



# Herb Production in Organic Systems

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The emphasis of this publication is on research into organic herb production in the U.S. and implications for herb production under the National Organic Program regulations.

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The term “herb” is very broad—generally applied to plant species (both annuals and perennials) used for culinary, medicinal, fragrance, or certain landscaping purposes. Methods of production include forest farming, greenhouse/hoop-house, field, raised bed, hydroponic, or pot culture. For more information about herb production and marketing, see the list of related ATTRA publications, page 13.

Federal regulations now control the labeling and marketing of organic products. Certification by a USDA-accredited certifier is required in order for producers and processors to display the USDA seal. ATTRA’s *Organic Farm Certification and the National Organic Program* provides an overview of organic certification. *NCAT’s Organic Crops Workbook* provides guidance for applying

USDA regulations to the basic techniques and methods used in organic growing.

## Why grow organic?

The Organic Farming Research Foundation estimates that, as of 2001, “there [were] approximately 7,200 certified organic producers in the U.S.”—an increase of 18% from the previous survey (1)—with 2.07 million acres under organic cultivation. Retail sales of organic foods have grown from 20 to 35% worldwide for the past 10 years.(2) Based on a 2002 informal poll of certifiers (3), about 1000 U.S. firms, including on-farm processors, manufacture organic products (mostly foods). As of 2004 the Agricultural Marketing Service of USDA reports that 30% of culinary herbs sold in the U.S. are produced organically. *NewFarm.com* now

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## Farm Profile: Developing Marketing Strategies for Culinary and Medicinal Herbs

**Objectives:** The Indian Springs Farmers Association (ISFA) assists small farmers in diversifying their farm operations via alternative crops. In partnership with Alcorn State University, the Federation of Southern Cooperatives, and other nonprofit partners, the Mississippi Association of Cooperatives and the Foundation for the Mid-South participated in training African-American small farmers from ISFA in the production and test marketing of fresh and dried medicinal and culinary herbs.

**Outcomes:** Six farmers participated in the trials and grew 32 acres of herbs, in addition to constructing 5 raised beds of 100 sq. ft. each. They found that picking directly into half-bushel plastic containers with holes in them was more efficient than the conventional 5-gallon buckets—allowing them to save time and labor by washing the herbs in the picking containers. An 8-ounce clamshell was the customer-preferred retail container. ISFA developed markets at the Crescent City Farmers' Market in New Orleans, Louisiana, and Alliant Food Services, Inc. (Selling fresh herbs by mail order was dropped because of quality considerations.)

**“They found a ready market for medicinal and culinary herbs. They also found, perhaps due to the nature of the product, that many customers asked for 100 percent certified organic products.”**

*Summary and quotation from USDA/SARE Farmer-Rancher Grant FS00-118, Final Report, 2002. [www.sare.org](http://www.sare.org)*

provides weekly reports on sales of organic herbs at the 18 U.S. wholesale produce terminals, and it is recruiting a network to provide regular reports on the 50% of organic herb sales thought to occur through direct marketing channels. (Reports on selected organic herb sales appear monthly in *Growing for Market*.)

## The beginning organic producer

Many herb producers in the U.S. start as hobby growers interested in the culinary, aromatic, medicinal, or ornamental qualities of herbs. Only a few acres are needed to begin selling on a small scale, as opportunities present themselves, although a few large corporate herb farms do exist. Fresh-cut culinary herbs, plugs, and potted herb plants are produced in greenhouses. A relatively small number of farmers have been able to secure production contracts for herbs. To

For information on alternatives to raising grains and other commodities, see the ATTRA publication *Moving Beyond Conventional Cash Cropping*.

improve farm income, no type of herb has proved to be a satisfactory alternative for U.S. corn, soy, or wheat producers. The typical U.S. herb farm is a small rural business that adds value in some way to a mix of mostly perennial herb crops and uses alternative marketing methods.

The Dietary Supplement Health and Education Act (DSHEA) of 1994 codified manufacturing of products based on “medicinal herbs.” The conventional flavoring and fragrance industry, which depends, in part, on herbs, has its own standards. Sales of encapsulated herbs rose steeply from 1994 to about 1998—then plateaued. Some products saw a steep decline in sales. No separate information is available on sales of products made from organic herbs. The organic labeling status of dietary supplements has recently been clarified (see box). Materials come from five or six large botanicals dealers, networks of contract growers, or vertical integrators.

Two rulings by the National Organic Program in 2005 potentially affect herbal products. NOP has posted a memo to certifiers saying that any product meeting the Final Rule may be certified, and if it meets the requirements for “100% organic” or “organic,” it may use the USDA Organic seal. ([www.ams.usda.gov/nop/NOPPolicyMemo08\\_25\\_05.pdf](http://www.ams.usda.gov/nop/NOPPolicyMemo08_25_05.pdf)) This memo reverses an initial decision to disallow organic certification for some categories of products derived from certified organic agricultural products, including personal care items.

Another ruling makes it more difficult to use non-organic agricultural ingredients (such as small amounts of essential oils used for flavoring or fragrance) in otherwise organic products, even when organic counterparts are not available. (See [www.ota.com/pp/usregulatory/index.html](http://www.ota.com/pp/usregulatory/index.html).)

It usually takes several years for a beginner to learn what works in growing and marketing a particular herb crop. This can involve extensive travel to attend conferences and visit other operations, as well as gathering information from the Internet, reading, and talking with other growers. Much of the necessary knowledge and expertise must come through experience and through

face-to-face communication. The pioneers of herb farming in the U.S. 15 years ago kept many details of their operations secret. Some well-known herb farms and businesses have recently become part of international corporations.

## Harvesting wild herbs growing on your land

Ginseng, goldenseal, blue cohosh, black cohosh, bloodroot, willow bark, and other native plants grow in undisturbed woodlands in the Appalachians and Ozarks. Ephedra, echinacea, and cascara sagrada are among hundreds of plants found in the arid West.

To certify land or a portion of land intended for wild harvest, the NOP rule is relatively uncomplicated, and wild-harvested plant parts or seeds may be sold as organic under certain conditions. Using a fungicide to “save the crop” is prohibited if it is to be labeled organic. In practice, if your entire farm has completed the three-year transition process and is certified organic by a USDA-accredited certifier, all wild plants, trees, and weeds on it are also considered organic and may be marketed as such. Be aware that many states require that ginseng be harvested only in the fall, after fruiting, and that the berries be replanted immediately.

A list of resources for identifying unfamiliar wild plants is provided below. Undisturbed native woodlands, prairies, or deserts are the most likely places to find them. The Conservation Security Act may provide landowners in certain selected watersheds financial incentives for preserving native woods and wetlands and other undisturbed habitats, as well as for using organic methods of production. Provisions are administered by local conservation committees that require good record keeping for a minimum of two years before applying for grants.

More information on possible income from woodland alternatives, other than timbering, may be found in ATTRA’s *Agroforestry Overview* and in U.S. Forest Service publications on special forest products.



*American ginseng (Panax quinquefolius) growing in the Ozark Mountains. Photo by Katherine Adam*

Plants found growing wild in disturbed ground (old fields) rarely have much economic value, although a few entrepreneurs have developed markets for them. Purslane, dandelion, stinging nettle, chickweed, sheep sorrel, mallows, and red-root pigweed (amaranth) have been identified by Dr. Peter A. Gail of the Goosefoot Acres Center for Wild Vegetable Research and Education (4) as the most salable. If the field has been certified organic under the Organic Rule provisions of §205.207, the weeds growing on it may be marketed as organic “salads” or “wild greens.” Seed may also be collected for sale as organic seed.

## Organic production of annual herb crops

Annual herbs can be raised organically in the field much the same as annual vegetables. However, today most commercial production of annual culinary herbs such as basil, cilantro, parsley, and lemon balm occurs in hydroponic greenhouse systems. At this time organic hydroponics is neither well defined nor certified by most certifiers. Most field transplants come from plugs, although some herbs are direct-seeded. For an introduction to greenhouse culture, see the ATTRA publications *Herbs: Organic Greenhouse*

### §205.207 Wild-crop harvesting practice standard

- a) A wild crop that is intended to be sold, labeled, or represented as organic must be harvested from a designated area that has had no prohibited substance, as set forth in §205.105, applied to it for a period of 3 years immediately preceding the harvest of the wild crop.
- b) A wild crop must be harvested in a manner that ensures that such harvesting or gathering will not be destructive to the environment and will sustain the growth and production of the wild crop.

*Production and Vegetables: Organic Greenhouse Production.* Related publications are *Potting Mixes for Certified Organic Production*, *Plug and Transplant Production in Organic Systems*, and *Integrated Pest Management for Greenhouse Crops*.

Seed spices—such as dillseed, coriander, and mustard—are direct-seeded annuals raised as field or garden crops. Calendula, used in cosmetics, is also a direct-seeded annual, and

caraway is biennial. Lack of specialized harvesting equipment and processing facilities has minimized production of the seed spices in the U.S., and overseas competition has caused a decline in the U.S. essential oils industry—with the exception of an emerging lavender sector. With federal funding, Purple Haze Lavender Farm, Sequim, Washington, and La Paix Herb Farm, Alum Bridge, West Virginia, have pioneered research into commercial small-scale lavender farming in the U.S. Floragenics of Pescadero, California, now sells mid-scale distillation equipment. Lavender oil is used principally in aromatherapy and as a fragrance for household products. Two multi-state lavender growers conferences are being held in 2005. For more information on lavender production and marketing, see the ATTRA publication

### §205.204 Seeds and planting stock practice standard

- 4) Nonorganically produced planting stock to be used to produce a perennial crop may be sold, labeled, or represented as organically produced only after the planting stock has been maintained under a system of organic management for a period of no less than 1 year; and
- 5) Seeds, annual seedlings, and planting stock treated with prohibited substances may be used to produce an organic crop when the application of the materials is a requirement of Federal or State phytosanitary regulations.

*Lavender Production, Products, Marketing, and Entertainment Farming.*

## Organic production of perennial herbs

Most common herbs are perennials, as were all the herbs in the Soberg study (see **Renne Soberg's Management Tips for Organic Herb Production**, below). Because seeds do not come true to type, many perennial herbs must be reproduced by vegetative methods; commercial growers buy them as plugs. In some very large herb industries (such as the former U.S. mint oil industry), a perennial was replanted each year and treated as an annual, to minimize disease problems. Since few sources of organic herb plugs exist at the present time, organic growers usually purchase conventionally raised plugs for perennial herb plants and then raise them for a year under certified organic management. For more information on plug and transplant production, see the ATTRA publication *Certified Organic Plug and Transplant Production*.

For more information on current issues concerning organic propagation material (seeds and starts), see the 2005 ATTRA publication *Seed Production and Variety Selection for Organic Systems*.

## Research on organic herb production

Several on-farm research projects involving herb production and marketing have been funded by USDA Sustainable Agriculture Research and Education (SARE) grants (see [www.sare.org](http://www.sare.org)). A research project conducted at New Mexico State University from 1994 to 1998 incidentally involved organic production methods. Perhaps the most complete organic herb trials, carried all the way through to formation of a producers' co-op and successful marketing, have been carried out by Renne Soberg of Soberg Farms in Minnesota, whose research on producing and marketing native medicinals was funded in successive stages by SARE (**FNC97-178**, "Native Minnesota Medicinal

Production Feasibility Study”) and by Minnesota Department of Agriculture alternative crops grants. Reports published in MDA’s *Minnesota Greenbook* series for 1998 and 2000 provide details of Soberg’s success in

- selecting and establishing suitable varieties,
- adapting equipment and facilities to accommodate herb production,
- successfully demonstrating commercial production of selected herbs under Minnesota conditions, and
- identifying a bulk market. (See **Renne Soberg’s Management Tips for Organic Herb Production.**)

In 2001 Soberg organized an herb producers’ cooperative and secured a contract with a national buyer.

Herb display plots are maintained at the University of Saskatchewan and Purdue University, while the University of Kentucky protects wild stands of black cohosh, ginseng, and goldenseal for research purposes. University of Kentucky Extension has conducted “workshops to teach growers how to produce ginseng and goldenseal under semi-natural and organic conditions.”(5) Since most universities doing organic research opt for a waiver of certification, any economic data generated does not accurately reflect farmers’ costs incurred for certification and record keeping.

## Research on forest botanicals

Wild native botanicals, sometimes grown wild-simulated in farm woods, have attracted recent attention as part of the category “specialty forestry products,” which also includes forest-based food products, woody decorative florals, and handicrafts or specialty woods. According to the NOP wild-harvested practice standard, wild-simulated botanicals would meet organic standards if the whole farm were certified.

The unique nature of niche markets for any such products must be thoroughly understood before such ventures are undertaken.(6) The University of Minnesota cautions:

- Most specialty forestry product (SFP) enterprises are risky—either because products are perishable or the markets are small and easily saturated.
- Prices can be volatile, and government programs may be limited.
- The market for products such as cedar oil is dominated by a few large processors.
- Some processors or wholesalers may purchase products from only a few preferred producers. This allows them to avoid the high costs of dealing with a large number of growers who bring small quantities of varying quality to their processing facilities.
- Newcomers to SFPs may have problems finding production or market information. Existing producers may be fearful of losing their already small markets and unwilling to share information.

For more information on risk assessment and management, see the National Ag Risk Library Web site (University of Minnesota), [www.agrisk.umn.edu](http://www.agrisk.umn.edu). Also see the ATTRA publication *Templates for Agricultural Risk Management* (also available on CD).

The University of Kentucky’s New Crop Opportunities Center, headed by R. Terry Jones (7), Department of Horticulture, is currently assessing the potential of a number of Kentucky wildflowers for commercial floral crop production.(5) Black cohosh is included in a study of “native plant and underutilized landscape plant species” at one of its research stations. Jones has published a useful guide (5) to seed and root sources for black cohosh (as well as blue cohosh, ginseng, and goldenseal) for Kentucky growers, as well as other Web resources. See also the list of suppliers in ATTRA’s *Ginseng, Goldenseal, and Other Native Roots*.



Goldenseal  
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A major horticultural study on black cohosh was initiated in 2001, under the auspices of the Center for Phytonutrient and Phytochemical Studies (a research consortium between the University of Missouri—Columbia and the Missouri Botanical Garden), funded by a sizeable grant from the U.S. National Institutes of Health. Research sites in Missouri include the Missouri Botanical Garden, St. Louis; Southwest Research Center, Mt. Vernon; and the Shaw Nature Center, Gray Summit. A shade house has been erected at each site for purposes of the study. The initial experiment is intended to answer questions about when and under what conditions (including stress) the herb produces certain phytochemicals (the “active principles”) and in what quantity. For current information, see the Web site [www.phyto-research.org/identification](http://www.phyto-research.org/identification) or contact the Center.(8)

In 2001 Frontier Natural Brands (formerly Frontier Herbs) turned over management of the National Center for the Preservation of Medicinal Herbs in Rutland, Ohio, to the nonprofit local community organization Rural Action (See **Resources/Organizations**). This center forms a green corridor with the adjacent 378-acre Botanical Sanctuary managed by United Plant Savers (UpS) (See **Resources/Organizations**). Until recently, both organizations had been conducting on-site research into medicinal and threatened native plant species on research plots under organic management. A change in corporate direction (9) caused Frontier to discontinue its research projects, and a subsequent fire in the UpS facilities destroyed results of years of research. UpS has conducted a fund drive among its membership to rebuild its facilities.

According to Lauren Piscopo, the Center is the “only U.S. organization researching the organic propagation of native herbs.” Some of the “over-harvested” plants included in the preserve are goldenseal, slippery elm, partridgeberry, bloodroot, goldthread, yerba mansa, and arnica. Native botanicals at both these sites are being raised organically (10), and before the mishaps, organic propagation and production were part of the research design. There have been several

related SARE-funded projects in Ohio. (See **ENC01-56** and **LNC00-174**, below.)

A New Mexico State University study supported by a grant from the USDA/AMS federal-state marketing improvement grant program yielded production and economic data for echinacea, valerian, and yerba mansa. The study was conducted in 1995–96, with results published in 1999.(11) In line with university research practice vis-à-vis organic production (and generally typical of medicinal herb crops), Constance Falk, chief investigator, notes that

Although these crops were not planted on land certified as organic, no synthetic fertilizers or pesticides were used.(11)

The same research team studied catnip, nettle, calendula, lemon balm, and globemallow. From 1994 to 1998 they focused on transplanting vs. direct seeding. The published report noted that “cultural practices followed guidelines for organic farming methods by the New Mexico Organic Commodity Commission.”(12)

No certification costs were incurred, and no organic premium was charged buyers of the research crop—a Santa Fe tincture manufacturer, local herbalists, and larger distributors in California and Oregon.

In July 2002 the Organic Agricultural Consortium (OAC) and the Scientific Congress on Organic Agricultural Research (SCOAR) launched a new peer-reviewed Web site for collecting research and information on organic crops. The Web site invites researchers and farmers to contribute “practical and scientific information on organic”



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agriculture. Organic production practices for vegetable crops, including greenhouse and raised bed production, are generally applicable to most annual herbs. [www.organicaginfo.org](http://www.organicaginfo.org)

Below are summaries of results from Sustainable Agriculture Research and Education projects related to forest farming of medicinal native plants and organic production of all types of herbs. Also see the related ATTRA publications *Ginseng, Goldenseal, and Other Native Roots* and *Agroforestry Overview*.

### **Renne Soberg's Management Tips for Organic Herb Production**

1. To get started, pick out some herbs and try growing them. Read as much as you can.
2. Plan three years ahead. You need to condition the ground with [plowed-down succession crops of] buckwheat/buckwheat/rye plantings the year prior to planting herbs. The second year is focused on establishment of the planting and the third year on your first substantial harvest. Don't plan on any income from herbs the establishment year.
3. Herbs have very strong characters and demand different conditions—soil, moisture, drying, and labor among others. Selection of herb species should be done with knowledge of the preferred growth conditions of the herbs in combination with an understanding of the conditions you can provide. Some accommodations will probably have to be made by both the herbs and by the grower, if you are to be successful.
4. The business of growing herbs requires many skills and a keen sense of observation and intuition. There is a quantum leap between growing herbs for pleasure and growing herbs for profit. To quote a former governor of North Dakota, "Think big, start small, stay liquid."
5. It may be best to stay out of herbs if you are only looking at the profit motive. It is best if it is a labor of love. The

learning curve is very steep for several years. Much of the business is based on relationships, and it may take years to develop the knowledge, experience, equipment, and growing ranges necessary to be competent enough to compete in the market on a professional basis

*Research Report: Minnesota Greenbook 2000*

## **USDA Sustainable Agriculture Research and Education (SARE) Projects**

Since 1991 USDA/SARE has awarded more than \$1,800,000 in grants for sustainable agriculture projects involving herbs. Almost all could be classified as on-farm research, with some university and nonprofit partners. A search of the SARE project database turned up information on a great many herb-related projects—a substantial proportion since 2000 have been on certified organic farms or used substantially organic methods. In a majority of cases, organic production was incidental to the research design. Two studies took place on Biodynamic farms. See the complete, searchable project database at [www.sare.org/projects](http://www.sare.org/projects).

### **Projects involving chemical-free forest farming of native medicinals**

#### Organic

#### **FNE02-436 (2002)**

#### **pH and Calcium Requirement in Woods-Grown Organic Goldenseal *Hydrastic Canadensis* L**

In progress. No final report.

#### Non-organic

#### **FNC04-527 (2004)**

#### **Interplanting Ginseng with Other Native Shade Plants for Fungal Control, Short and Long-Term Profitability**

*Farmer/Rancher project*

Objective is to create a managed forest system that allows sustainable production of high-value native plants—such as ginseng, goldenseal, bloodroot, cohosh, and trillium—by avoiding diseases typical of monocultures through the technique of interplanting.

In progress. No final report.

**LNC00-174 (2000)**

**Sustaining Farms and Biodiversity Through Woodland Cultivation of High-Value Crops**

*Research and Education project*

With significant federal and non-federal matching funds (total: \$94,559), this project explored cultivation of at-risk medicinal plants in the Ohio Appalachians. An association was formed of more than 40 growers with an integrated support system—including education, R&D, and marketing assistance. Growers participating in educational activities totaled 470. The report noted: “Significant initial plantings were made by growers and broader awareness of woodland cultivation was developed in the region.”

See 20-page Final Report.

**ENC01-056 (2001)**

**Forest Meets Farm: Profitable New Crops for Small Farms in Forested Ohio**

*Professional Development Program*

This project was about establishing a training program for forest-cultivated crops (such as native medicinals and perennial native herbs in the nursery trade) and other non-timber products (e.g., pawpaw and mushrooms) for forested regions of Ohio.

See 11-page Final Report.

**FNE99-286 (1999)**

**Integrated Forest Farming: Medicinal Herb Cultivation, Mushroom Production, and Forest Restoration**

*Farmer/Rancher project*

No report.

**FNC99-288 (1999)**

**Growing Various Species of Angelica as a Forest Crop in the Midwest**

*Farmer/Rancher project*

Growing five species of angelica in a woodlot as an alternative forest cash crop for medicinal use, the producer planted 260 to 300 angelica seedlings in cages to deter deer grazing. Some outgrew their cages. Other objectives were to provide “high quality, sustainably produced medicinal herbs” and to compare European/North American and Chinese angelicas for quality and ease of production. No production, harvesting, or marketing data were gathered during the life of the grant. However, the farmer promised to collect and eventually publish such data.

**FNE98-220 (1998)**

**Forest Grown Medicinal Plants to Increase Woodlot Income**

*Farmer/Rancher project*

This project was about establishing St. Johnswort, ginseng, and goldenseal in a farm woodlot. St. Johnswort was planted in a clearing and fertilized with commercial sources of N and P. Non-chemical weed control consisted of a cover crop of Japanese millet turned under, which proved effective. The investigator now recommends no application of fertilizer, as the weeds are likely to derive more benefit than the St. Johnswort. Direct seeding, as opposed to transplants, is recommended.

Ginseng seeds and roots, as well as goldenseal roots, were planted in an appropriately shaded, well-drained site fertilized with dolomitic lime, gypsum, and commercial P fertilizer. Ginseng sustained considerable waterlogging at one of the sites, as well as damage from small animals digging up the roots. Goldenseal took well and had no problems. The investigator recommends careful assessment of drainage at potential sites and protection of the roots with wire mesh.



Goldenseal proved more tolerant of light than did ginseng.

## **FNE95-102 (1995)**

### **Development of Woodlands Growing Method for New England Native Wildflowers and Medicinal Plants**

*Farmer/Rancher project*

The objective of this project was cultivation of native Massachusetts wildflowers (most having medicinal uses)—including golden-seal, ginseng, blue cohosh, bloodroot, goldthread, jack-in-the-pulpit, foamflower, partridgeberry, wild ginger, maidenhair fern, red trillium, May apple, bluebeard lily, Hepatica, and *Tiarella cordifolia*—in a two-acre forest setting, prepared by thinning to create a number of micro-environments at ground level (including both well-drained and boggy sites).

Watering was necessary the first summer, and some weeding was necessary during the second. After three years, all of the original planting of ginseng was lost for unknown reasons. [Steven Foster—herb author, photographer, and lecturer—commented during a native herb woods walk in 2001 that mature ginseng roots can apparently lie dormant for years at a time, then suddenly send up above-ground parts for reasons that are poorly understood.] The chief investigator replanted the ginseng. Success of the other species was judged as follows.

<b>Successful</b>	
jack-in-the-pulpit	blue cohosh
goldenseal	goldthread,
bloodroot	<i>Tiarella cordifolia</i>
foamflower	Hepatica

<b>Unsuccessful</b>	
partridgeberry	wild ginger

Principal investigator does not believe that growing wild plants in this way, and on this scale, can be economically justified. This is a suitable technique only if the objective is conservation of native species.

Recommendations for actual commercial production: secure road access; use a small tractor to prepare seedbeds.

## **Projects involving field production**

### **Organic**

#### **FNE01-362 (2001)**

### **Organic Row Cropping of Threatened Medicinal Herbs for Market in the Northeast**

*Farmer/Rancher project*

The applicant identified nine species of medicinal plants considered threatened in their native environment and proposed to grow them organically, recording plant vigor, yields, pest damage, and other indicators. The market for these medicinal would be explored.

No final report.

#### **FNE03-489 (2003)**

### **Organic High Density Production of Medicinal Herbs**

*Farmer/Rancher*

The proposal states: “High-density herb production may meet a market need and improve profits, and the farmer will collect and evaluate data on high-density costs such as technology, space requirements, and labor, as well as track weed, insect, and wildlife damage. The goal is to see if high-density herb production is more profitable than conventional methods. Projects results will be presented at conferences and will be offered for publication in herb industry newsletters.”

No final report.

#### **FNE02-440 (2002)**

### **West Virginia Herb Growers Research Project**

*Farmer/Rancher project*

Wholesale markets for organically grown domestic herbs suitable for West Virginia will be investigated. Seven farmers will propagate and cultivate, experimenting with biocultural practices to control fungal pests. They will publish results and develop a growers' manual.

No final report.

### **FNC99-252 (1999)**

#### **Organic Medicinal Herb Cultivation**

*Farmer/Rancher project*

With the objective of sustainably and profitably producing organic medicinal herbs, the producer planted the three commercial varieties of Echinacea. Results: Only 200 of more than 3,000 plants survived due to damage from the Aster Yellows virus, transmitted by leafhoppers.

### **FNC98-215 (1998)**

#### **Elixir Farm: Chinese Medicinal Herbs as Field Crops in the Ozarks**

*Farmer/Rancher project*

Objective: To increase organic production and marketing of the Chinese medicinal *Astragalus membranaceus* as a rural development strategy. [Elixir Farm is Biodynamic.] Investigators harvested 2 pounds of seed from 2/3 acre (1 lb. per year) and 18 pounds of dried root (in the second year). Production costs were deemed "high," and aggressive marketing was needed to sell the crop for a satisfactory return.

### **FW97-003 (1997)**

#### **Converting Pasture Land to Specialty Crop Production as an Alternative Farm Enterprise**

Objective: Project proposed to increase family incomes to make better use of pasture land by demonstrating to skeptical farmers the economic viability of producing organic dried herbs and flower seeds on land previously used only for grazing livestock.

No outcomes reported.

### **LNE97-092 (1997)**

#### **Chinese Medicinal Herbs as Crops for the Northeast**

This project evaluated the potential productivity and grower acceptance of Chinese medicinal plants as alternative crops. Organic production methods were used.

Plant development proved highly variable. Harvestable and marketable fractions varied within plots.

Recommendations: 1. Selection and production of genetically uniform plant propagation materials must precede introduction of Chinese herbs as a reliable alternative crop for the Northeast. 2. A community-based direct market system to practitioners must also be developed to ensure commercial viability.

### **FNC97-178 (1997)**

#### **Native Minnesota Medicinal Production Feasibility Study**

*Farmer/Rancher*

Objective: To determine which medicinal plants were commercially feasible to grow in Minnesota. Plants in the trial were dandelion, wormwood, motherwort, pennyroyal, scullcap, valerian, catnip, and licorice. Old grain-handling equipment was converted to handle these crops.

[Note: This research, conducted by Renne Soberg, was continued through 1999 with state of Minnesota grants. See Minnesota Greenbook 1998 and 2000 reports. See **Resources**, below.]

### **FW01-052 (2001)**

#### **Application of Oyster Shell Mulch for Lavender Production**

*Farmer/Rancher*

Final report: Plants mulched with oyster shells showed about a 12% increase in harvested bundles with no significant difference in oil quality/quantity (per mass spectra analysis). Oyster-shell mulched plants kept weeding, cultivating, and water use to a minimum. Project extended beyond life

of the grant to test hypothesis that increasing mulch area around the plant increases [reflected] light units, hence flower production, in ‘Royal Velvet’ (*L. angustifolia*) and ‘Hidcote Giant’ (*L. x intermedia*).

## **FNE01-358 (2001)**

### **Essential Oil Distillation for West Virginia Herb Growers: A Smell Good Project**

*Farmer/Rancher*

This project aimed to explore markets for distilled herb products, including hydrosols, and to connect herb growers.

According to the final report, with assistance from the West Virginia Department of Agriculture and West Virginia University Cooperative Extension, the project created an 11-member herb growers network, conducted educational events for growers, and investigated distillation and the potential of value-added products. A 32-page publication on propagation and uses of lavender and lemon balm was distributed to all participating growers, and a two-day Propagation and Distillation Workshop was held, using the small-scale distillation unit set up at La Paix Herb Farm. Twelve different herbs were tested for feasibility, with the outcome that although a high oil yield was not obtained from the small unit, alternative products from the hydrosols produced have potential.

More research needs to be done to determine how to achieve higher essential oil yields, and more education is needed on all aspects of herb production in West Virginia. Larger volumes of plant material are needed (especially lavender and peppermint). More research is needed on ideas for value-added products, especially from spent biomass.

## **Non-organic**

## **FNE97-160 (1997)**

### **Echinacea Field Trials**

Investigators grew *E. purpurea* and *E. angustifolia* under organic management, testing various parameters. Chief investigator found

“the most vigorous growth of *E. purpurea*, and the greatest number of flower heads” when it was interplanted with grasses. *E. angustifolia* was not as successfully propagated, but neither species was found to suffer from diseases or insects, and various cover crops provided fertilization.

## **Projects involving field production of culinary herbs**

### **FS00-118 (2000) [See *Alternative marketing* below]**

#### **Developing Marketing Strategies for Culinary and Medicinal Herbs**

*Farmer/Rancher project*

The Indian Springs Farmers Association (ISFA) assists small farmers in diversifying their farm operations via alternative crops. In partnership with Alcorn State University, the Federation of Southern Cooperatives, and other nonprofit partners, the Mississippi Association of Cooperatives and the Foundation for the Mid-South participated in training African-American small farmers in the production and test marketing of fresh and dried medicinal and culinary herbs.

Six farmers participated in the trials and grew 32 acres of herbs, in addition to constructing 5 raised beds of 100 sq. ft. each. They found that picking directly into half-bushel plastic containers with holes in them was more efficient than the conventional 5-gallon buckets—allowing them to save time and labor by washing the herbs in the picking containers. An 8-ounce clamshell was the customer-preferred retail container. ISFA developed markets at the Crescent City Farmers Market in New Orleans, Louisiana, and Alliant Food Services, Inc. Selling fresh herbs by mail order was dropped because of quality considerations. “They found a ready market for medicinal and culinary herbs. They also found, perhaps due to the nature of the product, that many customers asked for 100 percent certified organic products.”

## **LS96-075 (1996)**

## **Developing Sustainable Crop Management Systems for Improving Production of Culinary Herbs in the Virgin Islands**

*Research and Education project*

Objectives:

- To develop sustainable soil management practices for culinary herb production by using crop rotation with green manures, application of composts, animal manures, and other organic fertilizers.
- To evaluate use of organic mulches, cover crops, and biodegradable synthetic mulches.
- To develop IPM for herbs (intercropping and crop rotation).
- To increase efficiency in fertilizer and water use in herb production by using micro-irrigation.

Herbs evaluated were sweet basil, chives, cilantro, parsley, and thyme, over four cropping seasons.

No outcomes available.

## **LNC94-066 (1994)**

### **Investigation of the Viability of Growing Herbs as Alternative Crops for Iowa Farmers**

Objectives were 1) to examine seven herb crops for profitability, 2) to determine optimal cultural practices, 3) to evaluate time and labor requirements, as well as equipment needs/modifications, and 4) to investigate retail and wholesale marketing opportunities.

Only the culinary herbs basil, cilantro, dill, and parsley were found reliably profitable—given timely planting and water availability. Disease and insect problems were minimal for these four herb crops. Cultural practices found most beneficial:

- Use of organic mulches (corn stalks or cobs) to reduce weed pressure between rows and conserve moisture, reduce erosion, and maintain clean herbs at harvest.

- Use of 30-inch rows to promote optimum yield, while reducing disease problems.
- Tilling immediately before planting for weed control.

## **LS94-013 (1994)**

### **Plant Shelters to Extend the Growing Season for Herbs**

Objectives were to extend the growing season for sweet basil in the mountains of western North Carolina (36° N Lat.) from four months to possibly eight months, to capitalize on early- and late-season fresh market price premiums. The project aimed to design portable, lightweight, inexpensive, easily maintained/stored, energy-efficient, and reusable shelters with a drip irrigation component.

No construction materials or designs performed adequately for commercial production of herbs. Basil production proved ill-suited to 4-foot high shelters, as basil has a higher growing pattern than most herbs. Lightweight portable shelters tended to blow over in high winds, damaging the plants. During the project “market prices dropped due to unexpected availability of inexpensive herbs from Mexico, Israel, and Australia,” dropping expected returns below cost of production. Hence the crop was left unharvested. The principal investigator now considers it unlikely that he will remain in the culinary herb business.

## **Projects involving greenhouse production of culinary herbs**

### **Organic**

#### **FNE03-468**

### **Organic Plug Production: Evaluating Growing Media, Fertilizer and Economic Feasibility**

*Farmer/Rancher project*

The goals of this project were to evaluate economic feasibility of operating an organic plug production facility [in a 3000 sq. foot

greenhouse operation in the Northeast] and to compare three media types and two fertilizers.

Outcomes: Economic feasibility was confirmed: growing plugs actually produced more income per square foot of production space than growing traditional bedding plants. The organic germinating mix used performed better than did either the organic compost or a peat-based medium. A fertilizer made from liquefied fish protein (2-4-2) performed better than a fertilizer made from liquid fish and seaweed (3-2-2). [Note: The investigator has subsequently gone into business as one of very few organic plug suppliers in the U.S.]

## ***Alternative Marketing***

### **FNE00-348 (2000)**

#### **Harvest Home Organics**

The project objective was to establish a CSA for marketing organic vegetables, flowers, and herbs.

Shareholders did not find the social and aesthetic meaning in the CSA system that the investigator did, but viewed it primarily as a source of fresh produce.

Also see **FS00-118** (*Projects involving field production of culinary herbs, above*)

## ***Homeopathic animal remedies***

### **LNE97-086 (1997)**

#### **Evaluation and Documentation of Homeopathic Nosodes in Organic and Conventional Dairy Production**

##### *Research and Education project*

The project objective was the measurement of homeopathic nosodes used for prevention of mastitis and calf scours in organic and conventional dairy production (placebo-controlled, double-blind clinical field trial). There was a 25% reduction in infections in the treated group.

## ***Role of herbs in habitat enhancement for beneficial insects***

### **AS92-002 (1992)**

#### **Habitat Enhancement for Beneficial Insects in Vegetable and Fruit Farming Systems**

Using essentially organic methods, the participating farmers noted basil, cilantro, dill (and all flowering plants in the umbel family), also anise hyssop, garlic chives, and mints were highly attractive to beneficial insects. They rated strip or border plantings superior to companion planting. Participating farmers state that they have changed their farming practices as a result of the project and continue to share what they learned with others.

## ***Education***

### **EW97-005 (1997)**

#### **In-depth Training and Work Experience on a Community Supported Agriculture (CSA) Farm**

A four-day train-the-trainers workshop was held at Peach Valley CSA Farm in California, a certified organic farm, in July 1998. Participants, mostly from Extension, participated in the day-to-day operation of a certified organic farm.

A post-workshop survey indicated that specific knowledge of CSAs and related sustainable agriculture issues dramatically increased for workshop participants.

### **LNE96-077 (1996)**

#### **Sea Change Urban Horticulture Center: Sustainable Agriculture Initiatives**

One objective (of seven) was “to establish and evaluate a specialty herb and produce operation offering organically grown specialty items to urban restaurants and food specialty businesses.”

In May 1997 the CSA [staffed by residents of a Detroit designated Empowerment Zone and using land leased from the

Redevelopment Authority (RA)] became a certified organic farm with 33 family shareholders. Unfortunately, the leased land was taken back by the RA, and Sea Change was looking for new parcels after negotiating one last season on the organically certified land. Sea Change began selling organic produce to local restaurants (role of herbs not specified).

## Selected Abstracts: Organic Herb Production in the U.S.

*Goldenseal* [organic production]. Adrienne Sinclair and Paul M. Catling. 2001. Cultivating the increasingly popular medicinal plant, goldenseal: Review and update. *American Journal of Alternative Agriculture*. Vol. 16, No. 3. p. 138.

*Report on in-depth Canadian research project on production and marketing of goldenseal.*

*Ginseng* [organic production]. John Proctor. Presented at Richters First Commercial Herb Growing Conference, 1994. *Proceedings*. p. 25–41.

*Field Production of Three Basil Cultivars*. Peggy Jo Reed. Presented at the 9th Annual National Conference of the International Herb Association. p. 52. In: Arlene Kestner, James E. Simon, and Arthur O. Tucker (ed.). *Proceedings of Herbs '94: Ninth Annual National Conference of the International Herb Association*. IHA, Mundelein, Illinois.

*One paragraph on profitability of organically produced herbs.*

*Organic Greenhouse Growing Techniques*. Commercial greenhouse grower Marjorie Fortier, of Meadowbrook Herb Garden, Wyoming, Rhode Island, presented at the Second National Herb Growing and Marketing Conference, Indianapolis, Indiana, in 1987.

*Fortier's outline of growing techniques was published in the conference Proceedings. She concluded that "Most important points—proper watering, good sanitation, continuous monitoring, adequate ventilation, and good soil—of managing a greenhouse organically are very much the same as conventional methods."* [Note:

*Since 1989 soilless culture has become the norm in production of greenhouse herbs.]*

*Organic Production of Lobelia*. Jeff Licht, of Lincolnway Flower Farm, East Central Iowa, presented at the Fourth Richters Commercial Herb Growing Conference, in 1999.

*Lincolnway raises several acres of lobelia from transplants, under contract with a major herb dealer. About 1998 Licht became certified organic. He says, "The biggest problem that we have... is the weeds." After trying mulching between rows with oat straw, he now uses "soy-based printed newspapers between rows," and weeds the crop at least three times by hand.*

*There is no way to dry herb crops in Iowa without forced heat or forced air dryers. He has a well-insulated 20' x 30' drying room, with a circulating fan to keep the air moving.*

*Licht cautioned that crops and sales can be lost if there is a hitch in the certification process.*

*Field Production of Catnip*. Renne Soberg, of Soberg Farms, presented on organic field production of catnip in Minnesota at the Fourth Richters Commercial Herb Growing Conference, in 1999.

*He decided to grow catnip as his main crop in 1999, after a buyer inspecting his sample offered to buy all he had. In the spring he seeded 750,000 catnip seeds in a third of an acre, but only 150 plants germinated.*

*From this he learned that spring seeding does not work for catnip. But the weeds came; after cultivation, he reseeded in August and irrigated heavily. That fall he had a good stand from seed. As an experiment Soberg also put out transplants he had raised and found that there were pros and cons to both propagation methods.*

*Soberg raises a legume crop to fix nitrogen; red clover provides a saleable medium-grade herb crop in its own right (flowering tops harvested by combine). Remember that red clover is a biennial and will not bloom the first year it is seeded. He alternates red clover with the catnip in two fields.*

*Weeds continually get worse. He chops mulch and then sets his cultivator so that he can still cultivate next to the plant. Most remaining weeds are separated out by the harvesting process he uses. If any*

*foxtail gets through into the barn, it is manually removed. All foreign material must be removed prior to the cut-and-sift process.*

*Soberg tailors the herbs he grows to his own preferences. For instance, he will not raise mugwort because the dust does not agree with him. He advises, "Stay out of it if you're motivated by just profits."*

## **Selected Abstracts: Organic Herb Marketing**

*Herb Field Production and Processing with GAPs [Good Agricultural Practices] and GMPs [Good Manufacturing Practices]. Alan De Young of Van Drunen Farms presented at the fifth [and final] Richters Commercial Herb Growing Conference in 2000. [Transcripts, p. 49–67.]*

*In business for 30 years, Van Drunen Farms provides a significant share of the dried organic culinary herbs and some medicinal herbs for nutraceutical products in the U.S. (where it has four processing plants, a warehousing facility, and offices in Momence, Illinois, and Santa Rosa, California). A plant producing biological cultures for the nutraceutical industry subcontracts with Bio-source in Mequon, Wisconsin. Processing, including freeze-drying, is 80% of the business, and farming 20%. De Young comments on the difficulties of retrofitting an existing facility to Good Manufacturing Practices. Slides from the presentation are included in this extremely valuable, detailed inside look at the organic herb processing and nutraceutical industry.*

*Nationwide marketing: Building brand identification [relevant to marketing organic herbs]. Philip Moore, presented at the 11th Annual National Conference of the International Herb Association. p. 80–88. In: Herbs '96: Proceedings of the Eleventh Annual National Conference of the International Herb Association. IHA, Mundelein, Illinois.*

*Demographic and economic trends affecting the herb industry in the 1990s and beyond. Paula C. Oliver, presented at the 10th Annual National Conference of the International Herb Association. p. 31–32 [Organic Products in Demand]. In: Arlene Kestner and Arthur O. Tucker (ed.). Proceedings of Herbs '95: Tenth Annual*

*National Conference of the International Herb Association. IHA, Mundelein, Illinois.*

*Marketing Herb Crops. Renne Soberg, of Soberg Farms, Lakeville, MN, presented at the Fourth Richters Commercial Herb Growing Conference, in 1999, on the topic of marketing.*

*Soberg considers organic certification to be a marketing and quality assurance tool that makes it possible for him to ask at least two-and-a-half times more for his herb crops. He says, "Price is a poor place to compete. One of the real proven methods for businesses that have survived for a long, long time is to produce an excellent product and then sell service."*

*Medicinal Root Crops. James Quinn, of QBI Inc., presented at the Third Richters Commercial Herb Growing Conference, in 1998, on the topic of grow-out trials for herbs sold to a New Jersey cosmetics manufacturer.*

*QBI originated in Europe as "Island Organics." One of QBI's aims was to identify whether herbs they can grow in the United States compare favorably with what they were importing. Primary objectives of the trials were:*

- *Quickly bring about a reasonable amount of production for Island Organics' supply needs.*
- *Learn about the various types of specialized equipment to provide efficient mechanization for production at all levels.*
- *Generate reliable field information.*
- *Develop a network of growers who could supply product demands for future years.*
- *Establish regional businesses that can capitalize on the increasing need for cultivated botanicals.*

*The field trials compared soil types and cropping considerations; land preparation and soil fertility; seed germination; plant establishment and direct seeding; plug transplants; weed control; cultivation and irrigation; crop economics; yields; harvesting; drying; and diseases. Herb root crops raised included echinacea purpurea, E. pallida, dandelion, black cohosh, ginseng, goldenseal, valerian, yellowdock, and burdock. [Note: James Quinn regularly consulted with NCAT Agriculture Specialist Katherine Adam during the late '90s and kindly attributes the quote on one of his published*

slides to her: “It’s not what your crop is worth, but how well you negotiate.”]

*The most valuable part of this trial was the determination of reliable yield information for these crops over a period of three years, along with price/lb. offered. Quinn says, “Clearly, if some of these crops are only bringing \$1.00 or \$1.50 a pound, it’s very questionable whether they’re even worth producing. [This yardstick would eliminate all the above crops from consideration, except for goldenseal, and the two echinaceas.]*

*Contract Growers Requirements for the Production of Organic Herbs.* An unidentified representative of Trout Lake Farm presented at the First Richters Commercial Herb Growing Conference, in 1997, on criteria for contract growing, based on Trout Lake’s company requirements for contract growers.

*Trout Lake Farm, certified by Oregon Tilth, was started in 1973 near Bend, Oregon, and at its peak had more than 1000 acres of herbs in production, with 30 herb crops. Thirty other crops were being purchased from “outside sources,” including contract growers. Trout Lake Farm has operated since 1999 under the corporate umbrella of Amway Corporation.*

*Resources required for securing a contract to grow for Trout Lake:*

- *Growing and processing capability on an economy of scale appropriate for the crop and the customer base.*
- *Human resources: Management experience with crops requiring the same production methods. Availability of hand labor.*
- *Financial resources: Capital sufficient to cover upfront costs such as dehydrators, other specialized equipment, purchase of germplasm.*
- *Land and equipment resources: Owned rather than leased preferred.*
- *Environmental factors present in the growing location: Must have ideal climate, soil, water, and freedom from pest pressures and contamination.*

*A major goal is to establish long-term relationships with contract growers. Forward contracting of herb crops can be advantageous to both parties under the right circumstances.*

*Varietal Improvement of Herbs.* Conrad Richter presented at the First Richters Commercial Herb Growing Conference, in 1997, on improvement of strains of medicinal herbs grown commercially in Canada.

*He suggested the following herbs, for which few if any improved varieties exist, for targeted research: ginseng, Echinacea, borage, evening primrose, feverfew, goldenseal, catnip, St. Johnswort, valerian, milk thistle, foxglove, chamomile, angelica, sheep sorrel, burdock, comfrey, and nettle. Richter noted:*

*One of the challenges we face as a herb seed company is that many varietal improvements are unavailable to us. Established growers who make their own selections from their crops do not offer seeds to other growers or to seed suppliers... A large grower of narrowleaf echinacea...annually destroys over 1000 pounds of seed to inhibit new entrants to the industry. This grower has apparently judged that it is better to forego over \$100,000 in seed revenues in order to maximize his return on roots.*

*A long-range goal is to develop artificial seeds from arrested somatic embryos that are desiccated and coated, for those varieties that cannot be grown from natural seeds.*

*Spiritual Agriculture and Organic Medicinal Herb Production.* Emigdio Ballom presented a slide show on his research at the fifth and final Richters Commercial Herb Growing Conference, November 4, 2000. Transcripts, p. 33–47.

*Mr. Ballom, with South American university degrees in agriculture and plant genetics, as well as doctoral studies at Colorado State University, works at Resting in the River Farm, Abiquiu, New Mexico, where organic methods were being used [not necessarily certified organic]. He is currently researching germination techniques for Chinese and Ayurvedic herbs and the interface of Quechua farming techniques with modern agriculture.*

*Value-added Products and Herbal Tinctures.* Nick Morcinek, of Faunus Herbs, presented at the First Richters Commercial Herb Growing Conference, in 1997, on the importance of organic certification in marketing his farm’s herbal products and on some herbs with value-added potential—goldenseal, hops, evening



primrose, calendula, milk thistle, orris root, bloodroot, North American mandrake (May apple, umbrella plant), bloodroot, valerian, basil, and chamomile. Morcinek says,

*Why certified organic? We feature prominently the certified organic logo on materials. For example, you might have five thousand pounds of echinacea root that you've grown and are meeting with a broker that wants to buy it. The only difference between your competitor's product and yours is that you can say that yours has been independently certified as organically grown. I will tell you now that you will make the sale. Your customers don't have to accept just your word when you say it is organically grown if it's independently verified.*

*Feverfew—Field Production and Marketing.* Richard and David Borbely, of AgroPharm Technologies, presented at the First Richters Commercial Herb Growing Conference, in 1997, on their vertically integrated corporate farming venture in OCIA-certified medicinal botanicals, near Simcoe, Ontario.

*This report provides excellent details on organic production of feverfew on three acres. This venture adds value to the raw commodity by producing feverfew tablets for over-the-counter retail sales.*

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Hanks, Mary. 1998. Native Minnesota medicinal plant production. Greenbook '98: Energy and

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*First year project results for Renne Soberg's medicinal herb project.*

Hanks, Mary. 2000. Native Minnesota medicinal plant production. Greenbook 2000: Energy and Sustainable Agriculture Program, Minn. Dept. of Ag. p. 21–25.

*Organic production, harvesting, drying, marketing procedures developed and evaluated for herbs with known strong market potential—nettle, catnip, dandelion, scullcap, pennyroyal, valerian, licorice, wormwood, and motherwort. Soberg Farm.*

### Periodicals

*Journal of Herbs, Spices, and Medicinal Plants*  
*Reports on research in tissue culture, analysis of chemical constituents, nutrient management, and disease and insect control for the major herb crops in world commerce. Reports generally not about organic production. Largest percentage conducted in Egypt, India, Hungary, Sri Lanka, Costa Rica, Morocco, Albania, China, Pakistan, and other large volume, low cost producers. Until 2002 the U.S. was the chief source for organic herbs; many certified start-ups now provide organic herbs to U.S. markets and manufacturers from farms in Mexico, Central and South America, and the Caribbean.*

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#### HerbalGram

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*Emphasis on medicinal and industrial use herbs, including research reviews. Published by the American Botanical Council and the Herb Research Foundation.*

Natural Foods Merchandiser  
[nfm@newhope.com](mailto:nfm@newhope.com)

OFRF Reporter  
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*U.S. distribution at:*  
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*Written for the commercial herb grower in Oceania. \$125 (Aust.)*  
*For more information see:*  
[www.touchwoodbooks.co.nz/therbalharvest.html](http://www.touchwoodbooks.co.nz/therbalharvest.html)

## Organizations

- North Carolina State University Extension  
[www.ces.ncsu.edu](http://www.ces.ncsu.edu)  
*Research on medicinal herbs and herb entertainment farming. Principal researcher: Dr. Jeanne Davis.*
- Rural Action (*Trimble, Ohio*), 740-767-4938.
- United Plant Savers (UpS) (*Athens, Ohio*), 740-662-0041.
- Thanks to reviewers Renne Soberg, of Lakeville, MN, and Holly Born, NCAT.

## Related ATTRA Publications

NCAT's Organic Crops Workbook

Seed Production and Variety Selection for Organic Systems

Suppliers of Seed for Certified Organic Production (Web-only database)

Potting Mixes for Certified Organic Production

Herbs: Organic Greenhouse Production

Integrated Pest Management for Greenhouse Crops (series)

Overview of Cover Crops and Green Manures

Sources of Organic Fertilizers and Amendments

Plug and Transplant Production in Organic Systems

Organic Farm Certification and the National Organic Program

Overview of Organic Crop Production

Ginseng, Goldenseal and Other Native Roots

Lavender Production, Products, Markets, and Entertainment Farming

### **Herb Production in Organic Systems**

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