future but will never completely replace the traditional white-fleshed, russet type.

Climate, Soils, and Water

Although classified as a cool-season crop, commercial acreage can be found in all 50 States, with Idaho, Washington, Oregon, Maine, Wisconsin, California, and North Dakota leading. Soil temperatures should be between 45 and 70 degrees F at planting time. Planting into cold soils delays emergence and increases the risk of seed piece decay.

Although rainfall often suffices, irrigation may produce highest yields. Potatoes need 18 to 30 inches of water to mature. Potatoes are shallow rooted, with most roots being in the upper foot of soil.

Potatoes are sensitive to water stress. Well-drained, light textured soils, such as sandy loams or loamy sands, generally produce the highest quality potatoes.

Good-Quality Seed

Potatoes are vunerable to several diseases, including blackleg, bacterial ring rot, and viruses, which can be transmitted in infected seed. To avoid such problems, certified potato seed is recommended. Not guaranteed to be disease free, potatoes certified by State agencies have shown no more than an allowable tolerance level for disease symptoms. For certain diseases, such as ring rot, the tolerance level is zero. To be certified, seed lots must be inspected in the field during the growing season AND in storage or at shipment.

Addresses of State and Provincial certification offices which list certified growers may be obtained from the publisher of this factsheet.

A number of mail order companies also offer limited quantities of specialty potato seed. Among these are some run by innovative potato growers: Will Bonsall, Scatterseed Project, Box 1167, Farmington, ME 04938; David Ronninger, Ronninger's Seed Potatoes, Star Route 1, Moyie Springs, ID 83845 (both curators for Seed Savers).

Planting and Cultivation

In much of this country, potato seed pieces are planted 3 to 4 inches deep. But where soil moisture may be limited, seed pieces are planted an inch deeper. The amount of seed required varies according to seed piece size and plant spacing. A spacing of 9 to 12 inches between plants is common. Wider spacings often result in oversized tubers.

Cut seed is widely used, but whole seed is less sensitive to tuber decay. Cut seed pieces should be 2 to 2 1/2 ounces in weight, firm, and with at least one eye.

After planting, potatoes may be cultivated to help control weeds and to reshape beds. It is common to hill potato plants when they are 8 to 12 inches tall: Soil is mounded to a height of 2 to 3 inches around the plant base. Some varieties, such as 'Yukon Gold,' set tubers high in the bed. Hilling helps maintain suitable soil cover to prevent greening or sunburning of tubers.

Pest Control

The potato is vulnerable to pests. In addition to using certified seed, growers need many strategies to minimize insect and disease problems. Strategies include proper soil fertility and water management, crop rotation, sanitation, and the use of resistant varieties.

Harvesting and Storage

Time of harvest varies according to variety and intended market. Potatoes may be harvested with vines still green and tubers comparatively immature. Such potatoes are generally intended for immediate use as "new potatoes." Most potatoes, however, are harvested at full maturity. Indicators of maturity are tuber size, skin set, and death of the vine. Mature tubers store better than immature tubers and resist bruising better.

Many varieties of specialty potatoes, such as 'Michigold,' 'Donna,' and 'Yukon Gold,' produce a high percentage of A-size tubers—generally the most desirable size.

'Yellow Finn,' however, is an exception. The market prefers smaller sized tubers of this particular variety. With red-skinned varieties, the small C size demands the highest price. Many restaurants also prefer small potatoes.

Potatoes store best at 40 to 50 degrees F, with adequate ventilation and relative humidity at 90 percent. It is important to exclude light to prevent greening. Only sound potatoes should be put into storage.

Varieties

The dark-yellow flesh of 'Yellow Finn' has become something of a standard. By comparison, 'Yukon Gold' flesh is relatively light-yellow. Many European varieties also have light-yellow flesh.

'All Blue' is oblong with purple skin and purple flesh. Sometimes called 'Purple Marker,' its striking appearance led to its use as a marker for the ends of potato plots. It can be baked or boiled and retains the purple flesh color even after cooking. 'Purple Viking' has purple skin with red stripes.

Varieties with commercial potential: Yellow-fleshed with buff or yellow skin: 'Delta Gold,' 'Donna,' 'Michigold,' and 'Saginaw Gold.' Yellow-fleshed with red or pink skin: 'Desiree,' 'Iditared,' 'Red Gold,' and 'Rose Gold.' Yellow-fleshed with purple skin: 'Brigus.' And small-sized or fingerling potatoes: 'Banana' and 'Ruby Crescent.'

Good descriptions of potato varieties are in two out-of-print books often found in university libraries: **"Description of and Key to American Potato Varieties,"** C.F. Clark and P.M. Lombard, USDA Circular No. 741, Issued April 1946 (Revised November 1951) and **"North American Potato Varieties,"** H.M. Darling, 1959 Potato Handbook, Potato Varieties Issue, Potato Association of America (PAA).

Marketing

Marketing presents a challenge but the potato is a familiar crop and most consumers are willing to try colorful varieties. To successfully market specialty potatoes, farmers need to work with those who sell and promote vegetables.

Specialty potatoes have received national attention through articles in produce trade journals and the popular press. Supermarket chains have featured yellow- fleshed potatoes. At Larry's Supermarket in Seattle, a 4th of July promotion featured red, white, and blue potatoes. Without such efforts it is difficult to move specialty items beyond local markets and into the produce mainstream.

Quality is of paramount importance to market acceptance. For the fresh market, appearance strongly influences sales. Color, size, shape, and defects shape consumers' first impression of quality. Texture, flavor, and nutritive value are less obvious, but still important quality components, affecting first sales little but greatly influencing subsequent sales.

Many restaurants feature specialty potatoes. Often customers who first tried them in a restaurant purchased them later in supermarkets. Some brokers and others who pack and ship fresh produce concentrate on specialty potatoes.

Marketing specialty potatoes is complicated by the fact that most potatoes are not sold by variety name. Some specialty potatoes have characteristics that lend themselves to product differentiation. 'Yellow Finn' has a characteristic flattened shape and deep eyes. 'Yukon Gold' is distinguished by the pink coloration around its eyes. Packaging can also be important to market success. Bags that display the variety name along with cooking or nutritional information are useful.

Yellow-fleshed varieties have already been bred that can be used for either fresh market or processing. 'Saginaw Gold' produces a chip with good color and taste. Purple or pink potato chips and yellow french fries are among possibilities for processed specialty potatoes. Looking beyond local markets, specialty potatoes and potato products may also have potential for export.

The market for specialty potatoes is limited and overproduction is a real danger. Growers are advised to develop a market before trying new crops--and then only on a limited acreage.

Cooking Quality and Nutrition

Fresh potatoes contain about 80 percent water. Solids, or dry matter, is highly correlated with texture. A mealy texture is associated with high solids, a waxy texture with low solids. Although individual tastes vary, varieties such as 'Michigold' have a mealy texture usually considered best for baking or french-frying. Varieties such as 'Red Gold,' with a waxy texture, are more often used for boiling or in salads.

Potatoes are an excellent source of carbohydrates and contain valuable amounts of protein, minerals, and vitamins. Nutrient levels vary not only by variety but also according to the maturity of the crop and storage time. Nutritive content can be used to market specialty potatoes. It appears that the darker the yellow flesh color, the higher the level of vitamin A.

For More Information

In addition to the U.S. Department of Agriculture, State universities and county Cooperative Extension personnel can provide useful information on local production methods and marketing practices. PAA (Dr. David Curwen, Secretary, University of Wisconsin, Hancock Ag Research Station, Hancock WI 54943) publishes a Potato Extension Specialists Directory that lists University faculty members in 46 States and the District of Columbia. PAA also has an annual meeting and publishes "The American Potato Journal," a monthly. (Contact Linda Best, Membership Secretary, PAA, 8 Holmes Hall, University of Maine, Orono ME 04469-0163.)

Many potato production educational programs are sponsored by the Cooperative Extension System. In Washington, the Washington State Potato Conference and Trade Fair is held each year. Similar programs exist in Idaho, Maine, Michigan, Nebraska, and Oregon. Potatoes are included in numerous other conferences.

Other Information Sources

There are many excellent publications:

- *"Delta Golds...Consumer Response to Yellow Fleshed Potatoes*, Applied Market Research Report #2." Agriculture and Resource Economics, 206 Winslow Hall, Univerisity of Maine, Orono, ME 04469.
- *"Potato Handbook."* Agricultural Communications Center, 111 Ag Sciences Building, University of Idaho, Moscow, ID 83843.
- *"Potato Growers Handbook."* Washington State Potato Commission, 108 East Interlake Road, Moses Lake, WA 98823.
- *"Potato Varieties - An introduction to variety characteristics, management and performance in the Klamath Basin."*. University of California Tulelake Field Station, P.O. Box 447, Tulelake, CA 96134.
- *"North American Potato Varieties."* Potato Association of America, 8 Holmes Hall, University of Maine, Orono, ME 04469-0132.
- *"Selecting Potato Varieties for Michigan."* Michigan State University, Bulletin Office, P.O. Box 231, East Lansing, MI 48823-0231.
- *"Integrated Pest Management for Potatoes in the Western United States,"* Publication 3316. Agricultural Sciences Publications, Division of Agricultural Sciences, University of California, Berkeley, CA 94720.
- *"Compendium of Potato Diseases,"* American Phytopathological Society, 3340 Pilot Knob Road, St. Paul, MN 55121.
- *"A Guide to Monitoring Potato Pests in New York State, 102 IPM 107."* Cornell Cooperative Extension, Research Center, 7 Business and Technology Park, Ithaca, NY 14850.
- *"Potato Diseases, Agriculture Handbook No. 474,"* Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

A computer software program, *Potato Crop Management*, is available from the University of Wisconsin, WISPLAN Computing, 302 Hiram Smith Hall, 1545 Observatory Drive, Madison, WI 53706.

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Specialty Vegetables

There is a growing demand for Latin and other 'ethnic' vegetables in most of the larger cities such as Chicago, Miami, and New York. To supply customers' needs for such specialty items, many major chain stores across the country are turning to specialist marketers, many of whose suppliers are small-scale growers.

Specialty vegetables being introduced or reintroduced by immigrants from the Pacific Basin, Africa, Latin America, the Caribbean, and even Europe include amaranth, arrowroot (Chinese potato), cipolines, daikon, donqua, elephant garlic, fava bean, fiddlehead green, gil choy, Japanese eggplant, jicama, manzano banana, moqua, napa, taro root, tomatillo, and yuca (also known as sweet cassava). Even the native watercress is enjoying newfound popularity. Many such vegetables are described in a book, *Windows of Opportunity: The Market for Specialties and Organics*, ($25), by Nancy Lee Bentley, marketing consultant at The Food Circle, P.O. Box 62, Cabery, IL 60919. (One fresh produce item likely to capture consumers' fancy is the miniature watermelon, to be discussed in more detail in a fact sheet on fruits.)

Things to Consider

Above all, a small-scale entrepreneur interested in growing specialty vegetables must be cautious, advises Frieda Caplan. She is an ace California-based national-chain marketer of specialty produce for nearly 30 years. Her successes include Jerusalem artichokes (marketed under the name she coined, "sunchokes") and many other specialty vegetables. She gets as many as 50 phone calls a week from potential vegetable or fruit growers asking how to get started.

Frieda, as she is known in the trade, tells callers first to check with an expert, such as a Cooperative Extension Agent or Soil Conservation Service soil specialist with the U.S. Department of Agriculture (USDA), to learn what vegetables their soil can grow best. Next, from a seed company, "find out what's new and available." Then she suggests they contact her to learn whether she can market what they plan to grow. (Her address: Frieda's Finest Produce Specialties, Inc., P.O. Box 58488, Los Angeles, CA 90058).

Chances are, if an item is really new, she will advise them to grow only a few rows, just to try it out. She cautions growers about making certain before contracting that they have packing and shipping arrangements worked out. "It's up to the grower to arrange transportation," she points out.

Vegetables have to be packed according to standards; and growers must have arrangements to precool the vegetables for shipment. Failure to have all the links in the chain from soil to market can doom an enterprise.

To help growers, shippers, carriers, and receivers learn the standards and to reduce postharvest losses and expand the markets for highly perishable, high-value vegetables (and fruits), the Export Services Branch of USDA's Office of Transportation (410 McGregor Building, Washington, DC 20250-4500) has a *Tropical Products Transport Handbook* available at no charge. A Spanish version also will be available in 1988. It discusses maintaining quality of fruits, vegetables, plants, and flowers during transportation.

The booklet emphasizes proper planning, grading, packaging, and precooling practices as particularly important for crops shipped long distances from areas with tropical and subtropical climates. The information is presented in a brief manner with many illustrations. The handbook also discusses the choice of mode of transportation, checking the transport equipment before loading, loading practices, and recommended intransit and storage procedures. A summary of recommendations is given for 120 fruits and vegetables, most being tropical in origin. (Telephone 202-653-6317.)

One key need both before and just after harvesting is adequate labor to gather and pack crops quickly for market when they are ready. Most specialty crops can't be harvested by machine. A U-pick operation would solve the labor problem; but not all areas support pick-your-own operations. Each producer must evaluate his or her prospects for U-pick carefully.

Lawrence Rinkenberger, Indiana farmer who spoke at the 1986 "ADAPT 100" conference (sponsored by Meredith Corporation's *Successful Farming* magazine), said his pick-your-own acreage has been declining since 1981, despite his fast checkout lanes and a recreational atmosphere. Fewer customers are finding time for picking, and supermarkets have become more competitive with higher quality and lower prices.

The text of Rinkenberger's talk (along with discussions of many other alternative farming ideas) is in the book, *ADAPT 100*, available for $12.95 from *Successful Farming* at P.O. Box 10652, Des Moines, IA 50336.

Miniatures in Demand

In deciding what to produce, entrepreneurs may pinpoint demand. In some markets and gourmet restaurants, demand is often high for miniature or "baby" sizes of conventional vegetables, such as squashes.

Some varieties of vegetables have been especially developed to grow small, or miniature size. Others are simply picked at an immature stage; it is important to know which ones. Many minivegetables are being grown in California, Florida, Texas, and Mexico year round. With good soil, they can be grown in many States in summer, or they can be grown in greenhouses. Growing and marketing minivegetables is tricky. Besides being produced from appropriate varieties, they must be harvested precisely when they are at a sweet rather than bitter stage. Not all immature vegetables qualify.

Some Market Outlets

Any vegetable can be labeled "gourmet" if marketed at peak condition, according to David Miskell, a speaker at the 1986 "ADAPT 100" conference.

For information, Miskell noted seed companies and market outlets such as Frieda Caplan's; "Fresh and Healthy" of Lehigh Valley Organic Growers, Inc. (125 West Seventh Street, Wind Gap, PA 18091); Green Leaf Produce (1980 Jerrold Avenue, San Francisco, CA 94124); and Flying Foods International (43-43 Ninth Street, Long Island City, NY 11101). Both Sibella Kraus, Green Leaf planner, and Walter Martin, founder and managing director of Flying Foods, say

their companies are always interested in hearing from growers with plans for novel produce—such as colorful lettuces.

Miskell mentioned some of the gourmet lettuces being marketed, including Merveille de Quatre Saisons, Rouge d'Hiver, Red Sails, Red Romaine, Red Salad Bowl, Oak Leaf, and Boston type. Miskell may be contacted at Shelburne, VT 05482, where he produces organic vegetables on 3 acres with four greenhouses.

The produce market—gourmet or otherwise—is extremely competitive. The specialists emphasize that when too many people begin growing a vegetable crop, it is no longer a specialty that commands a premium price. Above all, the experts emphasize that people should NOT plant first and try to sell later.

One way to beat the competition as well as take advantage of the U-pick solution to labor shortages, is described in Dr. Booker T. Whatley's book, *How To Make $100,000 Farming 25 Acres,* ($17.95, softcover; $24.95, hardcover, from Rodale Institute, 222 Main St., Emmaus, PA 18049). He explains how clever growers can build a 'guaranteed' or contract market by organizing a clientele membership club. Members buy rights to pick vegetables and/or fruits at rates adjusted regularly to be below supermarket prices. This kind of club, of course, takes as much servicing as any organization.

Price Information

To help make decisions, operators can seek price data from many sources. One is USDA's Agricultural Marketing Service (AMS). Its Fruit and Vegetable Division has a Market News Branch (headed by W. H. Crocker, Room 2503-S, AMS, USDA, Washington, D.C. 20250). AMS reports daily on prices and shipment sizes at 20 of the Nation's biggest metropolitan centers. AMS will send inquirers data on subscription fees for reports from various cities.

While all major markets detail wholesale prices on the most common produce, not all report gourmet vegetable prices. However, AMS reports from New York and San Francisco often have lists of vegetables or herbs designated "oriental" or "miscellaneous." Some sell by the pound, others by the dozen (bunches) or by the carton or lug.

Caplan says the farmer's price can be estimated by deducting 30 percent from the price that AMS shows for any particular item.

For data on local prices and competition, the best source of data is the produce manager of the nearest large gourmet grocery store. If there is no gourmet store, the owner of a gourmet restaurant might discuss prices and supplies.

Production Ideas

Many sources of vegetable production information include county offices of the Cooperative Extension Service (CES), supported by the States, State universities, and USDA. Most counties have CES offices.

The Produce Marketing Association (PMA, 1500 Casho Mill Road, Newark, DE 19714-6036) can provide a list of articles on specialty vegetables to nonmembers of PMA for $20 (the search cost) plus $10 for a set of computer page printouts of up to 10 pages plus $1 per additional page.

A recent PMA bibliographic printout on "exotic produce" (which includes fruits as well as vegetables) covered about 18 pages. Two other pages were on Hispanic produce operations and two on Oriental produce and marketing.

Typical articles are two in *Restaurant Business,* "Oriental market poised for explosive chain growth" and "Oriental: Fast food of the next generation," and one in *Supermarket Business,* "Oriental items can be bonanza for produce section." Items on the Hispanic list include: "Tips on capturing a piece of Hispanic grocery market," in *Packer* newspaper; "The emerging Hispanic market," in *Produce and Floral Retailing* magazine; and "Ethnic perishables bring Denver Hispanics to TJs," in the *Supermarket News* newspaper.

USDA, Purdue University, and the CES (at West Lafayette, IN 47907) have a publication (HO-194) available at no charge: *Guide to Production Information for Commercial Vegetable Growers.* It is aimed mainly at readers in Indiana and the Midwest, and it lists publications of wider use, such as *The Basics of Trickle Irrigation,* from the University of Illinois.

Purdue also has published the 70-page *Indiana Vegetable Production Guide for Commercial Growers.* Numbered ID-56, it is available from the Publications Mailing Room, 301 South Second Street, Lafayette, IN 47905-1092, at $4. It summarizes recommended varieties of common vegetables, seeding rates, fertilizer rates, insect and disease control measures, and safe use of agricultural chemicals. The guide, updated every 2 years, has supplements alternate years.

The Purdue list names several vegetable books issued by private publishers and the 1977 USDA publication, *Growing Your Own Vegetables,* Ag. Info. Bulletin No. 409. No longer available from the government, this 244-page "how to" book may be found in some libraries. Because of its age, readers will want to update its pesticide information through their Extension agents.

Purdue's list also notes many periodicals on vegetables. While many emphasize the chemical control of pests, some are oriented toward organic methods—using biological instead of chemical approaches to control pests.

Another useful USDA publication, *Growing Vegetables in the Home Garden,* 49 pages, is available from the Superintendent of Documents, Government Printing Office (GPO), for $2.25. Ask for HG 202, Stock No. SN 001-000-004454-1. USDA's 1977 Agricultural Yearbook was the 392-page *Gardening for Food and Fun,* available from GPO for $12. Its Stock No. is SN 001-000-036789-3.

USDA's National Agricultural Library (NAL, Room 111, Beltsville, MD 20705) also has a bibliography listing publications on vegetable gardening and another on marketing of horticultural crops.

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Prepared by George B. Holcomb of the Office of Information, U.S. Department of Agriculture, for USDA's Office for Small-Scale Agriculture (Howard W. "Bud" Kerr, Jr., Program Director). The address is: Office for Small-Scale Agriculture, Cooperative State Research Service/Office of Grants and Program Systems, Room 635, Hamilton Building, Washington, DC 20250.

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United States Department of Agriculture

Cooperative State Research Service

Office for Small-Scale Agriculture

A Small-Scale Agriculture Alternative

Strawberries

Nearly everyone loves home-grown strawberries and many people will go out of their way to buy or pick fresh berries—often the first "taste of spring." Strawberries are the most widely grown small fruit in most States. The leading States in commercial production are California, Oregon, and Florida. However, strawberries can be grown in many soil types almost any place in the United States.

A strawberry crop can fit nicely into small-scale operations. The average farm in most States grows less than 10 acres. The strawberry harvest begins in spring or early summer and generates income when few other crops are available. Local marketing by pick-your-own (PYO) customers, at farmers' markets, or ready-pick sales to nearby stores is feasible for small farms. The income from strawberries can supplement farm income from other, primary sources.

Strawberry growing is labor and management intensive. Although much work can be performed by hand, growers soon learn that specialized equipment and crop knowledge go a long way toward ensuring success. Growing strawberries on any scale requires a significant investment in money and time. Knowledge about strawberry crop pests and proper timing is essential. Because weeds are often a pitfall, beginners must know about herbicides and weed control.

A job well done can gross $4,000 or more per acre. Strawberries can net $2,000 or more per acre with the right marketing, management, and growing conditions.

Planting Considerations

Strawberry plants are shallow rooted, low growing, and very sensitive to environmental conditions. Poor field and soil conditions cannot be overcome after the crop is planted. Select sites with enough slope to provide adequate air and water drainage, above lower land into which the cold air can drain, and well away from wooded areas and other frost pockets. Such a site allows for good air drainage. Cold air, which is heavier than warm air, drifts down to lower elevations, thus increasing chances of frost damage during blossoming. The soil must also be well drained; strawberries will not survive "wet feet."

Irrigation is necessary for commercial production—at planting time, for frost protection of blossoms, at renovation, and in dry spells during the growing season or at harvest.

The preparation of strawberry fields should begin at least a year before planting. Fields previously in sod should be cultivated for 2 or more years. Starting then allows for soil testing and amending, as well as for eliminating perennial weeds. In addition, pre-planting preparation provides time to grow a cultivated crop for improved insect and weed control, or to grow one or two green manure crops for increased organic matter, nutrient availability, and improved soil texture. Green manure crops can smother out weeds and, when plowed under, augment their destruction. All efforts should be directed toward reducing weeds: Weeds should not be permitted to produce seeds during this time.

Strawberries should not be planted after eggplant, peppers, potatoes, or tomatoes because of common susceptibility to the Verticillium wilt fungus, which can infect and damage strawberries. Strawberries should not be planted in fields treated with high rates of herbicides (such as atrazine) that could carry over to injure strawberry roots.

The success of a strawberry planting, in large part, depends on the health and vigor of planting stock. A new planting should not be started with plants from an old strawberry bed because almost all established plantings are disease infested. In the long run it is far better and cheaper to obtain virus-free plants from a dependable nursery than to risk using plants of doubtful value.

Choose the Best Varieties

Strawberry growers should plant the varieties best suited to their growing sites, cultural methods, and eventual markets. Even the best cultural practices cannot overcome the handicap imposed by poor varieties. Risks involved in variety selection can be spread out by planting three or four different varieties. Such planting enables a grower to lengthen the harvest season and give customers a choice of fruit qualities. Since most fields are harvested for only 3 or 4 years, changing varieties to meet future demands is relatively easy. Names of the varieties recommended for commercial and trial plantings are available from your local universities and extension service.

The Junebearer is the most widely grown type of strawberry outside of California and Florida. One or more of these varieties will likely grow well in most areas. The plants are set in early spring to form matted rows, the flower buds are initiated in the fall, and the crop is harvested the following spring. The field will be renovated after harvest and picked again for 2 to 4 years or longer.

Leading varieties include Totem, Benton, Shuksan, Redcoat, Glooscap, Earliglow, Redchief, Honeoye, Cardinal, Kent, Bounty, and Allstar.

Everbearers, widely grown but rarely commercially, tend to cycle up and down in crop production, and yields during summer and fall seldom approach those of Junebearers in berry size, amount, or quality. Most everbearers have limited potential other than for home use. Examples of varieties are Ozark Beauty, Quinalt, Ft. Laramie, and OurOwn.

New Types of Strawberries

New dayneutral and short-day strawberry varieties produce both flowers and fruit at the same time during most of the growing season. Production exhibits some "peaks and valleys," depending on the climate where grown. The berries produced during midsummer heat in the Midwest lack some desirable characteristics needed for commercial harvest. They need optimum management in weed and runner control, water and nutritional maintenance, and harvesting. Given ideal conditions, these varieties do offer the potential for expanding the marketing season in many locations, especially where nights are relatively cool. Among leading varieties are Douglas, Chandler, Pajaro, Selva, and Irvine, grown primarily in California and Florida. Tribute and Tristar are new disease-resistant varieties well adapted to other areas.

New Production Systems

Research on growing dayneutral and other varieties under highly intensive cultural systems has been on-going in recent years in New York, North Carolina, and Iowa. These systems utilize techniques (fumigation, plastic mulch, trickle irrigation, hill planting) similar to those practiced in California and Florida. Costs and potential returns, as well as risks, are much higher than for conventional production. Reports on costs, yield potential, and cultural techniques are available from (1) "Dayneutral Strawberry Production Guide," Information Bulletin 215, for $2.30 (including postage), from Distribution Center, 7 Research Park, Cornell University, Ithaca, NY 14850; (2) Dr. E.B. Poling, Annual Hill System Strawberry Research, Department of Horticultural Science, North Carolina State University, Raleigh, NC 27695-7609; or (3) Dr. Gail Nonneke, Department of Horticulture, Iowa State University, Ames, IA 50011.

Marketing the Crop

The principal market for strawberries is formed by consumers in local communities surrounding the producing farm. A high percentage of all strawberries grown in the Midwest and Northeast are harvested "pick-your-own" (PYO). The PYO market is competitive and in some areas saturated. The trend, now, is toward more ready-picked berries, and growers find more sales when they have workers for picking.

Word-of-mouth is the primary method by which local consumers learn about PYO strawberries. Thus, marketing begins with choosing the best cultivars, growing top quality berries, and having clean, weed-free fields and courteous, friendly personnel on hand to supervise PYO customers.

The strawberry crop is usually sold within 30 days, depending upon weather and varieties. Weekends are usually the biggest picking days. Coordinating sales advertising and promotion with peak harvest is a challenge even for experienced growers.

PYO growers must be market oriented. They must plan far ahead, seek alternative market possibilities, train help, make a suitable farm logo, and develop an advertising program, as well as make contingency plans in case of rain, cold or hot weather, or increasing PYO competition and California berries in local supermarkets. California berries have improved in recent years, making it difficult to attract city customers to PYO farms.

Before starting a PYO strawberry enterprise, each farm should study its potential trade area. What is the market opportunity and where are advertising media? There must be a large customer base within 20 miles of the farm. A farm with 10 acres of strawberries requires a nearby population of about 30,000, with no other competition, to provide a suitable PYO market. Information on how to determine a PYO-customer trade area is available from the Department of Horticulture, University of Illinois, 1005 Plant Sciences Lab, 1201 South Dorner, Urbana, IL 61801. Ask for Fact Sheet HM-6.

PYO strawberries are usually sold by weight in pounds and/or ounces, in single-quart or 4-quart baskets. The scales are usually inspected by the Weights and Measures Division of a State department of agriculture or commerce.

A business that markets directly to the consumer, either by PYO or ready-pick, does not develop completely in a single season. The farm image—neatness, cleanliness, the logo, signs, personnel, quality of fruit, printed material, and access roads—is extremely important. City customers especially enjoy the farm outing and recreational aspects. However, they may be critical of muddy or dusty roads, inadequate parking, poor sign directions, weedy fields, or rude personnel.

Since accidents may occur when crowds come to the farm, the grower must be sure to obtain adequate insurance coverage. The normal farm insurance policy most likely will not cover accident liability or even the buildings used in the business.

Many PYO strawberry enterprises are successful because the entire family works in the operation. Often, one spouse hires, trains, and supervises the help, handles the money and keeps records, helps in planning the advertising, and meets customers on a daily basis, while the other spouse and other members of the family are involved in field operations. By meeting or exceeding customer expectations, the local marketing of strawberries can be a successful enterprise.

For More Information

State universities and county Cooperative Extension personnel can often provide helpful tips geared to local production methods and marketing information. For example, the University of Illinois conducts an annual "Strawberry School" and publishes a Proceedings, which also includes other small fruits. For information, write to Dr. J.W. Courter, University of Illinois, Dixon Springs Agricultural Center, Simpson, IL 62985. Similar extension schools are held in Wisconsin, Ohio, North Carolina, Michigan, New York, Pennsylvania, Missouri, and New England States.

At the national level, the North American Strawberry Growers Association (NASGA) offers newsletters, annual conventions, proceedings, research reports in their journal, "Advances in Strawberry Production," marketing information, and legislative support, and also makes financial contributions to research projects. The benefits from joining NASGA are invaluable for the professional grower. Contact Dr. Richard and Shirley Funt, Executive Secretaries, NASGA, P.O. Box 20268, Columbus, OH 43220.

Other Information Sources

For cost information and availability on one or more of the following useful publications, potential growers should write to the address given:

- *Compendium of Strawberry Diseases,* 138 pp, color. The American Phytopathological Society, 3340 Pilot Knob Road, St. Paul, MN 55121.
- *Strawberry Deformities*, 13 pp, color, Bulletin 683. University of Vermont, Agricultural Experiment Station, Burlington, VT 05401.
- *Strawberry Deficiency Symptoms: A Visual and Plant Analysis Guide to Fertilization,* 60 pp, color, Publication No. 4098. University of California, ANR Publications, 6701 San Pablo Avenue, Oakland CA 94608-1239.
- *Insect Pests of Strawberries in Ohio,* 19 pp, color, Extension Bul. 667. Ohio State University, Ohio Cooperative Extension Service, Kottman Hall, Coffey Road, Columbus,OH 43210.
- *Ohio Strawberry Manual*, 43 pp, color. Ohio State University, Ohio Cooperative Extension Service, Kottman Hall, Coffey Road, Columbus, OH 43210.
- *Fruit and Vegetable Clip Art for Direct Marketers,* Series 52. University of Illinois, Department of Horticulture, Dixon Springs Agricultural Center, Simpson, IL 62985.
- *The Strawberry Enterprise*, 5 pp, FR-10. University of Illinois, Department of Horticulture, 1005 Plant Sciences Lab, 1201 South Dorner Drive, Urbana, IL 61801.
- *Small Fruit Crop Management,* 608 pp. Prentice Hall. Mail Order Billing Department, 200 Old Tappan Road, Old Tappan, NJ 07657.

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A Small-Scale Agriculture Alternative

Wildflowers

The wildflower business may bloom as never before in coming years. Federal legislation adopted in September 1987 requires that 25 cents of every $100 in Federal highway landscaping funds be used to plant wildflowers. With few exceptions wildflowers are now part of any landscaping project on the Federal-aid highway system. Most States already have some sort of native plant growth program involving highways, following the lead of Texas, which began its highway beautification with wildflowers in 1927.

A resurgence of interest in the landscaping of the last century, with its emphasis on native plants, also is noted by Dr. E. "Pat" Carpenter, professor of plant science at the University of Connecticut. Houseowners who want to get the most yard beauty from the least work, he says, are turning to "naturalistic landscaping."

Reduced maintenance costs also are part of the benefits from wildflowers along roads. Many native plants are highly resistant to drought. Texas reported saving millions of dollars by substituting flowers for roadside weeds.

Texas activities helped inspire the National Council of State Garden Clubs, which launched its Operation Wildflower project in 1973. Under Mrs. La Verne R. Collard of Massachusetts, it has a national newsletter (*The Columbine,* P.O. Box 860, Pocasset, MA 02559) and encourages work with the U.S. Department of Transportation's Federal Highway Commission and State highway agencies to promote road plantings.

Such projects may not only open up new markets for producers of wildflower seed but also stimulate greater demand for wildflower plants around homes.

Wildflower Families

"Wildflowers" is the nickname for herbaceous flowering plants native to an area. They come in many shapes, sizes, and colors and grow everywhere.

Most are annuals, but many are biennials or perennials. Those along highways are usually perennials from the meadows, but they also are found in alpine, aquatic, bog, and timber settings.

Major wildflower families include legume (including the bluebonnet, State flower of Texas, and the locoweed), rose, violet, heath (such as crimson snowplant), phlox, snapdragon, mint, sunflower, lilly, arum (including the Jack-in-the-pulpit and the skunk cabbage), and orchid—including the lady's slipper. Others not commonly thought of as wildflowers are cat-tails, poppies, capers, mustards, geraniums, callas, amaranths, cacti, and even Spanish moss.

Although wildflowers grow in all States, most are extremely sensitive as to the locale in which they can be grown. Wild plants have adapted by nature to environmental factors such as climate, rainfall, altitude, exposure to sun or shade, and the predominant soil's pH (balance of acidity to alkalinity). Any attempt to reestablish wildflowers must begin by recognizing those field factors. Relatively few natives are like the perennial columbines (*Aquilegia canadensis,* etc.) of the buttercup family that thrive from border to border. Therefore, before anything else, potential entrepreneurs need to learn which flowers are native to their areas.

Some species of wildflowers have even become extinct. Conservationists actively campaign against wild collection except at a commercialized site where bulldozers already are wiping out plants. They urge consumers to buy plants or seeds from growers.

Propagation

Some wildflowers are propagated best from seeds, although seeds sometimes must be frozen to get them started. Other ways of starting flowers are from divisions, or stem or root cuttings. Some can be started from bulbs, corns, rhizomes, stolons, or tubers.

But many plants are difficult to propagate, says Dr. Henry M. Cathey, director of the National Arboretum of the Agricultural Research Service (ARS), U.S. Department of Agriculture (in Washington, DC 20002). Wildflowers brought into landscaping are in "strange" territory that works against their reproduction, Cathey says. Also, the nursery industry needs tough plants that survive transplanting, shipping, and other environmental changes. At the same time, the industry needs plants that can be produced on a commercial scale.

Although out of print at USDA, Cathey's ARS booklet, *Growing Flowering Perennials,* Home and Garden Bulletin No. 114, may be of interest to wildflower growers. Some libraries still have it.

Other publications about growing wildflowers are:

1. *Wild Flowers of the United States* by Harold William Rickett (multivolumed encyclopedia with colorful photographs).
2. *Growing and Propagating Wild Flowers* by Harry Phillips (University of North Carolina Press, P.O. Box 2288, Chapel Hill, NC 27514, $16.45 pamphlet, $26.45 hard cover).
3. *American Nurseryman Magazine.*
4. *Directory to Resources on Wildflowers' Propagation.* (National Council of State Garden Clubs, 4401 Magnolia Ave., St. Louis, MO 63110.)

A source of bibliographic information on wildflowers is USDA's National Agricultural Library, 10301 Baltimore Blvd., Room 111, Beltsville, MD 20705.

An information source on nursery industry research involving native plants is Dr. Richard E. Bir, Extension horticulture specialist at North Carolina State University. His address is Mountain Horticultural Crops Research Station, 2016 Fanning Bridge Road, Fletcher, NC 28732-9628.

Research Center

The National Wildflower Research Center (NWRC) in Texas is the heart of research and information about U.S. wildflowers. This nonprofit organization, financed entirely by contributions, has a membership of more than 8,000. It publishes a quarterly newsletter, *Wildflowers,* for members. NWRC's address is 2600 FM 973 North, Austin, TX 78725.

"There is a phenomenal public interest in wildflowers for ecological, esthetic, and economic reasons," according to Dr. David Northington, executive director. The Center receives thousands of inquiries annually, from every State.

Members for $25 a year receive the newsletter, priority mail handling, and free fact sheets. Nonmembers wishing information should include a legal-sized envelope with 56 cents' postage.

The Center has cooperative projects with several facilities, such as

Farmingdale University and Clark Garden in New York, Atlanta Botanic Gardens and Callaway Gardens in Georgia, Denver Botanic Gardens in Colorado, and the University of North Dakota.

Specialists at NWRC and some State Universities are always looking for easier ways to grow wildflowers. Some county Cooperative Extension Service (CES) agents have information.

USDA Assistance

A Plant Materials Program, which includes other conservation plants besides wildflowers, is conducted by the U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS).

This program is handled through 25 plant materials centers in 22 States. Wildflowers are among the cultivars (cultivated varieties) that the program has developed to improve erosion control on cropland, along highways and shorelines, and at minespoils. The program also aims to boost forage yields and the protein diets of grazing livestock.

The SCS program includes help to wildflower seed growers. Much labor is involved in harvesting and packaging seed. And there is a scarcity of equipment. However, in Oregon and Washington, some commercial seed growers use grain harvesting equipment adapted to gathering seed.

Any local SCS county office can handle inquiries. Experts there will have advice and can speed getting seed from a plant materials center.

SCS's publication, *Improved Plant Materials Cooperatively Released by SCS Through December 1986,* lists many useful conservation cultivars of plants, including wildflowers. Also known as forbs (herbaceous plants other than grasses that are common in meadows), all may be grown from field-planted seed. With their cultivar name inside quotation marks, they include:

'Golden Jubilee,' a black-eyed Susan (*Rudbeckia hirta*);

'Sabine,' an Illinois bundleflower (*Desmanthus illinoensis*);

'Eldorado,' an Engelmann daisy (*Engelmannia pinnatifida*);

'Midas,' a rough oxeye (*Heliopsis helianthoides*);

'Eureka,' a thickspike gayfeather (*Liatris pycnostachya*);

'Appar,' a Lewis flax (*Linum lewisii*);

'Bandera,' a Rocky Mountain penstemon (*Penstemon strictus*);

'Kaneb,' a purple prairieclover (*Petalostemon purpureum*);

'Sunglow,' a grayhead prairie-coneflower (*Ratibida pinnata*);

'Nekan,' a pitcher sage (*Salvia azurea va. grandiflora*);

'Aztec,' of the Maximilian sunflower (*Helianthus maximiliani*); and

'Prairie Gold,' of the same species.

The SCS publication notes States in which each plant grows best and which plant materials centers grow them for seed. The booklet is available at no charge from W. Curtis Sharp, SCS national plant materials specialist, P.O. Box 2890, Washington, DC 20013. He also has a list of the centers, which may be visited.

Accessing Markets

A 17-page report, "Accessing the Market," is available from Pat Carpenter at the Department of Plant Sciences, University of Connecticut, Storrs, CT 06268. Carpenter discusses groups of plant buyers and how to reach them through paid or free promotions. He also lists 20 State native plant associations and the regional New England Wild Flower Society, Inc., Garden in the Woods, 180 Hemenway Road, Framingham, MA 01701.

Gardeners are one potential market. Garden clubs often have garden sales at meetings. Don Shadow, owner of Shadow Nursery, Inc. (Route 1, Box 37-A, Winchester, TE 37398), suggests growers also hunt for local markets at

(1) retail garden centers,

(2) organizations with botanic gardens, and

(3) larger established nurseries, which may use additional plants.

Other markets might include landscapers and interiorscapers or interior decorators for civic or other public areas, colleges, other institutions, and private apartments.

Another way to reach consumers is by displaying potted perennials at grocery stores or florist shops or from a temporary greenhouse in a shopping center parking lot or along a highway with ample parking space.

For seed sales, growers may wish to contact groups of wildlife and bird conservationists, some of whose members may have farmland lying fallow much of the year. They welcome ideas about wildflowers bearing seeds or fruit that stays on branches up above the usual snowfall. They might be reached through want ads in professional magazines.

Marketing Cautions

When selling seeds, conscientious marketers should label seed packets carefully. Garden club groups point out that some seed mixes are not labeled accurately and may contain unmentioned noxious weeds, such as loosestrife. They urge purchase only of carefully controlled seed mixes that contain high percentages of indigenous species. An entrepreneur should buy seeds only for one species at a time.

Also, shippers must be aware of State and Federal plant quarantine laws designed to prevent movement of diseases or other pests across State lines. Growers should seek information either from their State plant regulatory official at the State Department of Agriculture or officials with USDA's Animal and Plant Health Inspection Service (APHIS, Plant Protection and Quarantine, Regulatory Services Staff, Federal Building, Hyattsville, MD 20782).

When entrepreneurs are making plans, they might want to note that net income may be about a fifth of gross sales. Without a high gross, an entrepreneur should not expect to make more than a supplemental income even with skilled, hard work and a coldframe or two, according to Dr. Sam Jones, professor of botany at the University of Georgia, Athens.

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A Small-Scale Agriculture Alternative

Shiitake Mushrooms

Shiitake (pronounced "shee-tah-kay" and spelled the same whether singular or plural) are said to be the favorite mushroom in Japan. Worldwide production is second only to the common white button mushroom found in most grocery stores in the United States. Besides Japan, other large producers include China, Taiwan and Korea.

Since 1972, when the U. S. Department of Agriculture (USDA) first allowed shiitake spawn into the United States, production here has grown steadily. During the 1991-92 season, USDA's National Agricultural Statistics Service (NASS) estimated that over 2.7 million pounds of shiitake were grown in the United States. This compares to an estimated 738.8 million pounds of the common button mushroom. The current NASS statistics (published each August) can be purchased from ERS-NASS, P.O. Box 1608, Rockville, MD 20849-1608 for $6.

Jerry Larson, the International Trade Manager for the Oregon Department of Agriculture (121 SW Salmon St., Suite 240, Portland, OR 97204-2987) believes that the market potential for U.S.-grown shiitake has hardly been touched. He reports that the United States imports 14,000 metric tons of dried shiitake from Japan, Taiwan and Korea each year. If these were fresh mushrooms, this would amount to 126,000 metric tons (nearly 100 times the current U.S. fresh production level).

Growing Shiitake

Shiitake can be grown either on natural logs or on artificial logs made of a special combination of oak sawdust, bran, millet and other additives. Most small-scale farmers will want to start with natural logs because they require less environmental control. Further information on sawdust culture can be obtained from Professor Dan J. Royse, at Pennsylvania State University (211 Buckout Laboratory, Penn State University, University Park, PA 16802).

There are five basic steps in cultivating shiitake on logs:

•**Ordering good-quality culture, which is called spawn or inoculum, so that it will be on hand when needed.** The mushroom that will grow from the log is the fruiting body of the whole fungus. Most of the fungus is a mat of white strands (mycelia) that grow through the log to collect the nutrients necessary for fruiting. The spawn that you will purchase is nothing more than a pure strain of living mycelia, growing either in sawdust or in hardwood dowels. Contact your county extension agent for help in locating a spawn supplier near you.

•**Obtaining suitable hardwood logs.** Usually oak, maple, beech, ironwood, chestnut, or alder are used. The logs are cut green during the winter when the sap is down and are cut to 3- or 4-foot lengths for easy handling. Diameters from 2 to 6 inches seem to work well. Be careful to avoid damaging the bark. Torn bark can allow other organisms to enter the log and compete with the shiitake for nutrients.

•**Inoculating the logs.** Inoculate the logs with the spawn between 1 and 3 weeks after cutting to ensure optimal moisture content. Inoculate the log by drilling holes partway into the log. Then carefully pack these holes with the spawn and seal them with wax to retain moisture and keep out competing organisms.

•**Allowing shiitake to colonize the wood.** Once the mushroom has been introduced to the log via inoculation, it takes 4-9 months, depending upon climate, for the mycelia to spread throughout the log. During this "spawn run" period the logs are stacked and shaded to avoid moisture loss.

•**Inducing fruiting.** To induce fruiting the logs are soaked then shaded to keep the moisture level up until fruiting begins. Yields are quite variable. In some cases the spawn will not run through the log and no mushrooms will be produced. The highest yields are only attainable when all conditions are near ideal. The logs can be refruited several times without additional inoculation and can produce mushrooms for several years, depending upon how often they are fruited.

There are several additional steps that must be pursued by an entrepreneur to bring the shiitake crop to the market and ultimate sale. Crop harvesting, packaging, storing, transporting, and marketing are some of the vital and important steps that are necessary. However, there are a host of different procedures practiced because factors such as the grower's location, time limitations, financial considerations, etc. necessarily dictate the technique pursued.

Information Sources

Several books are available that can provide additional details on growing shiitake. Among them are:

- *Growing Shiitake Commercially*, by Bob Harris
- *The Mushroom Cultivator*, by Paul Stamets and J.S. Chilton
- *Growing Shiitake Mushrooms in a Continental Climate*, by M.E. Kozak and J. Krawcyzk
- *Shiitake Grower's Handbook: The Art and Science of Mushroom Cultivation*, by Paul Przybylowicz and John Donoghue

A 13 ¼ minute video on "Growing Shiitake Mushrooms" is available for $10 from the Cooperative Extension Programs of Georgia's Fort Valley State College and North Carolina A&T State University. It is part of a video library they produced on money-making ideas for small-scale farmers. (Checks should be payable to NC A&T University CEP and sent to Director, Extension/Research Communications, NC A&T University, P.O. Box 21928, Greensboro, NC 27420.)

Economics

The costs of producing the mushrooms vary considerably. Major items to consider are the cost of the wood, the cost of the spawn, and the cost of labor. Typically, labor will be the largest consideration.

Returns are also quite variable and depend heavily upon your growing climate. The Forest Resource Center reported results of field trials in the March 1992 edition of its newsletter, Shiitake News. Depending upon the species of log and the strain of shiitake used, it reports yields of 0.4% to 12.6% of the green weight of the logs. With a cord of oak which weighs 2,200-pounds and contains 300 logs and an average yield of 7%, one could expect to grow 154 pounds of shiitake over 3 growing seasons. At $4 per pound, this cord would gross $616 over 3 years. These are conservative estimates based upon the Minnesota experience. Higher yields, on the order of 20% of the weight of the logs, can be produced in warmer, more humid climates and with the proper choice of logs and spawn.

Production Scales

Kenneth F. Konsis of the Vermilion County Conservation District in Westville, IL, reported to the 1990 Illinois Specialty Growers Convention that for large profits a 3,000 log operation is needed. However, he also recommends starting in the 100-to 500-log range and adding more as desired. This advice is echoed by Ron Snyder, Coordinator for the Geode Resource Conservation and Development (RC&D) office in southeast Iowa.

NASS does not attempt to track production from growers with fewer than 200 logs. The agency reported 458,000 logs under production and 172 growers in the United States during the 1991-92 season. The average grower is thus using around 2,700 logs.

Market Prices

Wholesale market prices for fresh shiitake vary seasonally and according to the market serviced. During the fall and spring when most outdoor growers are picking their mushrooms, prices tend to be lower (say $4 per pound). In the winter and summer, prices tend to be higher (as high as $7.50 per pound) since only those with climate-controlled growing facilities will be producing the mushrooms.

The 1991-92 NASS report mentioned above showed the average price nationwide for shiitake at $4.11 per pound.

Jim Gwynn of the USDA's Agricultural Marketing Service's Fruit and Vegetable Division (Market News Branch, Room 2503-S, P.O. Box 96456, Washington, DC 20090-6456) reports that AMS has employees in most major markets obtaining market prices daily. Daily reports can be obtained by subscription at $15 per month per market city. Weekly reports are $8 per month. Markets currently reporting shiitake sales include San Francisco, New York, Chicago, Atlanta, Boston, and Los Angeles. The lack of reports from other markets indicates potential opportunities for growers in those areas.

Pluses for Small-Scale Farmers

Kenneth F. Konsis, in the report mentioned above, states that shiitake growing might fit well with other goals of small-scale farmers. He suggests thinnings from commercial woodlots can be used for shiitake logs. He also notes that in many cases trees can be cut at the 6- to 8-foot height and will resprout at that height without damage by animals. The trees can then be used as living fence posts and provide a continuous supply of shiitake logs.

The Forest Products Lab of the USDA Forest Service (One Gifford Pinchot Drive, Madison, WI 53705-2398) has a shiitake factsheet in its free *Techline-Microbial and Biochemical Technology* series. FPL suggests that smaller diameter hardwood trees and limbs and tops of larger trees are one of the most underutilized forest materials currently available and that shiitake growing is a viable use of those materials. The factsheet notes that shiitake cultivation is expected to be an excellent growth industry over the next several years.

Marketing Points

Shiitake have some strong selling points. Fresh, the caps, 2 to 5 inches in diameter, have a chewy texture and a full-bodied aromatic flavor. They are low in calories (125 per fresh pound) and low in fat.

Reports indicate that tree-grown mushrooms, like shiitake, have about twice the fiber content of the common white button mushroom (*agaricus bisporus*). The particular type of fiber found in these mushrooms feeds the beneficial bacteria in the colon and enhances colon health.

According to Dr. Shu-Ting Chang, Professor of Biology, Chinese University of Hong Kong, and Dr. Phillip G. Miles, Professor of Biology at the State University of New York in Buffalo (in their 1990 book *Edible Mushrooms and Their Cultivation)*, shiitake contain all of the 9 essential amino acids of protein required in the human diet.

More Information

The American Mushroom Institute (907 East Baltimore Pike, Kennett Square, PA 19348) publishes *Mushroom News* and *Mushroom News Flash* for their members on a monthly basis. Associate memberships are $300 per year and grower memberships start at $350 per year.

Successful Farming Magazine has published two articles on shiitake in its ADAPT series. One describes the initial experience of the Geode RC&D's shiitake project. The second shares the experience of a Virginia shiitake farm. Copies of these articles can be obtained from Betsy Freese at Successful Farming (ADAPT), 1716 Locust Street, Des Moines, IA 50309-3023.

Shiitake News is published three times a year by the nonprofit Forest Resource Center at Rt. 2, Box 156A, Lanesboro, MN 55949. The 16-page newsletter costs $25 for an initial subscription, which also includes three back issues. Renewals are $15 per year.

The Mushroom Growers' Newsletter (P.O. Box 5065, Klamath Falls, OR 97601) is published monthly and includes production and marketing information (including prices) on other cultivated mushrooms as well as shiitake in its 6 pages. The current issue is $3.50, back issues are $3 each and subscriptions are $24 per year.

By Jerry Haugen, P.O. Box 5065, Klamath Falls, OR 97601 and George B. Holcomb of the Office of Public Affairs, U.S. Department of Agriculture, for USDA's Office for Small-Scale Agriculture (OSSA), Howard W. "Bud" Kerr, Jr., Program Director. OSSA's address: Ag Box 2244, Washington, DC 20250-2244. Telephone: 202-401-1805; Fax: 202-401-1804.

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Mushrooms

Shiitake (pronounced "shee-tah-kee" and spelled the same whether singular or plural) are said to be the favorite mushroom in Japan. As many as 200,000 Japanese cultivate these forest fungi as a seasonal cash crop from logs of the shii tree, closely related to the oak. Other Asian countries are following suit; the brownish shiitake are also called black Chinese or black forest mushrooms and are grown in increasing amounts in Taiwan, China, and Korea.

The number of U.S. shiitake farmers is rising, though most of them operate on a small scale. Still, some U.S. growers already use more than 10,000 3- or 4-foot-long hardwood logs (2 to 8 inches in diameter) to produce shiitake. Some even plan to expand to more than 100,000 logs—the size of some growers in Japan.

U.S. shiitake production soared from nearly zero in 1980 to a possible 3 million pounds in 1987. Leading States in production are Pennsylvania, California, Michigan, and Minnesota.

Shiitake could mean new jobs for at least 20,000 U.S. farmers, according to Dr. Gary F. Leatham, a U.S. Department of Agriculture (USDA) research chemist with the Forest Service in Wisconsin. But that idea depends on an annual consumption rate in this country of a pound per person. In comparison, our current annual average per capita consumption of ordinary white (*Agaricus bisporus, A. bitorquis,* or *A. brunnescens*) mushrooms is about 2-½ pounds. However, that's an increase of a pound in only 8 years. U.S. production of all mushrooms increased to about 615.4 million pounds in 1986-87.

The prospective producer must decide in connection with any product how much the market can handle and what prices will be competitive. If the demand can be generated, domestic producers can compete with foreign producers in local markets, according to Dr. Michael P. Levi, Extension specialist at North Carolina State University (Department of Forest Resources, Raleigh, NC 27650). Few if any fresh shiitake are being imported.

As with any product that has a small-market niche, care must be taken not to produce more than the market can absorb at a profitable price.

Andy Hankins, alternative agriculture specialist at Virginia State University (Petersburg, VA 23803), suggests a small-scale entrepreneur start off with 1,000 log chunks, 3 to 4 feet long and 2 to 6 inches in diameter, as a winter project. If all goes well, he said, 1,000 logs can produce 1,000 pounds of shiitake over a year's time. That could bring about $5,000 at a market. He estimates Virginia alone has about 180 small-scale growers using 500 to 5,000 producing logs apiece. One grower has approximately half a million logs.

Regional prospects for using forests to produce shiitake were discussed in a 1985 paper, "An Evaluation of the Potential for Shiitake (*Lentinus edodes*) Mushroom Cultivation in Appalachia," by Dr. James P. San Antonio, an Agricultural Research Servicer (ARS) scientist at the Agricultural Research Center, U.S. Department of Agriculture (USDA), Beltsville, MD, and Dr. Fred B. Abeles, a scientist with West Virginia University and the ARS Appalachian Fruit Research Station at Kearneysville, WV. Appalachia has an abundance of underutilized second-growth hardwoods, they noted, with climate and topography conducive to shiitake cultivation.

But before beginning shiitake production, a prospective entrepreneur needs to check many information sources, such as the Economics and Marketing Reference Branch of USDA's National Agricultural Library (NAL). NAL's Jerry Rafats, himself a shiitake grower, has developed a bibliography of information listing 65 sources which NAL will mail on request (from Beltsville, MD 20705). Also, prospective entrepreneurs may contact county Extension agents to learn whether their State universities have mushroom specialists. Hankins urges potential growers to consider joining a marketing cooperative.

Shiitake Selling Points

Shiitake have some strong selling points. Fresh, the caps, 2 to 5 inches in diameter, have a chewy texture and a full-bodied aromatic flavor. They are low in calories (125 per fresh pound) and low in fat. Possibly because they grow on wood, shiitake have more fiber than the commonly marketed white button mushroom, according to Dr. Bela Szepesi, a USDA research chemist with the ARS Human Nutrition Research Center in Beltsville. Unlike fruits, mushrooms do not have "small" carbohydrates, such as sucrose, he notes. They can be a source of B vitamins and minerals. Drying with sunshine or ultraviolet light increases their vitamin D content but they usually are eaten fresh. Protein content is in the range of typical vegetables, mycologists indicate.

Drying Advantage

Drying gives shiitake a shelf life of years when stored in sealed containers at room temperature. Most domestic growers prefer to market them fresh.

Fresh shiitake have a shelf life of 12 days, compared with about 8 days for the common whites, and they are more resistant to bruising and spoilage. They may be refrigerated up to 14 days. They should not be washed or peeled to market them. (Their umbrella tops can be cleaned with a soft cloth or paper towel.)

Some U.S. producers market by mail order, but most sell shiitake locally. Gourmet restaurants, farmers' markets, and supermarkets provide opportunities. Allen C. Bjergo, community development specialist with the Montana State University Cooperative Extension Service (1018 Burlington, Room 200, Missoula, MT 59715), has developed a booklet called "Your Marketing Plan Outline" which can provide added ideas about marketing. He also has booklets on "Financing Your Ideas" and "Earn Extra Money From Your Farm or Ranch."

Marketing Prices

Prices vary considerably. In Ohio, fresh shiitake are bringing $4 to $6.50 a pound wholesale, according to Steve Bratkovich of the Forestry Department at Ohio State University, Columbus.

Current mushroom prices and markets may be obtained regularly from USDA, through its Agricultural Marketing Service (AMS). The AMS Fruit and Vegetable Division's Market News Branch provides daily reports on major sales of mushrooms, listing prices and shipment sizes from major metropolitan areas. In early 1987, while many cities reported sales of "domestic whites," only a few reported sales of shiitake.

In San Francisco, shiitake were bringing $6.50 to $8 a pound. That

market also reported sales of "sponge" morels from Canada, at $12.50 a pound; chantrelles from Oregon, $9 a pound; angel trumpets from Idaho, $8.50 a pound; and pleurettes from Italy, $27.50 per 8-pound carton.

The scarcity of sales reports on shiitake may suggest undeveloped markets at several major cities. (Write to W.H. "Bill" Crocker, Room 2503- S, AMS, USDA, Washington, DC 20250, to obtain subscription prices and cities from which prices are reported. The cost generally is about $12 a month per city.)

Ohio Study

In 1985, Bratkovitch and Constance A. Jones of the Ohio Cooperative Extension Service, at Ohio State, in cooperation with the Ohio Department of Agriculture Cooperative Extension specialist in forestry, began testing several strains from commercial U.S. suppliers to see if shiitake could be produced economically in Ohio. They can. With certain shiitake spawn the researchers were able to get as many as 338 pounds of shiitake per cord of wood over a 20-month period. They used oak logs soaked twice and carefully stacked to maximize air circulation. This procedure is a must to prevent weed fungi contamination.

Bratkovitch (at 017 Standpipe Road, Jackson, OH 45640) can provide a report describing the Ohio Shiitake Project. His report was also published by the *Shiitake News,* which covers growing as well as marketing topics. The *Shiitake News* is produced every March, August, and November. First subscription costs $25 a year including back issues, and annual renewal is $15. Editor is Joe Deden, director of the Forest Resource Center (private, nonprofit educational organization at Route 2, Box 156 A, Lanesboro, MN 55949).

Deden estimates that a cord of wood (roughly 150 4-foot logs) can usually produce 150 pounds of shiitake a year. At $4 to $6.50 a pound, that's a gross of $600 to $975 a cord. He calculates production costs at about $500 a cord.

The 1983 book, *How to Grow Forest Mushrooms (Shiitake)*, by Daniel D. Kuo and Mau H. Kuo (Mushroom Technology Corporation, P.O. Box 2612, Naperville, IL 60565), estimates production more conservatively. Their book (originally selling for $8.95) provides details on production and harvesting methods.

Iowa Conference

Ric Zarwell, former coordinator of the Geode Wonderland Resource Conservation and Development Office (3002 A Winegard Drive, Burlington, IA 52601), provided details on shiitake in *Successful Farming* magazine's publication, *ADAPT100,* (100 ideas for farmers). This publication grew out of the magazine's 1986 Iowa conference on diversification in farming. It sells for $12.95, including postage, at P.O. Box 10652, Des Moines, IA 50336.

Costs and related data on results of a 4-year shiitake project using hardwood logs indoors and outdoors at the University of Minnesota are scheduled for release by 1988. A report on the project may be obtained from Kraig Kiger (1851 E. Highway 169, Grand Rapids, MN 55744).

Culture

There are six basic steps in cultivating shiitake:

- Ordering good-quality culture, which is called spawn or inoculum, 3 months prior to cutting logs;
- Obtaining suitable hardwood logs such as oak;
- Inoculating the logs between 1 to 3 weeks after cutting to ensure maximum moisture content;
- Allowing shiitake to colonize the wood through incubation (the spawn run);
- "Fruiting," and
- Crop harvesting, packaging, storing, transporting, and marketing.

Stable temperatures and high humidity are required. Besides logs, sawdust is available for use in some areas. Some information on sawdust culture may be obtained from Dr. Paul Wuest, mushroom Extension specialist, or Dr. Dan J. Royse, associate professor at Pennsylvania State University (211 Buckout Laboratory, Penn State University, University Park, PA 16802).

Other Information Sources

A reprint of Leatham's "Cultivation of shiitake, the Japanese forest mushroom, on logs: A potential industry for the United States," published in the *Forest Products Journal,* August 1982, as well as lists of spawn suppliers and consultants, U.S. research groups, and references, may be obtained by writing to the Forest Products Lab, P.O. Box 5130, Madison, WI 53705.

Another information source is the American Mushroom Institute (907 East Baltimore Pike, Kennett Square, PA 19348), national trade association for mushroom growers and marketers. The Institute publishes the monthly *Mushroom News* of 30 pages or more and occasionally devotes most of an issue to a major problem.

The Produce Marketing Association (1500 Casho Mill Road, Newark, DE 19714-6036) also can provide a bibliography on mushrooms to nonmembers of PMA for $20 (the search fee) plus $10 for computer-page printouts of up to 10 pages, plus $1 per page additional.

Those wishing to grow mushrooms faster and perhaps easier than shiitake may note the May-June, 1987, issue of *The Furrow,* a publication issued by Deere and Co. (John Deere Road, Moline, IL 61265.) It reports that Louisiana farmer John Meek produces oyster mushrooms in pasteurized bermudagrass bales. He harvests 5 to 6 pounds of mushrooms per bale weekly for 6 to 8 weeks, growing this species in a converted barn.

For those entrepreneurs able to produce the morel mushrooms commercially, the Neogen Corporation (620 Lesher Place, Lansing, MI 48912) has been granted a patent and will award licenses to experienced growers or companies to produce morels in recommended facilities. The research on morels was led by Dr. Gary Mills (Department of Natural Science and Agriculture and Natural Resources, Michigan State University, East Lansing, MI 48824).

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A Small-Scale Agriculture Alternative

Asparagus

Easy to plant and care for, asparagus comes back every year—with minimal labor except for harvesting. Its high value brings early income to direct marketers before harvest of other vegetables or—as a good complementary crop—strawberries.

Asparagus, native of temperate regions, succeeds best where either low temperatures or drought stops plant growth for a 'rest.' Asparagus should not be considered for commercial production where warm conditions result in the plant's growth all year.

Asparagus grows and yields best in deep, well-drained sandy loam soil. However, it tolerates heavier soils as long as the water table does not come within 4 feet of the surface. The soil should be free of perennial weeds.

Planting Techniques

Planting can be done anytime in the spring after the soil warms to 50° F. Asparagus should not be planted in cold, wet soils which can harbor *Fusarium* crown rot disease.

To open furrows, a lister plow or middle-buster throws soil in opposite directions. Only a 6-inch deep trench is needed, and no deeper. The deeper the plant, the lower the yield.

Rows should be at least 5 feet apart. This permits good air circulation and helps stop onset of foliar fungal diseases.

Asparagus is generally planted using 1-year-old crowns. A crown is a root system of a year-old plant grown from seed.

At planting, 200 lbs. of 0-20-0 or 0-46-0 fertilizer per acre goes in the furrow. The crowns are tossed atop the fertilizer. They won't burn. If not added at first, phosphorous won't reach roots later.

Crowns go 1 to 1-1/2 feet apart in a row. This takes between 5,800 and 8,700 crowns per acre. Costs run about $130 per 1,000 crowns or from $780 to $1,170 per acre. Including fertilizer and lime (if needed), soil preparation, etc., total cost should be about $1,500 per acre.

Crowns placed in the trench should have the crown buds facing up with the root system spread out as much as possible. Cover the trench with soil up to the original soil level. However, do not compact the soil over the row, or spear growth will be seriously delayed. With good soil moisture, new spears emerge in about a week.

Harvesting Techniques

Asparagus is generally harvested by snapping versus cutting. Snapping has the advantage of harvesting an "all usable" product. The spear snaps at the point where fiber starts to develop. Cutting spears below the soil with a knife adds more weight to the spear but the lower 1/3 of the spear is tough and fibrous and has to be discarded. Also, cutting below the soil injures other potential buds that will send up new spears on the crown. A new spear comes up from another bud on the crown. Snapped asparagus should command a higher price than cut asparagus.

In California and certain other States, commercial asparagus growers still cut below the soil with a knife because the fibrous butt end of the spear helps to slow water loss in the tip of the spear so it can survive several days of transit.

Asparagus spears are harvested when they reach a height of between 5 to 9 inches, with a diameter of at least 3/8 inches or larger. The first harvest year is actually the year after crown planting. Harvesting lasts 2-4 weeks, depending on how long the mature fern stays green. In subsequent years, the harvest season can be extended for 6-8 weeks.

Contact a State Extension specialist to find out how long the harvest can last. In the east, in the cool spring, asparagus grows very slowly, and a 9-inch spear can be harvested with the spear tip being tight. When temperatures rise, a 5-inch spear may have to be harvested before the tip opens up or starts to "fern out." Spears allowed to fern out must be snapped and destroyed to deny insects a site to lay eggs and to prevent the delay of new emerging spears. Stop harvesting when 3/4 of the spear's diameter reaches less than 3/8 inch.

Fiber development (toughness) of the spear is related to the tightness of the spear tip. The tighter the tip, the more tender the spear is. Spear diameter has no bearing on toughness.

Asparagus can be harvested by hand into buckets. It is tiring work. Or a person can harvest an acre of asparagus in 2 hours riding a harvest-aid—easily home-made to straddle the rows—traveling between 1/2 to 3/4 mph.

Asparagus is very perishable and must be put into an ice water bath immediately after harvest. It can then be drained and placed in plastic bags, and stored under refrigeration between 32 and 40° F for 2 weeks without an appreciable loss of quality.

However, the grower shouldn't store for more than 2 days, thus giving the consumer the longest storage time possible. Wholesale growers will pack the spears into 30 lb. pyramid wood or corrugated cardboard containers.

Marketing Techniques

Many growers sell asparagus by direct marketing (roadside market, pick-your-own, or farmer's market). Many growers who have a roadside stand located on a well-traveled road do well. Others advertise through newspapers, telling the people to come to their farm to pick it themselves or to buy it already picked.

Pick-your-own marketing involves considerable consumer education on how and when to pick.

Wholesale marketing of asparagus for the small grower is not profitable due to the added production costs. Wholesale buyers usually want the asparagus packed in a certain container, or require the asparagus to be hydro-cooled, using equipment in a packing-house that showers ice cold water on top of the packed asparagus to remove the field heat. They will buy huge quantities of asparagus (tractor-trailer loads) over a certain period of time.

Also, when growers analyze the cost of packaging, cooling, transportation, etc., the price per pound they receive is usually very low compared with the price received by those growers who retail direct to consumers.

Wholesale marketers are forced to take whatever price is offered for their product, regardless of the quality.

Another way to wholesale asparagus, besides selling to produce wholesalers, chain stores, etc., is to sell to area hospitals, nursing homes, schools, etc. A small-scale grower may be able to receive a satisfactory price, and be able to "unload" some unanticipated asparagus during heavy growth.

Another sales option is to become familiar with chefs of fine restaurants in your area. Take them some asparagus and let them try it.

Other growers practice "value added"—changing the product and selling it in a different way other than in the raw product stage. For example, getting the necessary license to preserve green or white asparagus by pickling it and packing it in glass jars enables a grower to command a premium price and will bring off-season income if sold during the winter. Mail-order can be done.

White Asparagus

White (blanched) asparagus is traditionally grown in Europe by mounding up the adjacent soil over the asparagus rows in the spring before the spears emerge to a height of 10 to 12 inches. Once the tip of the spear emerges through the mounded soil, it is cut off at the base by digging into the mound. This is very

labor intensive but the product can bring a price of about $3 to $5 per pound.

An easier way to grow white asparagus is to suspend black plastic over wire hoops, bent over and spaced 5 to 6 feet apart over the row. One side of the plastic is weighted down with soil and the other is anchored by placing 2 X 4's on the edge of the plastic. When the spears emerge, the 2 X 4's are put to one side and the edge of the plastic is lifted to snap the white spears.

The black plastic has to be at least 4 mils thick to block out the sunlight. Otherwise, the spears turn green.

Varieties

The old Mary and Martha Washington varieties are **dioecious**, meaning they produce male and female flowers on separate plants. Female plants produce seed which fall to the ground, germinate, and become an asparagus seedling weed problem. They also have to expend more energy to produce seed, so spear yield is less.

All-male hybrids have been developed by Rutgers University in New Jersey to have superior high-yielding characteristics with no seeds produced. Some of these popular all-male varieties include **Jersey Giant, Jersey Knight, Jersey Prince, and Jersey King. Jersey Centennial** is a variety consisting of 50 percent male and 50 percent female plants.

The all-male hybrids yield 3 to 4 times more than the older, open-pollinated varieties. Growers following good cultural practices should be able to expect the following yields:

- 500 lbs. per acre the first year *after* planting
- 1,000-1,500 lbs. per acre the second year
- 2,000 lbs. per acre the third year
- 3,000 lbs. per acre the fourth year
- 4,000 lbs. per acre the fifth year

Other dioecious varieties for warmer climates include hybrids developed at the University of California. These include the F1 and F2 hybrids of UC 157, Ida Lea, and Apollo. They produce a high-quality 7- to 9-inch spear when daytime temperatures are warm. Yields are still less than those of New Jersey hybrids in warm climates.

Diseases and Disorders

Spears can be damaged by frost. If a frost is predicted, go out and harvest everything above ground. Spears should be mowed off at ground level after frost, being worthless.

Fungus diseases of importance include **asparagus rust**, *Phoma sp.*, and *Fusarium* **crown and root rot. Rust** will infect asparagus by attacking the fern growth. Orange rust pustules form on the fern and cause it to die back. *Phoma* forms elliptical (football shaped) spots on the fern stalks and also causes fern dieback. Approved fungicides must be applied after harvest when ferns reach 4 feet tall and then reapplied every 14 days throughout the season until late fall. *Fusarium* attacks the roots and the crown of the plant. It is present in the soil and plants will take it up through the root system when they are under stress.

Stresses can come from improper soil Ph; low fertility; excessive harvesting; and insect, disease, and weed infestations. Failure in any of these areas can lead to asparagus decline. The soil Ph should be between 6.5 and 7.5. Add limestone if soil Ph is below 6.0.

Insects

The **cutworm** feeds at night below the soil on one side of the spear tip. Spears are then unmarketable. Cutworms can be controlled using an approved insecticide.

Asparagus beetles lay eggs on spears, making them unmarketable. During fern growth after harvest, they chew on stalks, stripping off the green material, causing fern dieback. Asparagus beetles are controlled with an approved insecticide.

European asparagus aphids feed on fern growth, injecting a toxin. This results in dead crowns the following spring. So far, infestations have been sporadic throughout the Midwest.

Weed Control

Weeds are controlled mostly by hand hoeing and cultivation since no preemergence herbicides are labeled for use in asparagus during the planting year. The better the weed control during the planting year, the more fern growth for the next year's crop.

The following spring, about 3 weeks before asparagus emerges, mow dead ferns with a mower or bush hog. Delaying fern mowing until then will keep the soil temperature about 5 degrees colder than bare soil and discourage spears from emerging in an early warm spring.

Approved, preemergence herbicides may be applied right over the shredded fern because asparagus is a no-till crop. Cultivation will bury unwanted seeds from the female plants and run the risk of damaging crowns.

Asparagus Crown Sources

Jersey Asparagus Farms, Inc., RD 5,
Box 572 Newfield, NJ 08344.
Telephone: 609-358-2548; (NJ hybrids).

Daisy Farms,
91098 60th Street, Decatur, MI 49045.
Telephone: 616-782-7131; (NJ hybrids).

Nourse Farms, Inc.,
Box 485 RFD, South Deerfield, MA 01373.
Telephone: 413-665-2658; (NJ hybrids).

Cherokee Asparagus Farms,
1112 Valley Acre Lane, Tahlequah, OK 74464.
Telephone: 918-456-1993; (F2 of UC 157).

California Asparagus Seed and Transplants,
Inc., 2815 Anza Avenue, Davis, CA 95616.
Telephone: 916-753-2437; (F2 of UC 157, Atlas, Grande, and Apollo).

This list is intended only as a reference and does not imply endorsement; there undoubtedly are other suitable sources of crowns.

Information Source

For an illustrated publication on "Asparagus Production, Management, and Marketing," send $6 to Ohio State University, Piketon Research and Extension Center, 1864 Shyville Road, Piketon, OH 45661. Telephone: 614-289-2071.

By Carl J. Cantaluppi, Research and Extension Horticulturist, The Ohio State University, Piketon Research and Extension Center; and George B. Holcomb of the Office of Communication, U.S. Department of Agriculture, for USDA's Office for Small-Scale Agriculture (OSSA); Howard W. "Bud" Kerr, Jr., Program Director. OSSA's address: Ag Box 2244, Washington, DC 20250-2244. Telephone: 202-401-1805; Fax: 202-401-1804.

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All uses of fungicides, pesticides, and herbicides must be registered by appropriate State and/or Federal agencies before they can be recommended.

CAUTION: Fungicides, pesticides, and herbicides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife if they are not handled or applied properly. Use all products selectively and carefully. Follow recommended practices for the disposal of surplus products and their containers.

February 1994

United States Department of Agriculture

Cooperative State Research Service

Office for Small-Scale Agriculture

A Small-Scale Agriculture Alternative

Woodlots

At least 6 million people own woodlot parcels averaging 40 to 50 acres in size that make up 33 percent of the Nation's 348 million acres of private timberland. Many can improve their land management. This factsheet is intended mainly for them rather than for others who may want to try to get into the business.

Many newcomers are farmers who are planting trees on more than 2 million acres under 10-year crop retirement contracts with USDA. They start woodlots under the Conservation Reserve Program (CRP), administered by the Agricultural Stabilization and Conservation Service (ASCS) with assistance from cooperating State foresters. Owners receive cost-share assistance from ASCS and technical advice from the foresters on how to establish timber stands on cropland.

There are other Federal aid programs, such as the Forestry Incentives Program jointly administered by ASCS and USDA's Forest Service, which helped 92,000 farmers with timber management on nearly 3 million acres from 1975 through 1986.

The Forest Service (FS), working through State programs, provides thousands of private landowners with assistance annually for tree planting, seeding, timber stand improvement, and other woodland activities. The FS also is helping to support "Global ReLeaf," an American Forestry Association campaign to urge U.S. residents to plant 100 million trees by 1992.

Some owners may want to improve their management so as to boost timber production. Many others, however, favor production not only of wood but of other goods and services...water, wildlife, forage, esthetics, and recreation, including cross-country skiing. Not so incidentally, they also help with fire protection by way of fire lanes they maintain.

Management Lacking

Experts in the Forest Service and State and industry forestry circles say most woodlot farmers don't fully manage their operations. Their timber growth generally reaches only 50 to 60 percent of potential.

Good timber management means getting each acre to produce the maximum annual growth of trees spaced adequately to maintain good form and quality. It also means regenerating the stand to replace harvested trees.

According to many foresters, the most immediate need in most private hardwood timber operations is for a timber stand improvement cut, according to many foresters. Some State universities and Cooperative Extension departments have published booklets on timber stand improvement.

Several States have forestry officials who, at no charge, will arrange visits by a forester who will suggest plans for improvement of immediate and long-term commercial potential of woodlands. Private commercial foresters may be called in for more detailed plans and to oversee their proper execution.

The latter often work on the basis of a percentage of sales.

Some State foresters will show owners how to spot and mark trees that should be felled rather than left growing. They can review a written contract with a logger hired to harvest trees. Too many landowners have been defrauded and had timber and woodland abused by failing to clarify arrangements.

Officials can give names of professional foresters available for hire, as can the Association of Consulting Foresters, 5410 Grosvenor Lane, Bethesda, MD 20814. (Telephone: 301/530-6795)

Another source of information or help is The American Tree Farmer, official magazine of The American Tree Farm System, which has certified 65,000 tree farmers of 91 million acres. The system is managed by the American Forest Council, 1250 Connecticut Ave. NW, Suite 320, Washington, DC 20036. The magazine goes 6 times a year to persons paying annual dues of $15.

The owner may learn from a State forester how to protect water quality, how large a buffer to put between the logging and a stream, where to locate skid roads, and how to manage "slash" (trash) to avoid fires. Some States require a portion of the sales dollar from logging be set aside for slash management and reforestation. There may be forest practice laws requiring inspection before, during, and after logging to help insure replanting.

State foresters may tell of availability of small, portable mills and other ways to maximize profits. They may give written material and tell of workshops on timber management. Such foresters may provide landowners with plans to achieve double objectives, such as wildlife habitat improvement and increased timber productivity. Usually these two objectives can be accomplished together.

Without professional advice, improper logging may occur that reduces not only beauty but the biologic diversity of a forest by destroying essential wildlife habitat.

If a landowner can't locate the State forester, he or she can contact the National Association of State Foresters (NASF), comprised of the directors of State forestry agencies. NASF is at Hall of the States, 444 N. Capitol Street, NW, Washington, DC 20001. (Telephone: 202/624-5415)

Advice is available from the 33,500-member National Woodland Owners Association. The NWOA is at 374 Maple Avenue E, Suite 210, Vienna, VA 22180. (Telephone: 703/255-2700) Formed by nonindustrial private woodland owners, the NWOA is independent of the forest

products industry and forestry agencies. For $15 a year, members receive 8 issues of the Woodland Report and 4 issues of the National Woodlands Magazine. NWOA can arrange for a visit by a forester to a new member's location.

The Society of American Foresters (SAF), 5400 Grosvenor Lane, Bethesda, MD 20814, lists help professionals can provide:

o Inventory a forest to estimate its extent, quality, and value;

o Reestablish trees on bare land;

o Improve protection from fire, insects, and disease;

o Select timber for harvest;

o Help insure that timber is sold at a fair price;

o Administer harvest activities to prevent soil and remaining tree damage;

o Take advantage of financial incentives and other help offered by public agencies, industrial firms, and tax laws;

o Review the owner's tax situation.

Foresters sometimes specialize. A woodlot owner should select one whose specialty matches the owner's objectives.

Best Prospects

Owners with already-established woodlots often have immediate income potential. Sometimes, however, the return covers decades. An example appeared in the Winter 1989 issue of The American Tree Farmer, in an item from President Nels Hanson of the Washington Farm Forestry Association. He reported that when Lula and Vern Johnson bought their 40-acre Washington farm for $102 an acre, it had a 6-acre patch of 40-year-old Douglas fir. Between 1949 and 1987, as money was needed to clear and plant understocked areas and to supplement their income, they logged and thinned the stand. When the well-managed stand was sold to the Weyerhaeuser Company in 1988, it had 660,000 board feet of lumber. That high bidder paid the widow nearly $382 per thousand, or $252,000. Not everyone can find a timber investment to match that.

Benefits are available not only through selling logs but also through wildlife or other outdoor recreation projects. Information for the latter—such as developing hunting leases—is available from many Extension Service specialists and State and private foresters.

For those wanting to begin a long-term timber growth project, unused areas along creeks or streams often are excellent sites. Depending on the region (and advice from the experts), hardwoods or conifers can be planted. The exact species would depend on local growing conditions. As mentioned earlier, State and Federal officials often offer not only advice but also financial help in planting.

Woodlands along creek areas serve to filter agricultural chemicals from the soil to prevent contamination of the creek and watersheds below. Forested wetlands will become more important over time in controlling farm runoff.

The years it takes to develop a woodlot on idle land depends on the region.

The South produces salable lumber products in 15 to 25 years. In the North and West it usually takes 30 to 50 years. In the South, final harvests usually take place in 30 to 40 years and in the North and West about 60 to 80 years. Fairly intensive management is required to produce sawlogs in those timeframes.

A forester's services can be utilized to help determine proper species for planting, thinning cycles, and the right timing for a final harvest cut, not to mention reforestation plans.

What About Alley Cropping?

In many States, tree farmers can farm more than trees. One farmer plants potatoes in freshly logged areas. Dr Gene Garrett, University of Missouri forestry professor, suggests that in the Midwest, farmers plant Eastern black walnut trees (*Juglans Nigra*) in rows about 40 feet apart and then do "alley cropping." Alley crops can include soybeans or small grain or even vegetables.

In the South, a similar approach might be used with pecan trees. Harvesting the wood as timber takes many years, but in the meantime nut production can provide some income in about a dozen years.

Printed Information

There are many publications and books that a potential woodlot owner can consult. One fairly universally accepted is "The Woodland Steward," by James R. Fazio. A copy may be obtained for $15.55 (including postage) from the American Forestry Association, P.O. Box 2000, Washington, DC 20013.

USDA's Forest Service publishes Agriculture Handbook No. 681, "Forest Owners' Guide to Timber Investments, the Federal Income Tax, and Tax Recordkeeping," last issued in July 1989. It includes forms for recording timber transactions. A copy may be obtained for $5 from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325.

West Virginia University's Agricultural and Forestry Experiment Station published a 55-page Circular 148, "How to Estimate the Value of Timber in Your Woodlot," by Professor Harry V. Wiant, Jr. He also explains how owners often lose thousands of dollars by cutting too soon. A copy may be obtained by writing to Mrs. Mildred Spangler, Communications Bldg., West Virginia University, Morgantown, WV 26506.

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United States
Department of
Agriculture

Cooperative State
Research Service

Office for
Small-Scale Agriculture

A Small-Scale Agriculture Alternative

Aquaculture

An ancient science practiced by many major civilizations, aquaculture today produces more than 2,000 different species of plants and animals in fresh and salt waters around the world.

U.S. aquaculture production has dramatically expanded in the past 10 years with pond-raised catfish in the Southeast, cage-raised coho salmon in the Pacific Northwest, pen-raised Atlantic salmon in the Northeast, and farm-raised crawfish in Louisiana and Texas. Freshwater trout dominate the aquatic production of several States, while ornamental fish, plants, and algae abound in others. Emerging species with commercial potential include hybrid striped bass, redfish, yellow perch, and hybrids of trout and salmon.

During the last few years, harvests from capture-fisheries have reached a stable level. At the same time, however, consumer demand for both seafood and freshwater products has continued to increase. Per capita consumption has increased over 25 percent in the past 6 years.

Low-fat product

U.S. consumers are becoming increasingly aware of the advantages of aquaculture products. Trends in seafood consumption, fueled by concern for a contamination-free, low-fat product, suggest a steady annual increase in demand for several years to come.

Imports, many utilizing expensive air freight transportation, represent 46 percent of the U.S. seafood consumption in pounds and 82 percent in U.S. consumer dollars. Recent successful introductions of South American shrimp and Norwegian salmon prove the profitability of good-quality seafood.

Like traditional farming, aquaculture requires hard work, pride in the best product possible, and marketing knowhow to generate an acceptable return. Products are sold whole, processed, and value-added. Markets may be found locally, regionally, and internationally. Growers can market aquaculture crops as bait, ornamentals, pets, or stockers; specimen water plants; environmental grasses, and by-products: feed, fish oils, and fertilizers.

Water experience needed

Small-scale aquaculture is limited less by a lack of information than by farmers with experience working with water crops. There are many parallels with more traditional farming products. For example, problems of quality, shelf-life, and market development are similar to those for any perishable farm product.

Inspection of seafood processing is not yet federally mandated but Congress has seriously considered enabling legislation. Legislation, if approved, would have a direct impact on marketing processed aquaculture products.

One factor complicating aquacultural development is that mandated authorities of numerous State and Federal agencies may overlap and cause conflicts.

Information sources

Aquaculture specialist James W. Avault, Jr. (Louisiana State University, Baton Rouge, LA 70803), emphasizes that getting answers to problem questions is essential for successful aquaculture. His December 1989 article in *Aquaculture Magazine* lists many information sources.

There are a number of multispecies book sources, a list of which is available from the U.S. Department of Agriculture's (USDA) National Agricultural Library, with its AGRICOLA computer database and Aquaculture Information Center (NAL, Beltsville, MD 20705).

Federal sources

The USDA, lead agency in coordinating aquaculture development, also has these information sources: the Extension Service (Washington, DC 20250), the Cooperative State Research Service (CSRS) Office of Aquaculture (Aerospace Building, Suite 342, Washington, DC 20250-2200), the Soil Conservation Service (SCS, Washington, DC 20250) and federally supported Extension and research projects at 1890 and 1862 State land-grant colleges and universities.

Specific information about these and many more contacts also can be found in the "Directory of Small-Scale Agriculture" (Superintendent of Documents, United States Government Printing Office, Washington, DC 20402/$5.50 per copy).

Several other Federal agencies also are involved in aquaculture. The U.S. Department of the Interior's Fish and Wildlife Service (USFWS) may help with questions on hatchery management, fish biology, disease control, and reservoir management.

The U.S. Department of Commerce's National Marine Fisheries Service (NMFS, 1335 East-West Highway, Silver Spring, MD 20910) focuses on saltwater fish, shrimp, oyster, and other shellfish species.

Also within the Department of Commerce is the Office of Sea Grants, administered by the National Oceanic and Atmospheric Administration (NOAA, Rockville, MD 20805) to support research.

The Environmental Protection Agency (EPA, Waterside Mall, Washington, DC 20460) monitors the impact of aquaculture practices on surface and ground water.

The Food and Drug Administration (FDA, 5600 Fishers Land, Rockville, MD 20852) regulates pest control materials, food additives, and processing practices.

Regional sources

Other sources include USDA's five Regional Aquaculture Centers: (1) the North Central Regional Aquaculture Center (NCRAC, Room 13 Natural Resources Building, Michigan State University, East Lansing, MI 48824); (2) Southern Regional Aquaculture Center (SRAC, Delta Branch Experiment Station, Stoneville, MS 38776); (3) Tropical and Subtropical Regional Aquaculture Center (TSRAC, The Oceanic Institute, Makapuu Point, Waimanalo, HI 96795); (4) Northeast Regional Aquaculture Center (NRAC, University of Rhode Island, Kingston, RI 02881); and (5) Western Regional Aquaculture Center (WRAC, School of Fisheries, WH-10, University of Washington, Seattle, WA 98195).

State sources

State governments may also provide numerous kinds of information, materials, and experience. Many growers are surprised to discover the great diversity of products their State can culture. State marketing programs often promote local products, such as Mississippi catfish, Maine lobster, Louisiana crawfish, and Idaho trout.

Most States have a department of natural resources (or fish and wildlife or similar title) that regulates and manages the natural stocks of fish. These departments, particularly in States supporting large fish stocking programs, provide an excellent opportunity for new fish farmers to consult experienced aquaculturists. Information on facilities and research projects often can be obtained through county Cooperative Agricultural Extension (CES), SCS, or other government offices listed in the local telephone book. Land-grant universities, supporting local CES offices, often provide valuable local information.

Aquaculture associations

Associations and trade shows provide current production information and materials. Information on specific groups can be found through growers, manufacturing representatives, NAL, CES, or *Aquaculture Magazine's* "Annual Buyers Guide."

The names and addresses of pertinent publications from private trade sources may be obtained from the NAL, as noted above.

Elsewhere, the "1989 Yearbook of Agriculture" (Superintendent of Documents, United States Government Printing Office, Washington, DC 20402/$10.00 a copy) discusses the management problems on small-scale farm operations.

Tony Mazzaccaro, former Aquaculture Specialist in the CSRS Office of Aquaculture, says aquaculture places "high demands on a farmer for both time and technical ability."

He adds, "The new fish farmer is advised to begin small and make a modest investment. If a trial is successful, larger commitments can be made with a higher level of understanding."

Many aquaculture production systems require large capital investments. However, some areas have begun to diversify with unique products made on a smaller scale.

For example, at the Kirkwood Community College, Curtis Stutzman at the Rural Development Center (P.O. Box 2068, Cedar Rapids, IA 52406) makes use of refurbished swine containment buildings with indoor tanks, using recirculating water. Curtis says, "At the farm of Todd and Darrel Kleppe of Clinton, IA, tanks are producing tilapia whose fillets sell for $7 per pound at local restaurants."

Use of small-scale indoor tanks is also being encouraged by Paul Battistoni, president of AquaMar Industries, Inc. (1945 Pocomoke Beltway, Pocomoke City, MD 21851), who has experience operating a pilot-plant operation at the University of Maryland-Eastern Shore. He also has built a tilapia hatchery and production plant as a demonstration facility for potential "grow-out farmers" interested in producing fish under contract. He also is producing hybrid striped bass.

"We're looking at the successful economic model of the integrated poultry industry," he says. "We could provide fingerlings, feed, technical assistance, and a harvest crew to handle fish produced in indoor tanks."

Use existing resources

"It is important for small-scale producers to utilize existing resources," says Ronald Macher (Ridge Top Ranch, Rt. 1, Box 237 Clark, MO 65243). With a show-me attitude, Macher several years ago saw the Midwest, with 350,000 ponds, including almost a quarter million acres of water, as a potential farm resource. "We demonstrated over a 5-year period that we could economically raise catfish in cages," Macher explains. "Our growing season from May to November could consistently produce 1.5-pound catfish in 21 weeks." His publication, *Missouri Farm* (6 issues per year/$18.00), gives details on such alternative crops.

One overview of the seafood marketing industry is presented by Ian Chaston, "Marketing in Fisheries and Aquaculture," 1984 (State Mutual Book and Periodical Service, 521 Fifth Ave., 17th Floor, New York, NY 10175/$19.95). Specific reports on trout, crawfish, and aquaculture enterprises are in the 189-page book, "ADAPT2,) published by *Successful Farming* magazine (P.O. Box 10652, Des Moines, IA 50336). This publication is available in some libraries.

In farming, raising capital is always a major obstacle. However, one source of financing may be the USDA's Farmers Home Administration (FmHA). FmHA officials accept loan applications for proposed small-scale aquaculture enterprises. Applicants with experience in small production systems, involvement with existing business, and demonstrated familiarity with new technology provide strength to any such proposal.

Prepared by Thomas S. Handwerker, Small-Scale Agriculture Research at the University of Maryland-Eastern Shore, and George B. Holcomb of the Office of Public Affairs, U.S. Department of Agriculture, for USDA's Office for Small-Scale Agriculture (Howard W. "Bud" Kerr, Jr., Program Director). The address is Office for Small-Scale Agriculture, Cooperative State Research Service, ~~AC-Box 2248-D, Leonardo Building~~, USDA, Washington, DC 20250-2200 (Telephone: 202/~~401-4640~~) 401-1805

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United States Department of Agriculture

Cooperative State Research, Educatation, and Extension Service

Office for Small-Scale Agriculture

A Small-Scale Agriculture Alternative

Poultry

The low investment and small area required to raise a flock of domestic poultry makes this an ideal venture for the beginning small or part-time farmer. Domestic poultry can supplement family food supplies, and small specialized poultry producers can sell to several niche markets. For example, producers can consider selling organic meat and eggs, brown eggs, range-reared meat and eggs, live birds for ethnic markets, and birds for hobby, leisure, and purebred exhibition purposes. Most small specialty poultry enterprises raise chickens or waterfowl.

To ensure profitability, the small specialty poultry producer must do careful research on market opportunities. Successful producers for niche markets usually have unique products, good customer loyalty, limited competition, and the ability to maintain a profit margin when in competition with larger businesses.

Egg Production

Breed Selection

The best chicken breeds include commercial White Leghorn-type hybrids, which produce white-shelled eggs and are the most economical feed-to-eggs converters. Commercial production Reds (e.g., Rhode Island Reds, New Hampshire) or sex-linked hybrids produce large, brown-shelled eggs and are usually preferred for small range flocks. These birds have meaty carcasses and produce a good supply of eggs. The hybrids that lay brown eggs tend to be more docile than those that lay white eggs. All poultry breeds lay eggs, but they are not equally efficient.

Production Tips

To raise chicks, start the flock in late spring to reduce the cost of heating; however, buying started, ready-to-lay pullets is easier and more economical. Chicks should be brooded at 92-95°F for the first week, followed by a reduction of 5 degrees per week until a steady 70°F is reached.

Birds raised in a floor pen should have at least 2 square feet of space per adult bird. Windows or a fan will provide adequate ventilation to keep the pen dry. Keep 3 to 6 inches of litter on the floor and remove it as it becomes wet. Pine shavings provide the best litter for adult birds. To avoid leg problems, do not start chicks on slippery newspapers or pine shavings.

Feed a completely balanced ration. Void table scraps and whole grain, which dilute nutrient intake and decrease production. Use an 18- to 20-percent protein feed starter for the first 6 to 8 weeks, followed by a 14- to 15-percent protein grower or developer until 20 weeks of age. After 20 weeks, feed a 15- to 18-percent protein layer ration, and feed grit and oyster shells in separate feeders.

Provide 3 inches of feeder space per adult bird. To minimize wasted feed, the lip of the feeder should be level with the birds' back height, and trough feeders should be kept less than half full. Waterers must provide at least 5 to 6 gallons daily for every 100 birds. Provide 1 inch of water space per bird. Clean waterers three or four times each week, and provide fresh water daily.

Laying birds require at least 14 to 16 hours of light each day for maximum year-round production. Decreasing the light will stop egg production. Light must be added before sunrise and after sunset during the fall and winter, but be sure to provide several hours of darkness so the birds can roost. Use an inexpensive automatic timer to turn lights on and off. For each 40 square feet of pen space, install one 25-watt bulb at ceiling height above the food and water area.

For floor-reared layers, provide at least 6 inches of roost space per bird, using 2- by 2-inch wooden strips spaced 12 inches apart. Place roosts 24 inches above the floor and provide one 10- by 10-inch nest for every 4 or 5 hens. Nests should be 24 inches above the floor, away from the roosts. Keep nesting materials clean and dry. Collect eggs at least twice daily. Outside runs are not necessary; if used, they should provide 5 to 10 square feet of space per bird.

Meat Chicken Production

Breed Selection

The most efficient meat-producing chickens are the meat-type crosses (Rock-Cornish). Purebred poultry types most commonly raised for white meat are Cornish, Plymouth Rocks, and White Jersey Giants, but these breeds are less efficient than the crosses and take up to 14 weeks to develop a desirable carcass. There are niche markets for red-plumage birds and for the Silkie chicken, which has dark purple skin and is very popular in various ethnic live-bird markets.

Production Tips

Meat chickens can be raised much like laying chickens, except that wet and compacted litter is of even more concern with meat-type birds than with egg producers. These conditions cause breast blisters and leg weaknesses and give the carcasses an undesirable appearance. Never brood chicks on slippery surfaces. Pine shavings or straw are the best materials for giving meat birds the traction and leg support they need.

Feed a totally balanced ration. For fryers and broilers, use a starter mash or crumble pellets containing 20-23 percent protein. Roasters require a 20-percent protein starter for the first 6 weeks and can then be fed a 16-percent protein grower feed. At least 23 hours of light per day is recommended for meat birds. Use one 25-watt bulb per 100 square feet.

Do not use nests and roosts for meat-type chickens. Roosting causes breast blisters, crooked keels, bruises, and lameness in heavy meat birds. Meat-type birds make poor layers, so slaughter them before they reach egg production age. If you raise dual-purpose birds, put nests in place after slaughtering the culls and males. Outside runs are not recommended for meat chickens unless you sell range-reared birds.

Slaughter 2- to 3-pound fryers at 3 to 4 weeks of age; 4- to 5-pound broilers at 7 to 9 weeks; and roasters at 12 to 14 weeks. Remember, as birds get older and larger, they become less efficient and eat more feed for each pound of weight gained. Because older birds produce more meat, allow them to come as close to the desired weight as possible before slaughter.

Waterfowl

Breed Selection

The best breed of waterfowl to raise depends on several factors, including the reason for raising them and the amount of space available.

Ducks are small and require less space than geese. However, they need a year-round grain supplement and are more prone to predators. Geese require twice as much space as ducks, but do well on limited grain when they have plenty of grazing space. They are seldom bothered by predators.

Some waterfowl are raised for meat. They can be purchased from a commercial hatchery or local feed store. Duck breeds

favored for meat production include Muscovy, Peking, and Commercial (Barnyard) Rouens. The most common geese raised for meat are Emden, African, and Pilgrim.

Chinese geese are commonly raised as weeder geese. Because of their loud, harsh call when startled, they are also used as "watch" or guard geese.

Waterfowl raised for pets or as a hobby can be selected from among 14 breeds of domestic ducks and 11 breeds of domestic geese, covering a variety of shapes, sizes, and colors. A variety of wild, exotic waterfowl are also raised in captivity; however, wild waterfowl usually require special facilities and attention and special permits.

Production Tips

Young waterfowl usually are available only from April through July, while adult birds can be purchased from breeders throughout the year.

Young waterfowl—Waterfowl can be started much like chickens, but some special precautions are necessary.

Do not brood waterfowl on slippery surfaces (like newspapers)—this can cause spraddled legs. Paper towels, cloth, or burlap give the best traction.

Do not raise small breeds of waterfowl on mesh wire; their hocks (leg joints) may get stuck in the wire when they sit down. Mesh wire (approximately 3/8 inch) is acceptable for larger breeds.

Do not let young waterfowl swim or become excessively wet for the first 4 weeks. When wet, they chill easily, tend to crowd, and flip onto their backs, causing death.

Do not use litters that mold or compact when wet.

Do not use fine litter until the birds learn to distinguish it from feed. Excessive litter consumption causes death. Instead, use absorbent material like chopped peanut hulls, pine shavings, or straw.

Do not feed medicated poultry feeds to young waterfowl; they may have adverse reactions to some poultry medications. Use starter mash formulated for waterfowl.

Feeding and watering—Crumble and pelleted feeds are usually best, because waterfowl waste feed, especially when it is ground into mash. During the first 3 weeks, feed a 22-percent protein starter ration; then change to a 16-percent protein grower feed. Avoid digestive problems by feeding some grit 1 week before allowing access to green fibrous plants. After 8 to 12 weeks of age, geese and ducks will eat very limited supplemental grain. Most breeders feed a mixture of about 40 percent corn and 60 percent oats until breeding season. Breeding waterfowl require only a 15-percent protein diet. Allow 6 linear inches of feeder space per bird and place feeders away from waterers.

Provide plenty of fresh water at all times. Water is essential for healthy growth. To keep the pen dry, place the lip of the waterer at the birds' back height. Adult birds require a waterer deep enough to get their head under water beyond their eyes. To ensure successful mating, especially in larger breeds, make water available for swimming. An old water heater tank cut in half works well.

Specialty Poultry

Many unique markets exist. Quail, pheasants, turkeys, and guinea fowl are raised for meat markets. Some birds are raised for exhibition. Mallard ducks, quail, and pheasant are raised for hunting preserves and for dog training. Markets are also available for racing pigeons, feathers for fly fishing, guinea hens for tick control, and pickled eggs.

Disease Prevention

Disease prevention—biosecurity—is an important aspect of any domestic poultry operation. Never allow poultry and other fowl to run loose. House them or keep them in a fenced area. Wild or tame waterfowl, cage or pet birds, ratites, and any other exotic birds should be on separate premises from chickens, turkeys, and game birds. If this is not possible, maintain them in separated, nonconnecting pens. It is important to raise all species separately to minimize disease. Wild waterfowl are reservoirs of avian influenza and other diseases; mixed-species poultry operations can serve as a catalyst for virus mutation and increase the risk for disease outbreaks.

A feather or one speck of fecal matter can carry billions of infectious germs. Avoid unnecessary human traffic, and prevent contact with unsanitary crates, equipment, or vehicles. **Always** wear clean clothes and footwear each time you return to your poultry production area. Allow visitors only after they have put on properly sanitized footwear, clothing, and hats. Insist that all poultry buyers bring only clean, disinfected crates, equipment, and vehicles into your farm with no visible fecal material or feathers. Better yet, transfer your birds to buyers at another location and clean your hauling equipment before returning home.

Practice "all-in, all-out" when raising poultry. Get rid of the entire flock before replacements arrive. Wash and disinfect the poultry house and leave it empty for 2 weeks. Replace the flock with healthy chicks from a single source, and do not add any new stock until the next clean-out. Limit the number of age groups on your farm. When all-in, all-out is not possible, bring new stock onto your farm only by hatching fertile eggs you have purchased or by buying Pullorum-Typhoid Clean chicks. Even though they appear healthy, adult birds are often disease carriers.

Buy only adult birds that have been vaccinated against Marek's disease. All chickens, turkeys, game fowl, or waterfowl you buy should be officially classified as U.S. Pullorum-Typhoid Clean. Participate in avian influenza testing programs where available.

Other Information Sources

Contact your local Cooperative Extension Office or State University through local telephone directory listings. If possible, obtain a management guide from a breeder or hatchery.

Growing expertise, innovative technologies, and production supplies can be found through publications such as:

Chicken Tractor: The Entrepreneur's Guide to Happy Hens and Healthy Soil by Andy Lee (250 pages), from Good Earth Publications, P.O. Box 160, Columbus, NC 28722. Telephone 1-800-499-3201.

Chicken Health Handbook by Gail Damerow (344 pages), from Storey Communications, P.O. Box 445, Pownal, VT 05261. Telephone 1-800-441-5700.

Pastured Poultry Profits by Joel Salatin (340 pages), Polyface, Inc., Rural Route 1, P.O. Box 281, Swoope, VA 24479. Telephone 540-885-3590.

Raising Poultry Successfully by Will Graves (186 pages), from Williamson Publishing, P.O. Box 185, Charlotte, VT 05455. Telephone 1-800-234-8791.

Good Neighbors. This free leaflet provides information on a health program for small and specialty poultry flocks. Contact T. Milton Nelson, Cooperative Extension Service, 0126 Symons Hall, College Park, MD 20742. Telephone 301-405-4596.

For general information on all aspects of poultry, contact: Lance Gegner, Appropriate Technology Transfer for Rural Areas (ATTRA), P.O. Box 3657, Fayetteville, AR 72702. Telephone 1-800-346-9140.

National Poultry Improvement Plan (NPIP) Directory of Hatcheries and Testing. To locate individual State contact sources, write to Andy Rhorer, USDA/APHIS, VS, ~~Room 850 Federal Building, Hyattsville, MD 20782~~. Telephone ~~301-436-7708~~. 404-922-3496

By Phillip J. Clauer, Poultry Extension Specialist, Animal and Poultry Sciences Department, 3300 Litton Reaves Hall, VA Tech, Blacksburg, VA 24061-0306, for USDA's Office for Small-Scale Agriculture (OSSA), Howard W. "Bud" Kerr, Jr., Program Director, Ag Box 2244, Washington, DC 20250-2244. Telephone 202-720-5245; Fax 202-205-2448.

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October 1995

United States Department of Agriculture

Cooperative State Research Service

Office for Small-Scale Agriculture

A Small-Scale Agriculture Alternative

Sheep

The relatively low investment and the natural, gradually increasing size of a flock may make sheep ideal for the beginning small and part-time farmer, according to Dr. Clair E. Terrill. An animal breeding specialist, Terrill has been watching the economics of sheep production for years. Terrill, who retired from the U.S. Department of Agriculture's (USDA) Agricultural Research Service, says "the future of sheep is bright."

There are several kinds of markets for small-scale sheep production in the United States: plain white wool, naturally colored wool, "freezer lambs," ordinary slaughter lambs, and sheep-milk products.

According to Paul Rodgers, director of producer services for the American Sheep Industry Association (ASI), the conventional approach of adding 20 to 100 ewes to a farm operation can be profitable. Other approaches require careful marketing and would be more difficult and risky. Still, they might also prove more profitable.

Experts say it takes about 2 hours of work per year to maintain one ewe and her offspring on farm pasture. Farmers caring for 20 to 100 ewes thus would add 40 to 200 more hours of work to their regular duties.

Advantages of Sheep

Where a farmer already has some beef cattle, there are economical and biological advantages to adding some sheep to the operation, Terrill says. Shared pastures can work well, he points out. Sheep tend to prefer finer plants and cattle the coarser ones.

Sheep can be fed out to market on forage alone if it is adequate, thus requiring little outlay for feed. There are many acres of idle pastureland that could be used for sheep—natural meadowland, waterways, woods, orchards, or abandoned cropland, for example—as long as the sheep are protected from predators such as coyotes or dogs.

For small-scale entrepreneurs who prefer the conventional production of slaughter lambs and wool, the ASI is a good source of information.

The *Farm Flock Budget*, one of the Updates that ASI sells, shows a typical budget for a flock of 104 animals—4 rams and 100 ewes. It shows annual costs and returns based on farm prices for slaughter lambs varying from $63 to $75 per hundredweight (cwt). At $75 per cwt, and assuming wool brings $10.10 per ewe, gross annual income per ewe can average $106.98—if 129 lambs can be marketed from 100 ewes. Variable costs, including feed and labor, range from $74.45 to $77.03 per ewe. Fixed costs, including interest, average $12.77 per ewe. This puts total costs at about $87 to $89 per head.

A list of educational materials may be obtained by writing or telephoning ASI at 6911 S. Yosemite St., Englewood, CO 80110-1414; 303-771-3500. ASI also sells subscriptions to its *Research Journal* and its *Sheep Production Handbook*. The journal is published three times a year and sells within the United States for $30 per year. The handbook sells within the United States at $35 each for one to nine copies. Additional pricing and foreign shipment information is available by contacting ASI.

Costs of raising fewer sheep than ASI's example are detailed in *Raising A Small Flock of Sheep in Ohio*, Bulletin No. 654, from Ohio State University and the Cooperative Extension Service (CES). Startup cost of a 30-ewe flock is estimated to range between $187.50 and $235.84 per ewe and the annual cash operating cost at about $51 each. The bulletin makes the point: "To make money with sheep, you must raise more than one lamb per ewe." Local county agricultural extension agents throughout the United States may obtain copies of the 12-page bulletin to answer public inquiries.

The bulletin costs 50 cents to the public.

Problems

Help in dealing with problems can be found in *Recommendations for a Sheep Management Program*, Publication No. 240, of the North Central Regional Office of the CES. The booklet has details on feeding and marketing as well as on common diseases and parasites. A copy may be obtained at no charge from CES offices at the State universities of Iowa, Illinois, Michigan, Indiana, Ohio, Kansas, Missouri, and North Dakota.

One money-saving suggestion: Boundaries are essential, but where predators or thieves are not a problem, inexpensive electric fencing may suffice.

Keeping Track of Prices

A weekly news summary on average lamb and wool prices may be obtained for $35 a year from ASI's *Lamb & Wool Market News*. A similar report may be obtained for $70 a year from USDA's Agricultural Marketing Service (AMS). The AMS Livestock Market News Service (LMNS), P.O. Box 9646, Washington, DC 20090-6456, will also send a list, at no charge, of the numerous markets from which instant livestock market news may be obtained by phone in 36 States. Lamb prices are usually highest in the spring. ASI also publishes an annual Situation and Outlook Report that notes prices, production, and projects trends.

Freezer Lambs

Farmers-suppliers of freezer lambs may earn more profits than the average. They may produce and sell lambs at premium prices somewhat higher than 75 cents a pound for an unbutchered lamb weighing up to about

110 pounds. Sales sometimes can be made directly to individuals of certain ethnic backgrounds. Such buyers are likely to do the butchering themselves. Slaughter can be done on the farm or at a local freezer-locker plant. Many freezer plants or slaughterhouses will have a butcher available for processing after slaughter. An ASI publication, *Marketing Out of the Mainstream*, explains many aspects of direct and niche marketing of lamb and wool.

Improving Earnings

An entrepreneur can increase earnings by improving flock quality. Higher quality means production of faster growing lambs and more lambs per ewe, for example. The ASI has organized the National Sheep Improvement Program (NSIP) to help producers find superior animals through a computerized evaluation system. Entrepreneurs who want to buy ewes or rams on the basis of NSIP data may do so if the producer from whom they buy keeps NSIP records. Details may be obtained from NSIP by contacting ASI.

Several informational videotapes developed to assist sheep producers are available from Lincoln University. For information contact: University Extension, Lincoln University, Box 29, Jefferson City, MO 65101; telephone 314-681-5544.

Dairy Sheep

Livestock expert Dr. W.J. Boylan of the University of Minnesota, telephone 612-624-1727, says sheep product opportunities are not limited to meat and wool. He suggests cheese making, noting that U.S. consumers buy as much as 45 million pounds of imported sheep-milk cheese annually. Sheep cheeses include Roquefort from France, Feta from Greece, Ricotta and Pecorino from Italy, and Manchego from Spain.

Dr. R.M. Jordan, retired from the University of Minnesota, in his article "Angora Goats: New Home in the North," compared the economics of ewe/lamb operations with Angora goat operations. He found that either can make a profit. But higher lamb prices may give the edge to the ewe/lamb producer, he wrote.

Dr. Boylan will provide lists of publications on sheep milking and cheese manufacturing, equipment, and sources of supply. Write to the Department of Animal Sciences, Peters Hall, Room 122, University of Minnesota, St. Paul, MN 55108. One commercial source of equipment and information on cottage industry cheese is the American Cheese Society, 34 Downing Street, New York, NY 10014; telephone 212-727-7939.

One U.S. dairy sheep pioneer believes that making hard cheeses is not the best option for American producers. He is Ken Kleinpeter (Hollow Road Farms, Box 93, Hollow Road, Stuyvesant, NY 12173). Ken Kleinpeter and his partner, Joan Snyder, concentrate on producing yogurt and fresh cheeses from their sheep's milk, because unlike hard cheeses, these products are not imported from overseas. Kleinpeter notes that there are many imported hard sheep's milk cheeses on the market in the U.S., which sell for less than a domestic producer's cost of production. This is because dairy sheep in other parts of the world produce several times what U.S. breeds are capable of, and many European countries subsidize their cheese producers.

Kleinpeter is within 3 hours of two major gourmet markets, New York City and Boston, MA. Unless a small-scale entrepreneur has a secure market, he cautions, a gourmet item such as sheep's milk yogurt may be a hard sell. It would be difficult to support such an operation in areas not within 2 to 3 hours of a major metropolitan market, he said.

Dairy Sheep People

A few people in 1987 formed the North American Dairy Sheep Association (NADSA), Route 3, Box 10, Hinckley, MN 55037; telephone 612-384-6612. NADSA has grown to 150 members in the United States, England, Canada, Australia, and India. NADSA held annual conferences until 1992, when conferees decided to meet every other year. Depending on status and location, annual dues range from $10 to $25 and include 3 or 4 copies yearly of the NADSA newsletter, *Dairy Shepard*. NADSA has books on sheep topics and videotapes of conferences, available at various prices listed by NADSA. Roger and Lucy Steinkamp have served as NADSA president and treasurer, respectively.

Colored Wool

While everyone knows about black sheep, not so well known are those that produce blond, red, beige, brown, silver, and grey wool.

Breeders of such relative rarities usually belong to the Natural Colored Wool Growers Association (NCWGA), at P.O. Box 487, Willits, CA 95490.

NCWGA spokesperson Carole Sanders says the best fleeces of natural colored wool command premium prices. New colors are being developed, fiber diameter is being refined, and the staple length is increasing.

Sanders also says undyed, unprocessed, natural colored fleece is popular with the fiber industry, weavers, and felt markets. There is a growing recognition of colored wool in boutique clothing manufacture. So far, however, no major woolen mills handle colored wool because of the wide variation in its grade quality and color. All countries are trying to commence colored woolprocessing on a large scale commercial basis, but none have succeeded.

Sanders suggests seeking an outlet for colored wool with schools that have classes in fiber and textile arts.

Another approach: Attend the school and learn to produce yarn, or find spinners who want exotic fleeces.

Besides promoting colored wool sheep classes at fairs, NCWGA publishes a directory and a national newsletter, *The Marker*. One of NCWGA's objectives is to increase flock quality through flock and breeding line registry.

Prepared by George B. Holcomb of the Office of Public Affairs, U.S. Department of Agriculture, for USDA's Office for Small-Scale Agriculture (OSSA); Howard W. "Bud" Kerr, Jr., Program Director. OSSA's address is:

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United States Department of Agriculture

Cooperative State Research, Educatation, and Extension Service

Office for Small-Scale Agriculture

A Small-Scale Agriculture Alternative

Draft Animals

The word "draft" represents not a specific kind of animal, but a usage. Although "draft," mentioned in reference to a horse, has become synonymous with "heavy," animals of any size may be trained for draft purposes.

Horses, mules, and oxen are once again an important power source for today's small farms and woodlots.They cost less than mechanized equipment and are environmentally friendly. In fields, they don't compact the soil, and in woodlots, they cause minimal erosion and tree damage.

Unlike tractors, draft animals are not dependent on outside fuel sources. Instead, they help plant and harvest their own feed, and they provide an unending supply of organic fertilizer.

Draft animals are less costly to maintain than mechanized equipment and don't need constant repair. They can work in hilly terrain that would defy a tractor, and in soil wet enough to bog down machinery. They can easily be worked by one person, which you will readily appreciate if you try operating a motorized hay wagon or log skidder by saying "get-up."

Instead of depreciating as they get older, well-trained draft animals increase in value. Although mules don't reproduce because they are hybrids, and oxen don't reproduce because they are castrated, horses make little horses you can sell or keep as replacements. Virginia horse-power proponent Jason Rutledge is fond of pointing out that no farmer has ever gone to the barn to find a newborn tractor.

Horses

Young harness-trained horses, experienced draft teams, and farm implements are available at frequent sales in Indiana, at the Topeka Livestock Auction (Robert Bale, P.O. Box 279, Topeka, IN 46571; telephone: 219-593-2522); in Iowa, at the semi-annual Waverly Midwest Horse Sale (Bill and Ron Dean, P.O. Box 355, Waverly, IA 50677; telephone: 319-352-2804), and in Columbus, OH, at the annual Eastern States Draft Horse Sale (Sally Reed, 17588 Old Mansfield Road, Fredericktown, OH 43019; telephone: 614-694-5730).

Orchards, vineyards, and nurseries worked with draft animals may be planted with twice as many rows, since they can be spaced half as far apart as would be required for mechanized cultivation. Pick-your-own farm operators can attract new and repeat customers through entertainment farming by offering festive hay and sleigh rides.

Lin and Allan Ayers of Faulkner Farms (14292 Telegraph Road, Santa Paula, CA 93060; telephone: 805-525-9293) use Clydesdales for normal farming activities, but are best known for the horse-drawn hay rides offered through their pumpkin patch and Christmas tree farm. Stanley Gilbert offers both horse-drawn and ox-drawn sleigh rides on his upstate New York Christmas tree plantation (336 Partridge Hill Road, Barneveld, NY 13304; telephone: 315-896-2904).

In Wyoming, ranchers use horses to haul cattle feed during winter. From June through September, when the horses would otherwise be idle, Walt M. Korn of Box K Ranch (P.O. Box 110, Moran, WY 83013; telephone: 800-729-1410) leases neighboring horse teams for his Grand Teton Covered Wagon Cookouts; guests ride in a horse-drawn wagon to and from the cookout site.

Jerry Rapp and his Colorado neighbors use horses for summer hay production. During the snow months, Rapp leases neighboring horse teams to give sleigh rides to tourists. When he had trouble finding qualified sleigh drivers, Rapp started 4 Corners Driving School (47 Electra Lake Road, Durango, CO 81301; telephone: 303-247-8923), which now offers instruction in horse-drawn hay making and log skidding, as well as sleigh driving.

Demand for horse loggers is rising among woodlot owners wishing to minimize damage or who haven't enough timber to justify hiring heavy equipment. Horse loggers are regularly hired by the U.S. Department of Agriculture Forest Service to extract timber from environmentally sensitive areas.

In Washington state, Gregg and Deb Caudell run a productive horse-powered ranch and a profitable horse logging business. Although logging with horses is more labor intensive and slower than mechanized logging, the couple find that the income-to-expense ratio can be 10 times greater. The Caudells network through their quarterly publication, *Horseloggers International Newsletter*, Star Route Box 34-CC, Keller, WA 99140; telephone: 509-634-4388.

Another logger's resource is The North American Horse and Mule Loggers Association, c/o Glenn French, 8307 Salmon River Highway, Otis, OR 97368; telephone: 503-994-9765. Regional Director Jason Rutledge of Ridgewind Farm (8014 Bear Ridge Road, Copper Hill, VA 24079; telephone: 703-651-6355) offers horse logging workshops. Rutledge has obtained a grant from the state to develop horse logging as a tool for marketing value-added wood products extracted in an environmentally sensitive manner.

Amish communities in Ohio and elsewhere have long used horses for transportation, as well as for farming and logging. Recognizing the increasing interest in horses as a source of power, Amish farmer Eli J. C. Yoder (445 South Mill Street, Sugar Creek, OH 44681; telephone: 216-852-4603) offers hands-on driving instruction at his horsemanship school for beginners.

While members of the Nation's largest Amish community in Ohio prefer horses, the Lancaster County, PA, Amish favor mules. Differences in local preference, climate, and terrain result in different choices of draft animals in various parts of the country.

Farmers use light horses, donkeys, ponies, and even miniature horses no bigger than a goat for draft work. Indeed, goats can be readily trained to turn garden soil or pull a cart. Goat-sized accessories are available from Hoegger Supply Co., P.O. Box 331, Fayetteville, GA 30214; telephone: 800-221-4628. Even dogs can make handy draft animals, as Colorado's Richard Klimesh and Cherry Hill discovered when they trained their Rottweilers to haul horse feed. Richard designed and now manufactures a small chore cart appropriate for dogs. (Cherry Mountain Forge, P.O. Box 140, Livermore, CO 80536; fax: 303-491-9898).

Farmers who work larger acreages prefer heavy horse breeds standing 16 hands high or more (1 hand equals 4 inches), measured from the ground to the withers, and weighing 1,600 pounds or more. Of the many heavy breeds, North Americans favor five: Belgian (the most popular), Percheron, Clydesdale (the "Budweiser" horse), Shire, and Suffolk (the only breed developed specifically for farming).

For hilly terrain, smaller, more agile breeds include the Haflinger from Austria and the Fjord from Norway. When a horse is used for both farming and transportation, a light-weight, dual-purpose crossbreed, or a pure breed like America's old-style Morgan (Lippitt and Brunk bloodlines), combines the necessary strength and endurance.

Experienced trainers can adopt wild horses through the Bureau of Land Management (BLM) (P.O. Box 12000, 850 Harvard Way, Reno, NV 89520; telephone: 702-785-6586). For a small fee per horse which for training purposes should be no

more than 3 years old, one person may acquire up to four horses per year. At maturity each will weigh 800-1,000 pounds and stand 14-15 hands high.

Lowell Tart (85 Roberts Road, Lexington, TN 38351; telephone: 901-968-8536), trains and sells wild horses for harness work. By BLM regulation, he must house them in a strong corral and must keep each horse for at least a year before he can sell it. While wild horses are inexpensive to obtain, taming them requires skill and patience and is not a task for beginners.

Horse Reference Materials

A ready source of information on harnessing horses and mules is the Draft Horse and Mule Association of America, (DHMAA), which distributes a variety of written materials and sponsors workshops in Illinois and elsewhere. Since 1994, DHMAA has produced the annual Horse Progress Days trade show, where manufacturers and distributors demonstrate both new and antique horse-drawn implements. For details on upcoming events, contact Phil Farrell, Route 1, Box 98, Lovington, IL 61937; telephone: 217-864-5450.

Guide books include *The Draft Horse Primer*, by Maurice Telleen, ($13.00 from Draft Horse Journal, P.O. Box 670, Waverly, IA 50677; telephone: 319-352-4046) and two volumes by L.R. Miller, *Training Workhorses, Training Teamsters* ($24.95) and *Work Horse Handbook* ($16.45), both from Small Farmer's Journal, P.O. Box 1627, Sisters, OR 97759; telephone: 503-549-2064.

The Evener Work Horse, Mule & Oxen Directory and Guide ($6.00) is issued each May by Rural Heritage, 281-A Dean Ridge Lane, Gainesboro, TN 38562; telephone: 615-268-0655. This directory lists sources for harness, implements, and draft animals; schedules of workshops and stock sales; and information on participation in the Good Farming Apprenticeship Network.

Mules

A mule is a hybrid resulting from the mating of a mare (female horse) with a jack (male donkey). An average farm mule measures 13-14 hands and weighs about 1,000 pounds.

Mules have long been a tradition on southern cotton plantations, and are still very popular, because they can withstand steamy weather better than horses. A less well known fact is the ability of mules to endure extremely cold weather as well as, if not better than, a horse. Ongoing studies at the Louisiana State University-Baton Rouge and the University of California-Davis are researching endurance and optimum loads for mules in harness.

Mules favored by the Lancaster County Amish are the result of mating a heavy-breed mare to a Mammoth Jack. Offspring average 16-18 hands and 1,500-1,700 pounds.

Mules have smaller feet than horses, an advantage for cultivation, especially in hilly terrain. Any mule owner will tell you that a mule is smarter than a horse because it won't do anything to endanger itself. This admirable trait gives mules their reputation for being stubborn.

Unlike a horse, a mule won't overheat or eat so much it will founder (go lame). A mule will thrive on coarser, cheaper, and less feed than is needed by a horse of comparable size. Mules live longer than horses and are more useful as senior citizens—a mule can be productive to 35 years of age, while a horse is "old" at 20.

Sellers and exhibitors of quality harness mules gather each July at Tennessee's Great Celebration Mule Show (Cathy Neal, P.O. Box 1010, Shelbyville, TN 37160-1010; telephone: 615-684-5915). The oldest consecutive draft mule show occurs each August at the Missouri State Fairgrounds, 2503 West 16th Street, Sedalia, MO 65302; telephone: 816-530-5600.

Mule Reference Material

Basic mule and donkey information is distributed by the American Donkey and Mule Society (Paul and Betsy Hutchins, 2901 North Elm Street, Denton, TX 76201; telephone: 817-382-6845), which publishes an informative quarterly magazine, *The Brayer*, and offers a 10-page catalog of donkey and mule literature. *Mules And More* is a monthly magazine edited by Sue Cole, P.O.Box 460, Bland, MO 65014; telephone: 314-646-3934. The definitive book on the history of mules in America is a two-volume set, *The Missouri Mule: His Origin And Times*, by Melvin Bradley ($35.00), from Extension Publications, 2800 Maguire Blvd., University of Missouri, Columbia, MO 65211; telephone: 314-882-7216.

Oxen

An ox is a castrated steer of any breed that has reached 4 years of age and has alertness, tractability, strong bones and muscles for power, and straight, strong legs for traveling. Breeds and crossbreeds vary in popularity according to local custom. New Englanders traditionally favor dairy breeds such as Holstein and dairy Durham, while others may prefer beef breeds such as Hereford and beef Durham, or perhaps such exotics as the giant Chianina or the miniature Dexter.

Oxen in North American can be traced back to French and German settlers. Oxen were once popular for field and forest work across North America, but now are found mainly in New England. Today they are regaining stature throughout the Nation, thanks in part to the efforts of teamster and trainer Drew Conroy, who teaches dairy farm management at the University of New Hampshire (Thompson School of Applied Science, 291 Mast Road, Durham, NH 03824-3562; telephone: 603-862-1024). Conroy advocates oxen as being inexpensive to purchase and economical to maintain, making them ideal for small-acreage farms.

Oxen are similar to mules in their ability to handle rough terrain, but do become lethargic in hot weather. The productive life span of an ox is little more than 10 years.

An excellent introduction to working oxen is *The Oxen Handbook* by Drew Conroy ($13.95), from Butler Publishing, P.O. Box 1390, LaPorte, CO 80535; telephone: 800-728-3826. Workshops in oxmanship are offered by Tillers International, Richard Roosenberg, Director, 5239 South 24th Street, Kalamazoo, MI 49002; telephone: 616-344-3233. Recognizing that not all potential teamsters care to travel to Michigan, Missouri Town 1855 Living History Museum sponsors a Tillers International workshop in Lee's Summit, Missouri, Heritage Museums and Programs, 22807 Woods Chapel Road, Blue Springs, MO 64015; telephone: 816-795-8200 ex. 1-260.

Other Information Sources

Before acquiring horses, mules, or oxen as a power source, or as a means of increasing the value of your small-farm produce, first find out what's involved. You can increase your knowledge by joining an organization promoting the use of draft animals. Arrange to spend time working with a farmer or logger experienced in using animal power or sign up for a course on handling draft animals, and, of course, read the literature.

Additional sources of information include: Lance Gegner, Technical Specialist, Appropriate Technology Transfer for Rural Areas, P.O. Box 3657, Fayetteville, AR 72702, telephone 800-346-9140.

The Draft Horse Journal, Maurice Telleen, Editor, P.O. Box 670, Waverly, IA 50677; telephone: 319-352-4046.

Rural Heritage, Gail Damerow, Editor, 281-A Dean Ridge Lane, Gainesboro, TN 38562; telephone: 615-268-0655.

Small Farmer's Journal, L.R. Miller, Editor, P.O. Box 1627, Sisters, OR 97759; telephone: 503-549-2064.

Small Farm Today, Ronald E. Macher, Editor, 3903 W. Ridge Trail Road, Clark, MO 65243-9525; telephone: 800-633-2535.

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A Small-Scale Agriculture Alternative

Exotic Livestock

January 1989

Where's the beefalo? It's still around, but the excitement is gone. Such a query arises because introduction of exotic types of creatures into a country where they are scarce encourages speculators to bid prices extremely high. Breeding stock becomes the focus of attention rather than the basic use of the animal for meat, work, hide, fur, or feathers.

However, restaurant demand for "different" meat has risen to the extent that on February 24, 1988, the U.S. Department of Agriculture's Food Safety and Inspection Service (FSIS) proposed (in the Federal Register) to expand its voluntary exotic animal inspection program. FSIS would add reindeer (caribou), elk, antelope, water buffalo, and deer, such as red or fallow, under the head of "exotic animal." In the past the program covered only American bison and cattalo or beefalo.

FSIS officials say fewer than 2,000 "exotics" are slaughtered annually in this country compared to more than 32 million cattle per year. In view of the demand, small-scale entrepreneurs find it profitable to market federally inspected meat from certain exotic animals.

For the moment, the biggest dollar demand is for such exotics as ostriches and South American humpless camels such as llamas, alpacas, guanacos, and vicunas. Little demand is noted for Alaska's yaks or musk oxen. African pygmy goats are gaining in popularity, says Pamela Ames, executive for the National Pygmy Goat Association (5621 West Michigan, Tucson, AZ 85746).

In 1987, with almost no advance notice or publicity, a company called "Camelids,Inc.," sold 52 male and female llamas at an estimated cost of more than $1 million, according to the slick 24-page tabloid publication called "Llama Life." It is published quarterly by Terry and Kathy Price at 925 W. Culver, Phoenix, AZ 85007. An annual subscription costs $10 domestically and $15 in Canada.

One buyer paid $100,000 apiece for two studs. Three other males also brought $100,000 apiece at the opening rush, which drew nearly 100 buyers from all over the country.

Some people predict that 3,500 U.S. owners of 12,000 llamas will begin to price themselves out of the market, even if camelid wool is sought by handspinners and weavers and the pack animals are used in all sorts of fund-raising events—shows, fairs, and 4-H projects. Owners contend llamas excel as 300-pound pets.

USDA's Forest Service people traveling into wilderness country often use llamas as pack animals instead of horses or mules, both of which are ecologically more intrusive. You can rent a llama for $20 a day; there are more than two dozen commercial llama packers in business.

Females can bring from $6,500 to $16,000 and up as breeding stock. Males of age 6 months to a year bring $500 and up for training as pack animals. Already trained, they cost about $1,200 apiece.

They are hot investments, says a three-page chapter of the 189-page book called "ADAPT2," published by SUCCESSFUL FARMING magazine after its December 1987 conference on farm diversification. The publication costs $12.95 postpaid from P.O. Box 10652, Des Moines, IA 50336.

Owners have formed the International Llama Association (P.O. Box 37505, Denver, CO 80237). It publishes educational brochures.

The industry has a thick, colorful magazine, LLAMAS, published every 2 months. (Subscription: $20 a year from P.O. Box 100, Herald, CA 95638.) Although covering all camelids (a recently coined word), it emphasizes llamas.

It is expensive and difficult to import llamas or other animals from South America because livestock of some countries of origin have foot-and-mouth disease. USDA's Animal and Plant Health Inspection Service (APHIS) regulates importation.

Camelid experts include Dr. LaRue W. Johnson, an associate professor and veterinarian in the Department of Clinical Sciences, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO 80523; Dr. William L. Franklin, an associate professor in the Department of Animal Ecology, Iowa State University, Ames, IA 50011; and Dr. Juan Leon, College of Veterinary Medicine, Oregon State University, Corvallis, OR 97331.

Misunderstanding Carabao

Water buffalos, unlike llamas, aren't in great demand, despite such plaudits as a media advisory from Gail Porter for the National Academy of Sciences (NAS) saying the water buffalo may be the most misunderstood and underutilized animal. Despite its intimidating appearance and large size, the water buffalo's gentleness contrasts sharply with the ferocity of the African cape buffalo. Porter noted the former's tameness in "The Water Buffalo: New Prospects for an Underutilized Aminal," published by the NAS's National Academy Press in 1981.

The first commercial herd was imported to the United States in February of 1978. The two major types of water buffalo are the swamp buffalo, or carabao, and the river buffalo. Both are used for work and meat. The carabao is rarely used for milk, while the river buffalo is noted for milk. With either tightly coiled or drooping straight horns, breeds of the latter are commonly found in the temperate climates of Italy, Albania, Yugoslavia, Greece, Turkey; the Georgian and Azerbaijan areas of the Soviet Union; and in cold, mountainous areas of Pakistan, Afghanistan, and Nepal.

Latin America countries are beginning to catch on to their value. About 18 different breeds of both types can work in tropical mud that can bog down a tractor. One of these animals can work as many as 20 years.

Milk from river buffalo goes into mozzarella cheese in Italy. It has a higher content of both butterfat (at about 5 to 8 percent) and nonfat solids (at 16 percent) than cow's milk. River buffalos produce about 170 percent of India's milk; they also produce milk in Italy, Iraq, Turkey, Egypt, and Eastern Europe.

In taste preference tests, water buffalo steaks were judged to be leaner and just as tender as those of cattle.

Water buffalo usually maintain their appetite in hot weather, and thus may be more adaptable to it than cattle; but they may need shade or a pond in summer. Sensitive to some cattle diseases, they are highly resistant to others.

Chief breeders of water buffalo in this country are A.P. Leonards, Route 1, Box 74, Sulphur Springs, AK 72768, and Dr. Hugh L. Popenoe, Director, International Programs, University of Florida, Gainesville, FL 32611. Both are selling unbred young heifers at about $3,500 and bulls at various lower prices.

Another expert in water buffalo management is Dr. W.S. Cripe, College of Veterinary Medicine, University of Florida. Dr. Martin Drost, of the same address, is experienced in water buffalo reproduction matters.

European Fallow Deer

Despite competition from New Zealanders, deer farming and venison production is a business where demand continues to exceed supply, according to members of the North American Deer Farmers Association. Its founder and president, Joseph von Kerckerinck (Lucky Star Ranch, Chaumont, NY 13622), has authored a colorful book, "Deer Farming in North America," and also has produced a videotape on the subject. (Each item is available at $48 apiece postpaid. A set costs $86.)

In 1978, Von Kerckerinck and his wife, Illiana, began the first and largest operating European fallow deer farm in North America. About 3,000 deer roam 1,500 fenced acres of the 5,000-acre ranch. He says, "Deer farming combined with the right marketing approach can give hundreds of farmers the chance to stay on their land and make a decent living."

Part of the Lucky Star's success, he says, rests with the direct marketing program that assures venison is shipped fresh, unfrozen, by overnight express to arrive almost anywhere on the date needed. It also can be shipped frozen, with 3-day delivery. The Lucky Star has its own USDA inspected slaughterhouse.

For the 225-page book, he gathered data from New Zealand and Europe. West Germany has about 2,000 deer farms, with herds ranging from 5 to 500 animals. Yet, West Germany also imports more than 20,000 tons of venison annually; its venison consumption is second to that of beef. He says venison has less cholesterol than beef or chicken and only about a fifth of the fat in most beef. Its caloric content is almost as low as chicken. To preserve tenderness, venison should not be cooked beyond medium rare.

U.S. restaurants import from 500 to 1,000 tons of venison annually, mostly from New Zealand, which has about 3,000 deer farms that mainly produce red deer and North American elk or wapiti, plus hybrids of these breeds.

A problem with deer or elk is the need for fence about 7 feet high, a major expense in getting started.

Jim Hoar, manager of the Lucky Star's deer as well as its Hereford cattle, said it costs 5 to 7 cents a day to feed a deer. A deer needs about a quarter of an acre for healthy roving, but uses only a seventh as much pasture as a cow and can share cattle feed such as corn silage. An animal slaughtered at about 15 months of age yields a 65-pound carcass bringing $5 a pound. Thus a feeding cost of less than $35 can bring a gross of about $325. This, however, does not count the cost of fencing, housing, land, slaughtering, or depreciation, as well as farming disasters such as marauding coyotes or vultures.

Lucky Star sells breeding stock at about $800 a head for does and $1,000 to $2,000 for bucks, depending on age. One buck can tend 40 does.

Like Lucky Star, elk cow-calf farmers Rush and Inez Johnson (R.R. 1, P.O. Box 199, Bucklin, MO 64631), report a 2-year backup on orders for stock from their 200 head of Rocky Mountain elk on their 1,600 acres. Rush has sold most elk calves at $1,200 to $1,500 by weaning time. He said a good manager should get a 20 percent return on investment. Elk meat is usually the highest priced item on restaurant menus, he said. But most of it comes from New Zealand at about $7 a pound, he indicated.

Small-scale entrepreneurs without their own butchering facilities usually can find a cattle slaughtering house to handle deer or elk.

Ostriches

Ostrichskin boots cost a bundle when they can be found. U.S. shoemakers once bought ostrich hides from South Africa. That source has been cut off by trading restrictions.

Several ostrich ranchers are in Oklahoma. First known to raise ostriches were Bob and Bernadine Moore, who bought some in 1981. Bob Moore died in 1987 and his widow and sons Randy and Scott carry on with exotic animals, birds, and catfish. (They had a llama until a "deer hunter" shot it.) In 1987 they began publishing "Ostrich News," an 8-page newsletter. ($18 for 10 issues per year, from Route 2, Box 415, Inola, OK 74036.)

Kenneth and Judy Roberts of Rush Springs, Oklahoma, say pairs of the breeding size adults bring $12,000 to $50,000, depending on age and quality. Ostrich chicks at last reports fetched $1000 apiece at 8 weeks of age, when sex can be distinguished.

Chicks are susceptible to nutritional problems and pneumonia unless kept well fed, warm, and dry. An ostrich hen can lay as many as 50 eggs a year but not all eggs hatch; too few owners have proper hatcheries.

Leon Vandiver (8200 Northwest 32d, Bethany, OK 73008), founder and elected president of the National Ostrich Breeders Association, claims ostrich meat is low in cholesterol and has a taste somewhat similar to beef. But so far, virtually no U.S. ostriches are being eaten or skinned for their hides. That way, they can live as long as 70 years and produce plumes.

Ostriches can become overstressed with abuse or teasing. They should not be left alone with small children; they don't understand the strength of their peck. Their big bills can snatch up a wrist watch, glove, ring, or buttons in an instant, Dale Coody reported in an article in the "ADAPT2" book.

He said 6 or 7 strands of strong, smooth wire is enough for fencing, since most adults with strong forward kicks can protect nests from coyotes or stray dogs. In urban areas, many owners use high chain-link fences.

Ostrich fancier Dale Coody has produced a 36-page how-to manual for beginners called "Ostriches: Your Great Opportunity." ($12.50 postpaid from 4-C Ostrich Farm, Route 1, P.O. Box 71A, Lawton, OK 73501.)

Free information on care and feeding of ostriches can be obtained from Dr. Fred D. Thornberry, Texas Agricultural Extension Service, Texas A&M University, College Station, TX 77843. Veterinarians with expertise include Dr. J.P. Hoover and Dr. Frank V. Lochner, Veterinary Medicine Department, Oklahoma State University, Stillwater, OK 74078.

Predicting prices in a few years at $50 per chick, Thornberry says, "Current prices appear completely unrealistic when related to potential profitability from an as yet unproven demand for skins, meat, and feathers." He expects the farmer's price for skins would not exceed $200.

Veterinarian Lochner treats many sick ostriches because their owners don't know how to feed or care for them. He said he has heard that the minimum operation for profitability under ordinary circumstances should have about 2,000 birds.

Exotic animals are not tax deductible except as part of a genuine commercial farm, according to rulings from the Internal Revenue Service.

Prepared by George B. Holcomb of the Office of Information, U.S. Department of Agriculture, for USDA's Office for Small-Scale Agriculture (Howard W. Kerr, Jr., Program Director). The address is: Office for Small-Scale Agricuture, Cooperative State Research Service/Office of Grants and Program Systems, Room 342-D, Aerospace Building, USDA, Washington, DC 20251-2200. (Telephone: Area Code 202-447-3640.)

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United States Department of Agriculture

Cooperative State Research Service

Office for Small-Scale Agriculture

A Small-Scale Agriculture Alternative

Dairy and Meat Goats

Since pre-Biblical times, goats have been the most useful of domesticated animals, producing milk for drinking or for cheese, gourmet meat (commonly called cabrito in the Southwest and chevon in the North), leather, and fiber for clothing (cashmere or mohair — not to be confused with Angora rabbit fur). Relatively clean, goats make fine pets and show animals, and number as many as 460 million in the world. They can be easily pastured with cattle as they prefer head-high grazing. Goats stress easily, so they need careful protection from dogs, and skillful management is necessary to prevent diseases and internal and external parasites such as lice, mites, and fleas.

According to USDA's Agricultural Research Service, goats produce as much as 4.5 million tons of milk a year worldwide. Goat milk is so popular that some people have begun raising dairy goats before knowing whether they can sell the milk or learning how to make cheese. Yet most major U.S. cities do not have liquid goat milk available in local retail outlets, according to research by Judy Kapture, Dairy Goat Information Services, P.O. Box 298, Portage, WI 53901.

In at least 21 States, goat milk must be pasteurized when retailed. Pasteurization requires a big investment in equipment. Even in areas where milk can be sold raw, producers must be licensed. Selling milk for human consumption requires extensive marketing to overcome resistance among consumers raised on cow milk. Price may be an obstacle, too — the cost of complying with the myriad regulations involved may force producers to raise the cost beyond the means of the average consumer.

Goat Milk Alternatives

Dairy goat owners might well follow the lead of feeder-calf producer Lillian Buckley of Laura, Illinois, who raises calves on goat milk. Originally, she milked the goats, bottled the milk, and then let newborn calves nurse from the bottles their first 10 to 12 weeks. This shortcut, including doe training, allows the calves to do the nursing directly. Ms. Buckley, her husband, Mike, and family raise up to 35 Holstein-Semental or Holstein-Angus crossbred feeder calves, using 25 goats. The family also feeds about 40 to 50 hogs and handles 50 acres of vegetables, emphasizing sweet corn.

Making goat milk soap is a great alternative to selling the milk for food, since soap producers do not have to comply with the costly regulations that pertain to food products. Elizabeth Lauer, a successful entrepreneur, started making goat milk soap because she was allergic to other soaps. Her business grew into the current Does' Pride Natural Goat Milk Soap, Home Soap Works, P.O. Box 317, Millington, NJ 07946; telephone 908-604-2170 or 800-542-7180.

Dairy Goat Information

Do you want to make goat cheese? Get a free catalog from the New England Cheese Making Supply Company. Contact: Ricki Carroll, P.O. Box 85-S, Ashfield, MA 01330; telephone 413-628-3808; fax 413-628-4061. Ms. Carroll advises that although their "Cheesemaker's Journal" is out of print, all back issues are still available. Beginning cheesemakers can refer to the Carroll's "Cheese Making Made Easy - 60 Delicious Varieties" (1982, $9.95 postpaid). "Goat Cheese: Small-Scale Production" ($8.95 postpaid) is also recommended for mold-ripened cheeses. For the more advanced cheesemaker, the Carroll's offer Jean-Claude Le Jaouen's 206-page book "The Fabrication of Making Farmstead Goat Cheeses," available for $22.95 postpaid. Le Jaouen is head of the Goat Research Section, Technical Institute of Sheep and Goat Research, Paris, France.

The American Cheese Society, 1523 Judah Street, San Francisco, CA 94122 (415-661-3844), publishes "A Guide to American Specialty and Farmstead Cheeses," by Barbara Lang, which includes a list of cow and goat cheese producers. Not all producers make all types of goat cheeses, which include blue, caerphily, camembert, cheddar, chevre, feta, semi-aged, soft ripened, shepherd's, tomme, and capriano. The last three are hard aged cheeses.

Don't want to produce cheese? Instead, you might try selling fresh goat's milk curd, which is used in sauces and from which cheese can be made. Coach Farms, the 800-goat farm at Pine Plains in New York's Hudson River Valley, delivers curd to New York City stores, where it sells for $10.98 per pound. Goat curd has a special cooking attribute — it enriches and thickens cooked sauces, yet does not break down or separate like yogurt or sour cream when heated. The fat content of goat curd is 7 grams, about half that of cream, and the curd may be kept in the refrigerator up to 3 weeks. Coach Farms also produces a goat yogurt that retails from $.99 to $1.59 for 4 ounces.

Some dairy goat producers also sell young goats for meat. One example is Hazel McTeer, former president of both the Missouri Goat Breeders Association and the Central States Dairy Goat Marketing Cooperative. Ms. McTeer operates the Fancy "M" Dairy Goat Ranch, Route 1, Box 545, Springfield, MO 65803. She says dairy goat people in her area sell about 500 kids annually, ranging in weight from 17 to 38 pounds. At Easter, when goat meat is very popular, the goats are trucked to New York City. The 1994 price is $1.00 per pound live weight.

Nondairy Goats

Some successful entrepreneurs stay away from dairy goats, concentrating on goats for meat, leather, or fine hair. Those with the greatest chance for success may be already pasturing sheep and/or cattle and can add some meat and/or Angora goats without damaging their pasture improvement programs. Goats eat some plants that sheep and cattle do not seek, so they can be pastured together.

Meat Goats

An economically inviting aspect of goat production is the raising of animals for meat. According to the Agricultural Research Service (ARS), goats of all sizes worldwide produce more meat (1.2 million tons a year) than do cattle or hogs. The tender meat of young goats is especially popular among U.S. communities whose citizens are of Middle Eastern, Asian, African, Latin American, and Caribbean heritage. Gourmet restaurants have long recognized the appeal of goat meat, which tastes almost exactly like venison, but without the "gaminess" some find distasteful.

As immigration rates increase steadily (approximately 60,000 monthly, according to the September 1994 issue of the "Cooperative Farmer"), new processing plants and marketing techniques designed to meet the needs of ethnic consumers are emerging. Chevon can be found nationwide in grocery stores specializing in global foods.

The Halal Meat and Food Corporation, opened in 1993 in the Blanden Industrial Park, 211 Bypass Road, Blandenboro, North Carolina 28320, telephone 910-648-6143, is the first USDA-approved halal plant. The company — whose Arabic name refers to the ritual slaughter of animals according to strict Islamic laws

— processes more than 800 goats and sheep and 90 cattle weekly. Processing plants receive their goats primarily from farms in Texas. The Nation's largest goat auction is at Junction, TX. Other high-volume auctions are in San Angelo and Goldwaithe, TX, Hackettstown, NJ, and Lancaster, PA.

Because the Muslim population is increasing significantly in the United States due to conversion of Americans and to immigration, halal goat meat can be found in most major American cities. According to a recent article in the Washington Post (8/31/94), there are more than 40 butcher shops in the Washington, DC, metropolitan area alone — seven side-by-side in the block-long Build America Skyline Shopping Center in Baileys Crossroads, VA. They cater primarily to international students and diplomats, but also to a growing customer base of non-Muslims who have learned to enjoy goat meat.

The meat goat industry is rapidly developing. Reports from the National Agricultural Statistical Service indicate that more than 300,000 goats were slaughtered for meat in 1993. A decade earlier, only 79,403 were processed. Most goat meat comes from excess dairy goats, spent Angora goats, and "brush" or "briar" goats.

Genetically speaking, except for the South African Boer Goats imported via New Zealand in early 1993, there are no true meat goat breeds in the United States. However, several goat farmers have developed intensive selection programs using Spanish and dairy crosses in order to pull together genes that would make a meatier goat.

Dr. Morse B. Solomon, at the USDA/ARS Meat Science Research Laboratory in Beltsville, MD, reports that roasted and broiled chevon provides red meat that is 50 to 65 percent leaner than beef and 42 to 59 percent leaner than lamb. These figures apply to choice and prime grades. The low-fat (low cholesterol) goat meat is a boon for nutrition-conscious consumers.

Among the goat producers persevering in the improvement of meat goats are Jay and Gayle Nellsch, P. O. Box 98, Ft. Cobb, OK 73938. They have bred goats for the last 8 years and are producing animals with meat production capabilities far superior to those of the foundation herd.

Since 1972, the 8-Mile Ranch, run by Jim and Elaine Willingham, P. O. Box 1828, Uvalde, TX 78802, has been selecting animals for adaptability to the environment of West Texas, multiple births, and soundness. Another enduring meat goat producer, Robert Kensing, Bowie Spring Meat Goats, P. O. Box 55, Menard, TX 76859, has been selling quality meat bucks since 1985. Due to the growing popularity of goat meat, the American Boer Goat Association (address listed below) was chartered in June 1993; breed standards were established and an animal registry was begun.

As the acceptance of goat meat increases in the United States, additional information is certain to be published for both producers and consumers. This publication is one of several from the U. S. Department of Agriculture's Office for Small-Scale Agriculture on various types of dairy and meat goats, and is meant to provide preliminary information only. The following associations and research institutes represent a cross-section of sources throughout the United States.

More Information:

Dairy Goat Journal
W2997 Markert Road
Helenville, WI 53137
414-593-8385

United Caprine News
P.O. Drawer A
Rotan, TX 79546
915-735-2278

American Dairy Goat Association
and
Dairy Goat Products Association
P.O. Box 865, 209 W. Main Street
Spindale, NC 28160
704-286-3801

American Meat Goat Association
P.O. Box 979
Mertzon, TX 76941
Executive Director: Kay Keen
915-835-5704
Southeast Regional Meat Goat Association
P.O. Box 99731
Raleigh, NC 27624-9731
919-676-1917

American Boer Goat Association
P.O. Box 248
Whitewright, TX 95491
1-800-414-0202

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804-281-1317

GEORGIA: Seyoum Gelaye, Director, Dairy Goat Research Center, Fort Valley State College, Box 5744, Ft. Valley, GA 31030; telephone 912-825-6817.

NORTH CAROLINA: M. Ray McKinnie, Extension Research Animal Science, North Carolina Agricultural and Technical State University, Greensboro, NC 27411-1011; telephone 910-334-7500.

OKLAHOMA: Nelson Escobar and Thian Hor Teh, Directors, E. "Kiki" de la Garza Institute for Goat Research, Langston University, Box 730, Langston, OK 73050; telephone 405-466-3836.

TEXAS: Scott D. Horner, International Dairy Goat Research
Center, College of Agriculture, Drawer U, Prairie View A & M University, Prairie View, TX 77446; telephone 409-857-3926.

UTAH: Sheep and Goat Research Center, Utah State University, Logan, UT 84322, telephone 801-797-1000.

VIRGINIA: Terry Gipson and Stephen Wildeus, Meat Goat Research Project, Agriculture Research Center, Virginia State University, Box 456, Petersburg, VA 23803; telephone 804-524-6716.

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United States Department of Agriculture

Cooperative State Research Service

Office for Small-Scale Agriculture

A Small-Scale Agriculture Alternative

Cashmere Goats

The world is beginning to give goats—nature's best herbicide—more attention. Leafy spurge—poisonous to some animals—is causing even people who laughed about goats to take a more serious look. When some Nebraska goats were taken on a demonstration tour, people could hardly believe the sight of goats walking through high brome grass to select out spurge heads!

But while most goats go for spurge, only cashmere goats also have the fiber of kings. And their owners now know better than to cross them with Angoraproducing goats. (Angora hair is another important fiber.) Australia and New Zealand breeders experimented with a cross to try to develop heavier fleeces. It proved to be a mistake. The crossed goats produced—cashgora—with limited uses and characteristics of neither cashmere nor mohair.

Demand Exceeds Supply

Demand for cashmere, the fine underdown from cashmere goats that has long been preferred by royalty, has always exceeded supply. Garments made of cashmere are prized for their unique feel. Cashmere is very soft, warm and long wearing. It feels much softer to the skin than wool, and while not as strong, cashmere outwears wool!

Cashmere goats are a type, not a breed. Most goat breeds, except Angora, can produce this down in varied quantities and may be called cashmere goats. There is no such thing as a "purebred" cashmere goat.

The fleece consists of the very fine, crimpy down and the usually longer, outside, coarse, straight guard hairs. A goat that does not display both types of fiber should be avoided.

Cashmere fibers must be separated, either by combing out the down or by using a commercial dehairer on sheared fibers. The longest, finest down is used in knitted garments and the shorter down in woven fabrics. The separated guard hairs go into rugs or hair canvas used in tailored garments.

The majority of the world supply of cashmere has come from Afghanistan, Iran, Outer Mongolia, India, and China. In recent years, when these countries' political disarray disrupted cashmere supplies, manufacturers began looking for more stable sources.

New Zealand and Australia have been producing cashmere for more than a decade. Breeding selection began even some years earlier with captured feral (wild) goats.

Selecting Breeding Stock

Prospective herd members can be selected from either dairy goat or meat goat sources. Cashmere down growth begins on about the longest day of the year and stops on about the shortest day. (Shortly after down growth stops it will be shed naturally if not combed or sheared.) Best time for goat selection is in the latter part of growth-stopping period; down quality can be easily assessed. The guard hair is parted to determine whether there is down underneath.

If the goat carries the gene for down, it can, over time, be developed into saleable amounts. The crimp is called the character or style of the fiber; a very tightly crimped down is most desirable. The diameter (measured in microns) of the fiber must be under 19 microns to be labeled cashmere. Select goats may have fiber as fine as 14 microns. The usual range is 16 to 19 microns.

A yield of at least 30 percent down is desirable, but is not the average by any means. Buyers pay on the down weight or weight of dehaired fiber, not the weight of the entire fleece. Prices vary over time.

Goats come in many colors and combinations of colors, but solid colored goats are much preferred. Cashmere down is either white, brown, or gray in solid colored goats. The less desirable down from mixed colored goats is classed either as white with color or mixed color.

Some U.S. growers have imported goats from Australia or New Zealand as a herd or as breeding stock to improve selected native goats. This might produce greater returns more quickly than would native stock alone.

Some Natives Are Good

There are, however, many very good goats among native breeds. Their fiber's diameter is apt to be smaller, but the length and yield of fiber are much less. The aim through selective breeding is to keep the finer diameter and increase the length and yield. Dramatic results in fiber are shown in crosses of imported bucks and native does, these crosses are called FI or bred-on crosses.

The Spanish meat goats from Texas and the Southwest provide cashmere breeding stock that also produces big meaty goats. Of the dairy breeds, Toggenburg, Saanen, and Nubian are being used with good results. Pygmy and Fainting goats are being used by some growers.

Large goats with wide, thick, meaty bodies bring in more income when sold for meat or culled. Large bodies can also produce more hair if they also have dense hair follicles.

The gestation period for goats is usually 150 days, but it can vary several days each way. The first kids can be expected 156 days after the buck goat is turned in the does. Kids are usually "dropped," as the term goes, from late February through April or early May.

As noted above, goats are browsing animals and can be pastured with sheep and cattle, since each species prefers different plants. Goats prefer brush, tree leaves, and rough plants. They are used for pasture improvement and in reforestation areas. Ranchers in the high plains find them most useful in controlling leafy spurge. Goats will also destroy multiflora roses and red cedars.

Breeding Does Need Extra Feed

When growing plants are not available, goats will need to have supplemental feedings of hay and, perhaps, grain. Does also need extra feed prior to breeding. Pregnant does need good feed in order for the fetus to develop hair follicles. To assure big growthy kids, nursing does need good feed.

In does, poor nutrition is the leading cause of abortion and poor mothering, with

younger or lighter weight does most likely to abort. Stress from disease, moving long distances, or cold wet weather also can cause abortions.

Does should be in good condition and gaining weight at breeding time. Young does should weigh at least 55 pounds and mature does at least 75 pounds sheared weight at breeding.

During pregnancy and lactation, does need almost 1/2 pound of crude protein daily. Supplement feeding must be started as soon as the goats begin to show a loss of top condition and/or weight. The rewards of improved nutrition are more and better kids and heavier fleeces. However, overfeeding of protein can cause fleeces to coarsen prematurely.

Goats should be given adequate nutrition both before and after shearing. Goats have neither the layer of body fat nor lanolin-laden wool that sheep have. So, goats sometimes need shelter from cold rains and chilling winds. If shelter has not been provided, goats may even die. Depending on weather variations, goats may need shelter for 4 to 6 weeks after shearing.

Not Many Triplets

Twins may account for 10 percent of births, most commonly in older does, with a much lower percentage being triplets. With proper management it is possible to get three kid crops within a 2-year period.

Does may be bred to kid when they are a year old if they have sufficient growth. Since male kids usually reach sexual maturity at 4 months of age, they should be removed from the herd to prevent accidental breeding.

Kidding problems are nothing any experienced livestock person would find unusual. Unless it is a breech delivery or a tough sack that does not break and allow the kid to breath or the doe is too small, there usually are no complications.

Due to lack of labor and facilities, large herds are usually kidded on the range, while many small herds use a more intensive confinement system to handle the goats. For open kidding, small pastures with some sort of shelter, centrally located watering and supplement feeding area, and a bedding area are required. This arrangement reduces the number of kids that get separated from the does.

On the range, does and kids should be left undisturbed for several weeks, since the does may abandon the kids. When goats are moved, pastures should be rechecked for kids that have been left behind.

A more intensive kidding system makes use of buildings, small individual stalls, heat lamps, and feeder space. With this type of system kidding can be done earlier in the year. However, such a system is much more labor intensive and therefore more expensive. A larger kid crop can be realized if the facility is well managed. Before kidding, the does should be outdoors—except in cold or wet weather or at night; this helps keep bedding clean and dry and encourages the does to exercise.

As does kid they should be moved into stalls and the kids' navels treated with 7 percent iodine. C and D antitoxin should be given. Cold kids will not try to suck and a heat lamp may be needed; they will usually suck by themselves when they are warm. Some kids may need help to begin to suck if does' teats are not adequately open. After identification with matching paint or ear tags, does and kids can be moved to group pens or holding areas after the kids are well established. Twins and triplets should not be grouped with singles since stronger kids often rob from the usually smaller multiple-birth kids. Likewise, the groups should contain kids of similar age.

Maintenance Pointers

As with sheep, internal and external parasites and pneumonia are a major health problem with all kinds of goats. Lice can be controlled by spraying after shearing. Coccidiosis is a threat to kids, both before and after weaning, and any kid not growing properly is probably infected.

Their hooves may need to be trimmed, depending on the walking conditions, but wear from rocky ground sometimes helps take care of this problem.

Working with a veterinarian, a grower should establish a good health care program that includes vaccination for most diseases.

Goats need special 4-foot-high fencing both to keep them in and predators—always a threat to kids—out. Goats like to go under or through obstacles. Five wire electric fences constructed with three hot wires and two grounded wires work well. Existing fences can be used with the addition of a 12-inch outrigger electric wire located about 12 inches above the ground.

Horns Handy, Sometimes!

Other types of small-mesh fencing may be used. Horns caught in the fence or the crotch of a tree become life-threatening, not only because of predators but also because of other goats. While most goats are not aggressive toward humans, they are not always kind to other goats who cannot defend themselves. They can quickly do serious or lethal damage with their horns.

A goat raiser soon discovers that horns are useful—as handles! A goat without horns is hard to control; some shearing stands even depend on horns when securing the goat for shearing. Unlike Angora goats, cashmere animals are sheared standing.

Care should be taken not to damage a young goat's horns by rough handling. A frightened or startled goat is apt to jump or flail around and handlers should always use caution to prevent injury from the horns—especially to eyes. For safety, both for other animals and the handler, sharp points of horns may be clipped off using a bolt cutter or similar device.

Sources of Information

The American Cashmere Growers Marketing Cooperative (ACGMC), P.O. Box 1105; Castle Rock, CO 80501 (Telephone: 303-621-2874). Its trade name is Cashmere America. Its manager, Terry Sim, is Australian-born and an Australian fiber classer.

Cashmere Producers of America (CaPrA); 1-800-FOR-GOAT; *Concerning Cashmere* (bimonthly publication from CaPrA).

Ranch Magazine; P.O. Box 2678; San Angelo, TX 76902. (915-655-4434)

Cashmirror Magazine; P.O. Box 639; Toledo, WA 98591. (206-864-4200)

By Harriet L. Jensen, R.R. 3, Box 144; Cozad, NE 69130, and George B. Holcomb of the Office of Public Affairs, U.S. Department of Agriculture, for USDA's Office for Small-Scale Agriculture (OSSA); Howard W. "Bud" Kerr, Jr., Program Director. OSSA's address: Cooperative State Research Service, USDA, Room 328-A, Aerospace Building, Washington, DC 20250-2200. Telephone: 202-401-1805; Fax: 202-401-1804

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December 1992

United States Department of Agriculture

Cooperative State Research Service

Office for Small-Scale Agriculture

A Small-Scale Agriculture Alternative

Angora Goats

Angora goats may be the most efficient fiber producers on Earth. These makers of mohair came from and were named after Ankara (Angora prior to 1930), the Turkish province where they have thrived for centuries. Turkey guarded these goats against exportation until 1849 when seven does and two bucks were imported into the United States. Later, more were imported from Turkey and South Africa, the two principal mohair producers in the 19th century.

But now the United States has become one of the two biggest producers (along with South Africa) of mohair—the long, lustrous, wavy hair that goes into fine garments. The other primary fiber from goats is cashmere. (See "A Small-Scale Agriculture Alternative, Cashmere Goats," December 1992.) Never the twain should meet! To cross Angora with cashmere goats results in a fiber called cashgora, with very limited use and characteristics of neither fine fiber.

The two goat types differ in temperaments, too. The Angoras are pretty laid back and docile, while cashmere and/or Spanish meat goats are often flighty and high strung. (Incidentally, Angora goats, which do produce mohair, do not produce Angora hair; only rabbits can produce that.)

Although Angora goats are somewhat delicate, they grow their fleeces year-round. This puts considerable strain on the animal and probably contributes to their lack of hardiness.

About 90 percent of the U.S. mohair clip originates in Texas, but the goats are raised over wide areas of the United States. They adapt well to many conditions, but are particularly suited to the arid Southwestern States. Central and southwestern Texas have all the major mohair warehouses.

Shear Twice a Year

Angora goats are sheared twice a year, before breeding and before kidding. The hair grows about 3/4 of an inch a month, and adult hair should be 4-6 inches long at shearing. Shearing most often follows the method developed by the Mexicans, with the goats lying down with legs tied. Shearing should be done on a clean-swept floor or sheet of plywood.

Care should be given to keep mohair clean and free from contaminants—weeds, grass seeds, or urine. Buyers severely discount unclean hair and hair showing second cuts. Fleeces should be bagged separately in 6-foot burlap bags. Not acceptable are polyethylene bags or poly twine.

Each bag should show the grower's name marked with a permanent-type felt-tip pen, be tagged, and contain only one fleece type clearly marked: Kid, yearling, young adult, adult, buck, and stained with spring or fall clip. Special problems, such as burrs or coarse, extra long, or short fleece, should also be listed on the tag. Buyers slit the bag's side when inspecting before buying; sellers must present a uniform product.

An adult goat usually will produce 8-16 pounds of mohair a year. Kid mohair should be 4 inches long, is finer, and may yield 3-5 pounds a year. Mohair fiber diameter ranges from 20 to 40 microns.

If kemp fiber (long, straight, hollow and brittle) shows up on any goats, especially along the backbone and thighs, such "kempy" animals should be culled, as suggested by the U.S. Mohair Marketing Board. Kemp fiber breaks easily and does not readily accept dye.

The U.S. Government has a direct-payment program for mohair producers to help maintain a viable industry. The direct payment through the U.S. Department of Agriculture's (USDA) Agricultural Stabilization and Conservation Service (ASCS) is based on the difference between the national average market price and a support price. In one recent year, producers received an average of $2.475 for every dollar's worth of mohair marketed. Details can be found at ASCS offices in many counties.

Selecting Bucks

Bucks should be chosen for body conformation and fine hair. Preferred are open-faced bucks not blinded by hair. Bucks should be left with does for 6 weeks. Angora goats are seasonally in estrus. The normal breeding season is from late September into December.

The gestation period for goats is usually 150 days, but it can vary several days each way. Kids are usually dropped from late February through April or early May. Twins may account for 40 percent of births, with a much lower percentage being triplets.

Fiber Comes First

Angora goats have high nutrient requirements and give nutritional advantage to fiber growth at the expense of other demands. Meeting nutritional needs should be the producer's main concern. Range forage of browse and forbs, protein supplements, grain and crop residues, and cereal crop pastures can help supply needed nutrients for growth and reproduction.

Goats, browsing animals, can be pastured with sheep and cattle; each species prefers different plants. Goats prefer brush, tree leaves, and rough plants. They can improve pasture, clear reforestation areas,

control leafy spurge, and destroy multiflora roses, red cedars, sand burs, knapweed, hound's tongue, Canadian thistle, sagebrush, buckbrush, giant ragweed, sunflowers, and many other weeds.

When growing plants are not available, Angora goats need supplemental hay and perhaps grain. While gaining at breeding time, young does should weigh at least 55 pounds (sheared weight) and mature does at least 75. Does need extra feed before and after breeding so fetuses can develop hair follicles.

During pregnancy and lactation, does need almost 1/2 pound of crude protein daily. Supplement feeding must start as soon as does begin to lose weight and condition. Improved nutrition brings more and better big growthy kids and heavier fleeces. Poor nutrition is the leading cause of abortion and poor mothering. Young or lighter-weight goats are most subject to abortion. Stress from disease, moving long distances, or cold wet weather also cause abortions.

Goats should be given adequate nutrition before and after shearing. Angora goats must be able to take shelter from wet and cold; great death loss can occur without shelter for 4 to 6 weeks after shearing. Goats do not carry layers of body fat, unlike sheep.

Kidding on the Range

Due to lack of labor and facilities, large herds are usually kidded on the range, while many small herds use a more intensive confinement system. For open-range kidding, small pastures with shelter, centrally located watering and supplement feeding areas, and bedding spots reduce numbers of lost kids.

Angora does and kids should be undisturbed for several weeks, since does may abandon their kids. When goats are moved, pastures should be rechecked for kids.

An even more intensive kidding system uses buildings, small individual stalls, heat lamps, and feeder space. This "system kidding" can be done earlier in the year but is much more labor intensive and therefore more expensive. But a larger kid crop can be realized with good management. Before kidding, does should be outdoors except in cold or wet weather or at night; this helps keep bedding clean and dry and encourages needed exercise.

As does kid, they should be moved into stalls and kids' navels treated with 7 percent iodine. C and D antitoxin should be given. Cold kids will not try to suck and may need a heat lamp. When warm, they will usually suck by themselves but may need help to begin. Angora kids, very sensitive to cold, can die within a short time if too chilled. Immersion in warm water to speed restoration of body temperature and then thorough drying may save severely chilled kids.

After identification with matching paint or ear tags, well-fed does and kids can be moved to group pens or holding areas. Twins and triplets should not be grouped with singles since stronger kids often rob milk from usually smaller multiple-birth kids. Groups should contain kids of similar age.

Parasites Trouble Goats

Among goats, major health problems are internal and external parasites, coccidiosis (in kids before and after weaning), and pneumonia. A good health care program includes vaccination for most diseases and should be established between a grower and a veterinarian.

Goats' hooves may need to be trimmed, depending on walking conditions. Rocky ground may take care of that problem.

Goats may need special 4-foot-high fencing to keep them in and predators out. Goats like to go under or through obstacles. Five-wire electric fences, with three wires hot and two grounded, make a good system. Woven-wire fences may be used with the addition of a 12-inch "outrigger" electric wire about 12 inches above the ground. Small-mesh fencing also may be used.

Horns caught in the fence or the crotch of a tree become life-threatening, not only from predators but also from other goats. While most goats are not aggressive toward humans, they are not always kind to other goats and in seconds can do serious or lethal damage with their horns. A goat raiser may find horns useful—as handles. For safety, both for the handler and for other animals, horns' sharp points may be clipped, using a bolt cutter or similar device.

Following are additional information sources on Angora goat production:

Mohair Council of America
P.O. Box 5337
San Angelo, TX 76902
telephone: 915-655-3161

Ranch Magazine
P.O. Box 2678
San Angelo, TX 76902
915-655-4434

E (Kika) de la Garza Institute
for Goat Research
Langston University
P.O. Box 730
Langston, OK 73050
405-466-3836

Texas A & M University System
7887 North Highway 87
San Angelo, TX 76901
915-653-4576

"Angora Goats the Northern Way"
Susan Black Drummond
Stony Lonesome Farm
1451 Sisson Road
Freeport, MI 49325

By Harriet L. Jensen, R.R. 3, Box 144; Cozad, NE 69130 (Telephone: 308-784-3312) and George B. Holcomb of the Office of Public Affairs, U.S. Department of Agriculture, for USDA's Office for Small-Scale Agriculture (OSSA); Howard W. "Bud" Kerr, Jr., Program Director. OSSA's address: Ag Box 2244, Washington, DC 20250-2244. Telephone: 202-401-1805; Fax: 202-401-1804.

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April 1993

Appropriate Technology Transfer for Rural Areas

Text Only Version

On-Line Publications List

- ATTRA Materials List
- Fundamentals of Sustainable Agriculture Series
- Agronomy Series
- Horticulture Series
- Livestock Series
- Pest Management Series
- Soil and Fertility Series
- Marketing & Business Series
- Value-Added & Processing Series
- Alternative Farming Systems Series
- Resource Series
- Planting Your Farm's Future Leaflets

webmaster@attra.org

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Appropriate Technology Transfer for Rural Areas

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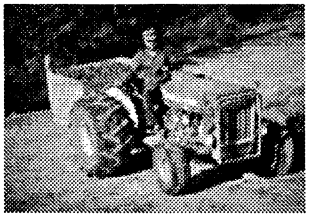
ATTRA - Appropriate Technology Transfer for Rural Areas - is the national sustainable farming information center operated by the private nonprofit National Center for Appropriate Technology (NCAT).



ATTRA provides technical assistance to farmers, Extension agents, market gardeners, agricultural researchers, and other ag professionals in all 50 states. Topics addressed by ATTRA can be categorized into three broad areas:

- sustainable farming production practices
- alternative crop and livestock enterprises
- innovative marketing

Technical assistance, publications, and resources are provided free of charge to appropriate users. ATTRA is funded through a cooperative agreement with the USDA Rural Business--Cooperative Service agency.

The National Center for Appropriate Technology is a 501(c)3 non-profit organization with programs in sustainable agriculture, rural development, renewable energy, and low-income housing. The ATTRA program is one of several sustainable agriculture projects managed by NCAT.

Appropriate Technology Transfer for Rural Areas
P.O. Box 3657
Fayetteville, AR 72702
1-800-346-9140
M-Th 8:30am-4:30pm CST
F 8:30am-12:30pm CST

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Appropriate Technology Transfer for Rural Areas

ATTRA

MATERIALS LIST

January 2000

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Soil Series
Resource Series
Livestock Series
Marketing & Business Series
Horticulture Series
Agronomy Series
Pest Management Series
Value-Added & Processing Series
Alternative Farming Systems Series

Introduction

ATTRA is the national sustainable agriculture information service that offers technical assistance and information free of charge to people and organizations involved with U.S. commercial agriculture, including full- and part-time farmers, Extension agents, agricultural support groups, researchers, educators, and agribusiness. Founded by the nonprofit National Center for Appropriate Technology (NCAT) in 1987, ATTRA is funded through a grant from the USDA Rural Business-Cooperative Service.

ATTRA specializes in responding to specific sustainable practices or enterprise questions. Our staff will research the question, summarize findings in writing, and compile supporting literature as appropriate to accompany the report which a caller receives by mail. On this list are ATTRA's current information packets on a host of sustainable agriculture topics.

In addition to providing customized research, we offer five types of standard materials within series, or families, of sustainable farming topics. When you receive our informational packets, you will notice subtitles on each which denote them as:

- **Fundamentals of Sustainable Agriculture Series**, *which covers broad topics of*

importance to sustainable farming advocates.

- **Systems Guides**, *offering broad treatments of topics that include inter-related systems.*
- **Production Guides**, *which focus on a specific crop or livestock series.*
- **Technical Notes**, *targeting specific sustainable ag methods.*
- **Resource Series**, *which identifies many helpful organizations, agribusinesses, services and informational materials.*

To order them, please call ATTRA's toll-free number 1-800-346-9140.

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FUNDAMENTALS OF SUSTAINABLE AG SERIES

Holistic Management: A Whole-Farm Decision Making Framework
A decision making framework that assists farmers and others in establishing a long-term goal, a detailed financial plan, a biological plan for the landscape and a monitoring program to assess progress toward the goal.

Integrated Pest Management
Uses, benefits, IPM and sustainable agriculture, monitoring, economic thresholds, planning, tools & options, microbial pesticides, useful information resources.

Making the Transition to Sustainable Farming
Goals of becoming economically, ecologically and socially sustainable, planning & decision-making, rotations & cover crops, developing a cropping mix, weed & pest management, key ideas.

Overview of Cover Crops & Green Manures
Soil benefits from cover crops, nitrogen production, weed suppression, cover crops in rotations, pest management benefits, economics, many sources of additional information.

Sustainable Soil Management
Covers the components of the living soil, soil organisms, and organic matter, fertilizers, and soil quality. Provides ways to assess soil health, build soil, and manage the soil livestock. Complete with resource list of additional information.

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SOIL SERIES

Alternative Soil Testing Laboratories (available only in print)
Labs are in two broad categories: (1) humus, organic matter, and microbial analysis, and (2) mineral analysis and fertilizer recommendations. References for soil quality and alternative fertility.

Farm-Scale Composting Resource List
Suggested reading, compost references, associations, web links, software, magazines, email lists, bibliographies.

Overview of Cover Crops & Green Manures
Soil benefits from cover crops, nitrogen production, weed suppression, cover crops in rotations, pest management benefits, economics, many sources of additional information.

Nonconventional Soil Amendments (available only in print)
Mineral powders, plant & animal byproducts, seaweed, growth regulators, inoculants, enzymes, micronutrients, dusts/powders.

Sources for Organic Fertilizers & Amendments
A listing of manufacturers, national distributors, major regional distributors, and mail-order sources.

Sustainable Soil Management
Covers the components of the living soil, soil organisms, and organic matter, fertilizers, and soil quality. Provides ways to assess soil health, build soil, and manage the soil livestock. Complete with resource list of additional information.

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RESOURCE SERIES

Sustainable Farming Internships and Apprenticeships

K-12 Sustainable Agriculture Curricula
Education, curricula, publications, electronic resources.

Sustainable Agriculture Organizations & Publications

University Programs and Contacts

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LIVESTOCK SERIES

Avian

Sustainable Chicken Production (available only in print)
Housing, breeds, feeding, health, marketing.

Ratites: Ostrich, Emu, Rhea (available only in print)
Brief history, considerations before investing, marketing options.

Beef & Dairy

Alternative Beef Marketing
Value-added beef, lean beef, direct marketing, cooperatives, niche markets: organic, natural, pasture-finished.

Sustainable Beef Production
Grazing & feeding options, low-stress handling, alternative parasite control, environmental & social concerns.

Beef Farm Sustainability Checksheet
Assessment tool to help plan a whole farm in which beef production is a major enterprise. Management of animals, forage, soil, watershed, marketing, economics and goal-setting are addressed in the 200 questions.

Grass-Based & Seasonal Dairying
Pasture as primary feed source for dairy cattle; seasonal production to reduce feed costs.

Fish & Worms

Evaluating an Aquacultural Enterprise
Considerations (physical, biological, financial), culture and species options, resource lists.

Worms for Composting (Vermicomposting)
Describes systems that use worms to process animal and other organic wastes; gives commercial examples of various types; provides a sample production budget; suggestions about marketing included; lists many further resources, both print and electronic.

Grass Farming

Assessing the Pasture Soil Resource
How to take a soil sample and an easy way to assess soil biological activity and water infiltration. Assessment sheet included.

Matching Livestock and Forage Resources in Controlled Grazing
Grazing objectives, maintaining botanical balance, encouraging rapid growth, compromising between yield and quality, minimizing mowing, producer goals.

Meeting the Nutritional Needs of Ruminants on Pasture
(available only in print)
Impact of grazing management on nutrition, supplemental feeding on high quality pasture, feed profiling, feed budgeting, matching livestock and forage resources for efficient pasture use.

Nutrient Cycling in Pastures
Examines elements of pasture ecology, including soil organisms, plants, and animals. Discusses their interactions and ways to enhance nutrient cycling with minimal losses to air or ground and surface waters.

Introduction To Paddock Design And Fencing-Water Systems For Controlled Grazing
Designing a controlled grazing system, determining paddock size based on forage availability for the number of animals grazed, shape of the paddock based on landscape and other variables, purchasing fencing items, water systems, sources.

Rotational Grazing
How to manage pastures and grazing animals to more profitably utilize the farm's resources.

Sustainable Pasture Management (available only in print)
Managing fertility and pests, grazing systems, conserved forages, maintaining productivity, additional resources.

Hogs & Sheep

Sustainable Hog Production Overview
Breed selection, feed alternatives, odor and dust problems, waste and crop nutrient management, health, humane concerns, vertical integration, identifing an alternative marketing niche, and sources of additional information.

Alternative Marketing of Pork
Commodity vs. direct marketing, what is direct marketing, niche markets such as organic and ethnic, direct market consideration and channels, and sources of further information.

Hooped Shelters for Finishing Hogs
Hooped shelter design, purchasing a complete or noncomplete shelter, deep bedding, cost, sources for additional information.

Sustainable Sheep Production (available only in print)
Pasture & range grazing, alternative health strategies (parasites & diseases), marketing, industrial development, sources for additional information.

Other Livestock

Bison Production
Advantages and disadvantages of raising bison, information on pasturing, fencing, and handling of bison, as well as marketing options, and diseased and parasites of bison. Sources of additional information are also provided.

Pest Management

Integrated Parasite Management for Livestock
A system approach to assess and manage the soil, forages and animals to decrease internal

parasites and their effects.

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MARKETING & BUSINESS SERIES

Holistic Management: A Whole-Farm Decision Making Framework
A decision-making framework that creates a link between sound economics and the environment. Managing people, land, and money in a responsible way. Framework to evaluate sustainability of farm decisions.

Organic Certification
Comprehensive list of organic certification organizations.

Community Supported Agriculture
Examining the full spectrum of CSA arrangements from subscription marketing to "shareholders," including success factors, financial concerns, profiles, management challenges.

Direct Marketing
Importance of marketing, market research, niche marketing, value-added marketing, pricing, promotion, related resources.

Farmers' Markets
Information for organizing a market and for selling at market.

Pick Your Own & Agri-Entertainment
Covers advertising, crops, facilities, and pricing for pick-you-own crops and various forms of agri-entertainment.

Resources for Organic Marketing
Pondering the options, proactive approach, national and regional organic trade organizations and publications, market research studies, many contact sources.

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HORTICULTURE SERIES

Flowers, Mushrooms

Field Grown Cut & Dried Flower Production & Marketing
(available only in print)
Marketing, climate, trade organizations, conferences, literature, species list.

Mushroom Cultivation & Marketing

General review of cultivation technologies (including shiitakes), enterprise evaluation, further research resources.

Phenology Web Links: Sequence of Bloom, Floral Calendars, What's in Bloom
Links to web sites that discuss phenology as a tool for observing seasonal events in nature such as emergence of crop pests. Other sites link to data on sequence of bloom, floral calendars, and what plants are blooming in gardens and arboertums. .

Fruit Crops

Overview of Organic Fruit Production
Fertilization, pests, weed control, obstacles.

Organic and Low-Spray Apple Production
(temporarily available only in print)

Organic Blueberry Production
Highbush, fertility, insect pests, diseases.

Organic Culture of Blackberries and Raspberries
Diseases, pests, resistant varieties.

Organic Grape Production
(temporarily available only in print)

Pawpaw Production
Culture, research, markets, pesticidal properties.

Strawberries: Organic & IPM Options (available only in print)
Fertility, weed control (cultural, biological and mulches), insect and mite control, disease control, symptoms and identification, alternatives to Methyl Bromide, references.

Herbs

Echinacea as an Alternative Crop (available only in print)
Production of Echinacea root as raw material for the herbal supplement industry.

Ginseng, Goldenseal & Other Native Roots
Status of ginseng and related (opplopanax, Siberian ginseng, sarsaparilla), goldenseal and black cohosh (related), and blue cohosh as alternative root crops for the herbal supplement industry. Includes USDA bulletin. (Online copy does not include bulletin.)

Herb Overview
Marketing strategies, trade organizations, literature, conferences, consultants, resource list.

Lavender as an Alternative Crop
Medicinal herb, essential oils, climate zone, uses, resources.

St. Johnswort as an Alternative Crop

Evaluation of St. Johnswort as an alternative U.S. farm crop (raw materials for the herbal supplement industry).

Nut Crops

Agroforestry Overview
Alleycropping, silvopasture, shelterbelts, buffer strips, forest farming, costs, marketing, products, resources.

Black Walnut Agroforestry (available only in print)
Culture of black walnuts for timber/crops, marketing, other resources.

Sustainable Pecan Production
Native pecan groves, papershell orchards, northern varieties, general culture, agroforestry, pests, diseases.

Vegetable Crops

Organic Allium Production
Discusses all alliums (onions) except for garlic. Information is presented on varieties, culture, soils and fertility, irrigation, integrated pest management (including weeds, insects, and diseases), harvest, postharvest, and economics.

Companion Planting
The scientific and traditional bases for plant associations are discussed. A companion planting chart for common herbs, vegetables and flowers is provided, along with a resource list.

Manures for Vegetable Crop Production
Discusses problems associated with using both raw and composted manures for commercial vegetable growing and suggests some solutions.

Organic Sweet Corn Production
This publication features traditional ideas and current concepts for fertility, pest management, and marketing of a popular vegetable crop.

Sprouts and Wheatgrass Production
Hydroponic and shallow bed methods to sprout vegetable and cereal grain seeds. Food safety issues are addressed. Books, seed suppliers, and equipment sources are listed.

Organic Tomato Production
Organic certification, economics, variety selection, crop rotation, fertility, weed management, training systems, insect and disease control, resources and web links.

Related Topics

Alternative Pollinators: Native Bees
Discusses using solitary bees (non-honeybees) for pollination. Includes information on how to attract and raise alkali bees, bumblebees, leafcutter bees, mason bees, sweat bees and

others. A list of suppliers of bees and bee equipment is also included.

Alternative Seed Suppliers: Untreated, Heirloom, Organic
Some sources for hard-to-find untreated, heirloom and organic vegetable seed. Includes electronic contacts.

Organic Potting Mixes
Describes potting mix ingredients and appropriate mixes for organic and sustainable operations; extensive listing of prepared mixes and suppliers.

Postharvest Handling of Fruits & Vegetables
A guide to maintaining produce quality and safety for the market gardener.

Sustainable Small-Scale Nursery Production
Container and field production, irrigation and runoff, weed control, integrated pest management, fertilization, potting media, marketing, costs, sources for additional information.

Season Extension Techniques for Market Gardeners
Cultural practices, mulches, floating row cover, slitted and punched row cover, cold frames, high tunnels, shade cloth, economics, sources for additional information.

Solar Greenhouse Resource List
List of resources available on construction, operation and manufacturers of solar and small-scale greenhouses.

Grass/Turf

Sustainable Turf Care
Least-toxic practices, compost, irrigation, variety selection, mowing, insect & disease management, weed management, references, organizations, reading, databases, supplies.

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AGRONOMY SERIES

Agroforestry Overview
Alleycropping, silvopasture, shelterbelts, buffer strips, forest farming, costs, marketing, products, resources.

Alternative Agronomic Crops
(temporarily available only in print)
Considerations before diversifying, marketing alternative crops, and sources of additional information.

Alternative Soil Testing Laboratories
Supplies a range of soil testing labs and supplies that support the special analytical needs

of farmers using organic or sustainable methods of production.

Intercropping Principles and Production Practices
Implementing nature's principle of diversity on the farm. Intercrop concepts, production, and management with examples.

Principles of Sustainable Weed Management For Croplands
Root cause of weeds, understanding weed banks & germination, monoculture vs biodiversity, management strategies, costs.

Sustainable Corn & Soybean Production
Tips and ideas for successful corn and soybean production with minimal inputs and limited environmental impact.

Use of Baking Soda as a Fungicide

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PEST MANAGEMENT SERIES

Integrated Pest Management
Uses, benefits, IPM and sustainable agriculture, monitoring, economic thresholds, planning, tools & options, microbial pesticides, useful information resources.

Integrated Pest Management for Greenhouse Crops
Monitoring, sanitation, biological controls, biorational pesticides, insect growth regulators, disease control methods.

Greenhouse IPM: Sustainable Aphid Control
Focuses on monitoring sanitation, biological controls, biorational pesticides and insect growth regulators.

Greenhouse IPM: Sustainable Thrips Control
Controlling thrips in the greenhouse with biological controls, biorational pesticides, and planning, tools & options, microbial pesticides, useful information resources.

Alternative Nematode Control
Nematode suppressive cover crops, crop rotations, soil solarization and steaming, nematode suppressive soil amendments, references.

Compost Teas for Plant Disease Control
Diseases for which compost extracts are effective, suppressive effects, active components, fermented versus aerated, Weltzein and Brinton fermentation method, Cantisano and Luebke aerobic method, extraction variations, references, suggested reading.

Disease Suppressive Potting Mixes
How they are developed, suppressing pathogens through general competition or specific

microbial antagonists, using peat moss, compost systems and analysis, other natural disease control methods, suggested reading, suppliers.

Farmscaping to Enhance Biological Control (available only in print)
Description & benefits, strategies & techniques. Tables include Plants that Attract Beneficials, Pests and Associated Beneficial Insects, and Seed Blends to Attract Beneficial Insects.

Late Blight in Potatoes: Alternative Controls
New strains of late blight have given rebirth to an old pest problem. Organic management options are available and are outlined in this publication.

White Mold on Soybeans: Alternative Controls
White mold is a fungal pest associated with intensive soybean production practices. This publication addresses the key strategies and options for control.

Use of Baking Soda as a Fungicide
Discusses the use of sodium and potassium bicarbonate sprays to control powdery mildew and other foliar fungal diseases. Also includes recommendations for use.

Fire Ant Management
Least-toxic options for suppression of fire ants.

Grasshopper Management
Focuses on preventive management, non-chemical strategies,cultural and biological controls.

Management Alternatives for Thrips on Vegetable & Flower Crops in the Field
Organic control options for this common insect pest are described in detail. Information is especially relevant to onion growers.

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Value-Added & Processing Series

Grain Processing
Profiles of farmers who are processing grains, from whole-wheat flour to baked goods. Resource list for additional information, supplies, and equipment.

Overview: Adding Value to Farm Products
Presents the basic concept, keys to success, sources of information on business planning and regulations.

Small-Scale Food Dehydration: A Resource List
Describes dehydration process, equipment and designs and lists resources for more information.

Small-Scale Oilseed Processing
Description of basic process, including a low-tech method for small-scale processing of sunflower seeds. Provides list of sustainable raw materials, sources for equipment, and additional information.

Soy Foods
Introduces a few of the food products made from soybeans, and basic process for tofu. Describes sources for in-depth processing and marketing information.

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ALTERNATIVE FARMING SYSTEMS SERIES

Biodynamic Farming & Compost Preparation
History, concepts, biodynamic preparations, compost preparation, herbal teas, planetary influences, companion planting, community supported agriculture, research, web links and resources.

Introduction to Permaculture
Introduction, definitions, characteristics, practical application, ethics, principles, resources, book, email chat groups, web links.

Radionics in Agriculture (available only in print)
Introduction and history of radionics, instruments for plant and animal diagnosis and treatment, uses (analysis, evaluation of materials, vitalization), resources.

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UNIVERSITY OUTREACH
University Extension
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LINCOLN UNIVERSITY

Vol. 6, No. 3
May–June 1996

Ag Opportunities

• Small Farms
• New Family Farms
• Agricultural Alternatives

"Choosing Your Enterprises: A Checklist"

(Reprinted with permission from *"Sell What You Sow"* by Eric Gibson)

Personal and family considerations

* Have you identified goals and objectives for your business and personal life?
* Have you conducted a full inventory of your resources (human, physical and financial) which can contribute to accomplishing these goals and objectives?
* Are you willing to make sacrifices required to make this enterprise profitable (time, changes in lifestyle, privacy)?
* What do you wish your business to look like five years from now, and what are some intermediate steps or objectives required to get there?

Inventory resources

* Physical resources: land, soils, climate, water, buildings, machinery and equipment;
* Management and labor resources;
* Local marketing options available;
* Financial resources;
* Miscellaneous: sources of information, suppliers, processors and distributors;
* Time

Identify enterprises

* Current and potential buyers, produce managers, books, magazines and publications, seed companies, chefs, etc.

Enterprise feasibility

* Is this enterprise technically feasible for your location given the following factors: climate, soils, water, insects, diseases, growing season?
* What are the building, machinery, equipment, management and labor requirements? If you don't have the necessary resources, what is the cost (in dollars and time) of acquiring them? Do you have the facilities to pack, package and ship the product?

Market factors

* Have you clearly defined what your product/service is (features such as size, quality, varieties, etc. and benefits to buyer or user)?
* Are there markets for the product, and if so, what is your target (niche) market(s)?
* Market outlet alternatives;
* Geographic location of market(s);
* Demographic characteristics (age, income, etc.);
* Behavioral characteristics (lifestyle, etc.);
* How large is the existing market demand?
* Number of potential buyers;
* Annual per capita consumption;
* Average purchase per buyer:
* Can the market be created or expanded to absorb an increased supply of the commodity? Are advertising and promotion efforts worthwhile?
* What are the favorable market windows for the product? (Compare historical prices against projected costs per unit);
* Does the market demand specific grade/quality/size standards?
* What is the cost of transportation to the targeted markets?
* Are there any middlemen services involved (brokers, wholesale distributors, etc.)? If so, do they have any specific requirements (delivery, volume, etc.)?
* How many competitors are located nearby? What do you have to offer to surpass your competitors?
* What prices does the market offer and how steady are those prices? What is the highest price and the lowest price you are likely to receive and what conditions create these price situations?
* What is your expected sales volume? What is the minimum and maximum volume of product you believe you could sell in one year?

If your market research shows that supply already exceeds demand for the product/service being evaluated, or that the trend is one of declining consumption and/or prices, do not pursue the enterprise any further. If your market research is favorable, continue with the following considerations.

Financial considerations

* Once you are in full production, what are the expected costs and returns (enterprise budgets)?
* What will be the impact of varying yields/production levels on profitability?
* What are the costs of production given varying climatological and pest problems?
* Are you able to acquire the necessary start-up capital to establish the enterprise? What about the annual operating funds necessary to continue the enterprise?
* What is the impact of the new enterprise on the profitability of any existing enterprise?
* Is the proposed enterprise complementary or supplementary to existing enterprises, or does it compete with them? If so, what is the impact on the profitability of the other enterprises?
* How will the additional costs and returns of the new enterprise affect the cash flow of the business?
* How will investment of additional resources and the diversion of existing resources from present uses affect the financial risk position of the farm?

Miscellaneous considerations

* Are there any legal restrictions, regulations or liability factors associated with the new enterprise?
* Does the enterprise require any special recordkeeping to provide information for both management decisions and/or government reports?
* Does the enterprise require an abundant or continuous supply of special production inputs?
* Will the proposed enterprise limit off-farm employment opportunities?

If you have satisfactorily answered all of the questions from this checklist, you probably have enough information to make a decision about the new venture. If you decide to go ahead with the enterprise, you should now develop an implementation plan, including a business development plan that specifies a timetable, production schedule, marketing plan, management structure and financial plan.

"The Farmers' & Gardeners' Resource Catalog" has dozens of agricultural, gardening and herb books and reports. For a free copy, contact Eric Gibson, New World Publishing, 3085 Sheridan St, Placerville, CA 95667, 916-622-2248; email-newworld@innercite.com; WWW - http://www.innercite.com/~newworld

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AFSIC staff create and publish **Quick Bibliographies** (QBs), **Special Reference Briefs** (SRBs) and **Agri-Topics** (ATs). These publications focus on specific topics of current interest. QBs are bibliographic in nature, and are reflective of materials contained in the National Agricultural Library collection and/or indexed in NAL's database, AGRICOLA. SRBs and ATs provide a broader picture of a topic, including descriptive text and internet and organizational resources, as well as suggested reading lists.

The publications on this list are available either in **hardcopy [ ]** or in **electronic format ( )**. Electronic versions, ASCII text, are distributed on diskette, or may be downloaded from the AFSIC Web Site. You may order the publications in hard copy and/or on diskette, as available. (Most publications are too lengthy to be sent via e-mail.) In addition to these recent publications, many older publications dating from 1992 to the present are presently available **only** in electronic format. They are listed separately. *Please indicate format you desire by checking the relevant column and by indicating format preference at the end of this list.*

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[ ] Check here if you wish to receive information about the *AFSIC series of videotaped oral history interviews* with leaders in the sustainable agriculture movement.

The Center also has a limited number of copies of the following hardcopy publications to distribute:
[ ] *Alternative Agriculture*, National Research Council, 1989, 448 p.
[ ] *Aquaculture Overview*, G. Lewis & J. Shelton (Univ. of GA Extension Service), 1994, 8 p.
[ ] *Lost Crops of Africa*, vol. 1, Grains, National Academy of Sciences, 1996, 383 p.

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Availability of databases and documents available for searching on-line is increasing rapidly. For a detailed list of electronic databases related to agriculture, available to our staff, please contact us. We will be happy to share our publication, "Finding Information and Information Resources Through Tools Available at the Alternative Farming Systems Information Center."

You may also wish to review the resources at the Agricultural Network Information Center (AgNIC). A searchable compilation of electronic databases with information on how to access each one is available at the AgNIC Web Site, http://www.agnic.org/agdb/

Greenbook '99

A Decade of Tools

Energy and Sustainable Agriculture Program
Minnesota Department of Agriculture
90 West Plato Boulevard
Saint Paul, Minnesota 55107
651-296-7673

August 1999

Compiled by the Energy and Sustainable Agriculture Program Staff
Edited by Prescott Bergh

Our Cover. Front cover, clockwise from upper left: Dennis Rabe, Mark and Nancy Moulton and family, Jaime DeRosier, ESAP rainfall simulator, Phil and Dawn Brossard and family, Renne Soberg. Back cover, clockwise from upper left: Hans Kandel, Steve Stassen, Richard and Leila Arndt, Ken Winsel, Midwest Food Connection, Howard Kittleson, Jon Peterson.

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INTRODUCTION TO THE GREENBOOK

For 11 years, the Energy and Sustainable Agriculture Program (ESAP) at the Minnesota Department of Agriculture has been providing grants for farmers, researchers and educators to experiment with new and innovative farming practices and systems through the Sustainable Agriculture On-Farm Demonstration Grant Program.

Our understanding of sustainable agriculture has grown rapidly in that time. In the early years, we focused mostly on the environmental and economic aspects of farming. Today, we look at the impacts of farming both on and off the farm, in watersheds, and in local and international markets. Today's sustainable agriculture looks beyond simply how a particular practice affects the farm itself. It also asks how this practice affects communities and ecosystems.

Each year, ESAP publishes the *Greenbook,* which highlights the work of farmers, researchers, and educators who are willing to take the risks of discovery. These people are the vanguard of sustainable agriculture, testing new and innovative ideas and in the process expanding our understanding of what sustainable agriculture means. Many of these projects will become common farming practices around the countryside in the next few years.

The *Greenbook* also includes updates about other ESAP activities in the areas of the Sustainable Agriculture Loan Program, soil quality, whole farm planning and organic farming. There are also several thought-provoking essays on the experience of some early grantees with this diverse program.

The sustainability of Minnesota agriculture is vitally important for our economy, our environment, and our communities. I hope you find this issue of the *Greenbook* interesting and full of new ideas that will help you make your life more sustainable as well.

Gene Hugoson, Commissioner
Minnesota Department of Agriculture

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