



Greenhouse Growing

Agriculture and Natural Resources Fact Sheet # 528

The Basic Idea

Greenhouse production offers a cost-efficient way to extend the growing season at both ends and to even grow some crops year-round. A lot of information is available on greenhouse growing, equipment, and supplies. This fact sheet presents a few basic considerations and is meant as a starting point. Follow-up on some of the ideas and resources provided here with your own research and experiments.

Most people think of greenhouses as solar, or heated and lighted by the sun. Solar greenhouses are insulated to collect and store energy from the sun for use at night and during cloudy weather. Here in the Pacific Northwest, however, most of the light in winter is diffuse and little direct light from the sun reaches the earth because of our cloudy climate. As a result, greenhouse production in this area will likely require the use of supplementary light or heat. This type of greenhouse system is often referred to as an active system. Those that rely only on energy from the sun are passive systems.

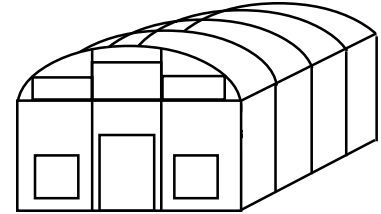
Types and Location

Greenhouses generally are attached to a building (house, shed, barn) or are freestanding. Most commercial greenhouses are freestanding. Whichever type you choose, the best placement is such that light is captured from all directions. For an attached greenhouse, the south side of a building will be the sunniest all year. The north side is not recommended. Wind is another factor to consider in deciding where to locate a greenhouse, especially one that is freestanding.

Temperature & Light

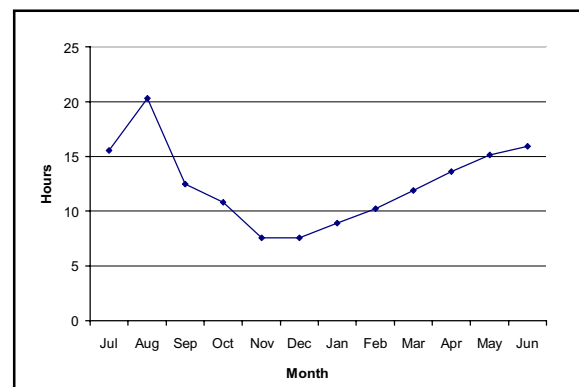
In the Pacific Northwest the long period of short gray days during winter make solar heating difficult. Electric lights and alternative heating sources (e.g., electric or fossil fuel) can be used during fall, winter, and spring months to overcome this limitation. You may also want to install a backup heating system in case of power failure.

However, Eliot Coleman, author of the book *Four-Season Harvest: How to Harvest Fresh Organic Vegetables from Your Home Garden All Year Long*, suggests any greenhouse from simple hoop structures to glass conservatories which grow plants in the soil can produce vegetables without artificial heat. "All you need is to add a second protective layer of translucent material inside the greenhouse... This twice tempered climate in your green-



house is three zones warmer than where you live." (See *Growing for Market* Vol. No. 1). USDA climate zones are based on a 10° F spread so this means the temperature inside a greenhouse could be 15-30° F warmer, a significant difference in the cool months of spring, autumn, and winter in this area. Ventilation is as important as heat. Lack of proper ventilation can result in too much heat or conditions that favor mildew and disease.

Winter plants have to be planted before winter to overcome the limitation on growth caused by the cooler temperatures of winter lower levels of light (see *Frost Dates/Climatic Data*, Community Horticulture Fact Sheet #40). During the period of winter when there are less than 10 hours of daylight (see figure), newly sown seeds grow very slowly. Count on these crops for early spring harvest.



Hours of Daylight Over a Year in the Pacific Northwest (Seattle)

What to Grow

Greenhouse production offers a wide variety of plant choices, including those that may be grown year round and those that can be transplanted outside. Cold tolerant vegetables such as brassicas, lettuce, spinach, scallions, parsnips, beets, chard, radishes, and turnips are easily grown in a greenhouse throughout the off seasons (see *Fall and Winter Vegetable Gardening*, Community Horticulture Fact Sheet #41). Warm weather crops like melons, peppers, eggplants, and tomatoes can be started early in the greenhouse for later transplanting outside or can be grown inside the greenhouse all the way to harvest. Such

crops will not yield as well in winter but it is possible to get tomatoes in winter with added light and heat. For winter growth in the greenhouse look for varieties of plants grown in the South which are varieties adapted to short-day culture. Whether you plant cold tolerant or heat loving plants, timing is key in greenhouse growing. Once you understand your greenhouse climate and light conditions you will be able to schedule plantings to maximize growth and harvest.

Other possibilities for greenhouse growing include herbs, specialty or delicate plants such as orchids, some types of mushrooms, bedding plants, bulbs, potted flowers and, of course, cut flowers. Cut flowers that can be grown successfully include bachelor's button, calendula, carnation, chrysanthemum, gardenia, lupine, marigold, pincushion flower, poppy, snapdragon, stock, zinnia.

Pest and Disease Management

Disease is often best handled by practicing proper hygiene, cultivating strong, healthy plants which will be more resistant to disease and pests, and weeding out weak and sick ones. Diseases and pests can enter the greenhouse via insects, in soil, on plants, and on seeds so careful handling and monitoring can go a long way to prevent disease and pest infestation.

Prevention is very important in the greenhouse environment but diseases and pests will inevitably be a problem at one time or another. Pest management rather than eradication is a more realistic goal and is the basis of Integrated Pest Management (IPM). IPM in greenhouses involves monitoring, pest identification, record keeping, understanding pest life cycles, exclusion techniques, cultural practices such as sanitation, biological controls including the use of beneficial organisms, insect growth regulators, and, as a last resort, chemical controls (see ATTRA publication *Integrated Pest Management for Greenhouse Crops*). Perhaps the most important aspect of IPM is monitoring and understanding the life cycle and behavior of pests. This information will help you develop the most effective control strategy.

Resources

Appropriate Technology Transfer for Rural Areas (ATTRA)
PO Box 3657, Fayetteville, AR 72702 (800) 346-9140;
web: <http://www.attra.org>.

Related publications:

Greenhouse IPM: Sustainable Aphid Control
Greenhouse IPM: Sustainable Thrips Control
Greenhouse IPM: Sustainable Whitefly Control
Integrated Pest Management for Greenhouse Crops
Solar Greenhouses: Horticulture Resource List

Coleman, Elliot. 1999. *Four-Season Harvest: How to Harvest Fresh Organic Vegetables from Your Home Garden All Year Long*. Chelsea Green Publishing, White River Junction, VT.

Growing for Market Newsletter. Fariplain Publications, Lawrence, KS (800) 307-8949.

WSU Cooperative Extension King County. *Frost Dates/ Climatic Data*. Community Horticulture Fact Sheet #40. Seattle, WA. Call (206) 296-3900.

WSU Cooperative Extension King County. *Fall and Winter Vegetable Gardening*. Community Horticulture Fact Sheet #41. Seattle, WA. Call (206) 296-3900.

Greenhouse Equipment & Supplies

BioTherm Hydronic, Inc. (heating specialists for the greenhouse industry) 800-GET-HEAT or 707-794-9660; P.O. Box 750967, Petaluma, CA 94975; e-mail: biotherm@getheat.com; <http://www.getheat.com/>.

Cascade Greenhouse Supply
(253) 833-5664; 214 21st SE Auburn, WA 98002.

Charley's Greenhouse Supply
(800) 233-2611 1599 Memorial Hwy, Mount Vernon, WA 98273-9721.

Future Gardening & Hydroponics
(253) 531-9641 11522 Canyon Rd E, Puyallup, WA 98373-4360.

Garden Specialties Inc
(253) 941-6767 30821 Pacific Hwy S, Federal Way, WA 98003-4901.

Green Air Products
(800) 669-2113.

Green Gardens Distributing
(425) 454-5731 12738 Bellevue Redmond Rd, WA 98005-2601.

Indoor Garden & Lighting
(253) 373-9060 730-A S Central, Kent, WA 98032-6109; (253) 761-7478 3843 6th Ave, Tacoma, WA 98406-4903.

Indoor Sun Shoppe
(206) 634-3727 911 NE 45th, Seattle, WA 98105-4714.

Linda's Gardening & Hydroponics Inc
(253) 531-9641 11522 Canyon Rd E, Puyallup, WA 98373-4360.

M & R Lighting
(206) 729-7751 1301 N 97th, Seattle, WA 98103-3319
(253) 891-4190 22914 State Route 410 E, Buckley, WA 98103-3319.

McCalif Growers Supplies Inc
(360) 435-0741, Arlington, WA 98223.

McConkey J M & Co Inc (206) 328-1500 or (253) 863-8111.

Oregon Valley Greenhouse (800) 347-2701; 20367 Hwy 99E, Aurora, OR 97002; [email: ivans@ovg.com](mailto:ivans@ovg.com).

OBC Northwest, (800) 477-4744 or (503) 266-2021; PO Box 759; Canby, OR 97013; email: obcnw@webster.com.

Steuber Distributing Co
(360) 568-2626; (800) 426-8815 308; 3rd, Snohomish, WA 98291.

Sunglo Solar Greenhouses
(253) 833-4529; 214 21st SE, Auburn, WA 98002.

US Global Resources
(425) 391-5646; 20808 SE 20th, Issaquah, WA 98029-7406.

Sources

Coleman, E. 1999. "Start Your Season Now!" in *Growing for Market* Vol. 8, No. 1. Fariplain Publications, Lawrence, KS.

Freeman, M. 1998. *Greenhouse Basics: Gardening in Your Greenhouse*. Stackpole Books, Mechanicsburg, PA
Greenhouses. Washington State University Cooperative Extension Spokane County, <http://www.spokane-county.wsu.edu/GARDEN/c055.htm>.

Greer, L. and Diver, S. 1999. *Integrated Pest Management for Greenhouse Crops*. ATTRA, Fayetteville, AR.

Greer, L. 1999. *Solar Greenhouses: Horticulture Resource List*. ATTRA, Fayetteville, AR.

Miller, E. and C. 1999. "Fundamentals of Solar Greenhousing" in *Acres USA* March 1999.

Miller, E. and C. 1999. "Greenhouse Management Tips" in *Acres USA* July 1999.

No endorsement is intended of any businesses listed in this fact sheet, nor is criticism of unnamed businesses implied.

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