Specialty Lettuce & Greens: Organic Production

Current Topic

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The terms "specialty" and "gourmet" mean different things to different people when applied to lettuce, and in some markets any high-quality lettuce that isn't an iceberg is a specialty crop. Specialty lettuces and "mesclun" (mixed baby lettuces and other greens) began receiving a lot of interest from both producers and consumers in the late 1980s. Consumer interest in salads generally, but especially in unusual or "new" salads such as mesclun, increased rapidly, and prices soared as demand outstripped supply.

Such high prices and rapidly growing markets always attract a lot of attention from growers seeking greater returns per acre, and the resulting increase in production eventually exerts downward

pressure on prices. Specialty lettuces are no exception to this phenomenon. For example, farm-gate specialty-lettuce prices were roughly $16/lb. in 1992. In 1997, salad-mix prices had collapsed to $3/lb. at retail (1). In fall of 2001, *Growing for Market* reported "spring mix" greens wholesaling for slightly more than $3.80/lb. (2), which translates to roughly $4.95-$5.35 at the retail level.

It is also worth noting that a study by USDA-ERS (3) at the Boston wholesale market found that new growers attracted to mesclun expanded into both the organic and regular markets, depressing the organic premium. At the time of the study (1997), the average monthly organic premium was only 14%, though it varied from 8% in November to 22% in December. Industry insiders said that as long as there was a large supply of regular mesclun, organic prices would continue to stay low. The market appeared to bear only a very small premium for organic mesclun. But according to the authors of the study, organic mesclun producers could remain in the market even with organic prices approaching conventional, because variable production costs are not much higher than for

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regular mesclun. Since the lettuce and greens are harvested while still small, they are not in the ground very long and are thus less susceptible to insect and disease problems than are most other organic crops (3).

Direct marketing may still allow farmers to receive premiums for organic mesclun and other specialty lettuces in markets where competition from wholesale supply is not as great.

Organic Production

Organic agriculture has now come under federal regulation. All growers wishing to label and market their produce as organic must become certified; only those small farmers who market less than $5,000 of organic products annually are exempt from this requirement. For more information on organic agriculture and the developing federal regulations, ask for ATTRA's *Overview of Organic Crop Production* and the *Organic Certification and National Organic Program* information package.

While federal regulation of organics is new, the essential nature of organic farming remains the same. Organic production still entails the growing of crops without synthetic pesticides or standard commercial fertilizers. Organic growers utilize a wide range of cultural practices and alternative inputs to manage crops in a manner believed to be safer for the environment and better for the consumer.

Specialty Mixes

While a mesclun mix may contain any mixture of lettuces, greens, and herbs, young leaf lettuces are normally the primary component. Leaf lettuces are generally tastier and less watery than head lettuce, while the variety of leaf shapes (smooth to crinkled edges) and colors (pale green to red) makes them attractive in leafy salads. Chefs like the texture of the leaves, which hold dressing well. Growers like these lettuces because they are generally the earliest maturing, are relatively trouble-free, and may resprout if cut young as a baby lettuce. Many "old fashioned" looseleaf lettuce cultivars are consequently making a comeback as specialty lettuces. Of particular note are the "oakleaf" types, with their attractive leaf shape and texture.

Apart from the standard iceberg-type lettuces, there are a number of lettuce "families" that may or may not be considered gourmet or specialty crops, depending on how wide a definition is used. The closer to the top of the following list a family is, the more "mainstream" it is, meaning that its price will usually be lower; the market for that type of lettuce, however, will be deeper than the market for types lower on the list. There are both green and red members of most of these families.

- Batavian lettuces are somewhat more open than icebergs, but form a distinct head nevertheless; they tend to be more flavorful than iceberg.
- Romaine types are upright and deep-colored, with a robust flavor and somewhat coarse texture.
- Bibb varieties are low-growing, tender, and sweet, forming a small, loose head as they approach maturity. Bibbs are sometimes called "Boston lettuce" or "Butter lettuce."
- Smooth-leaf lettuces are open-growing and tender, with generally pale leaves and delicate flavor when young.
- Crinkle-leaf sorts are similar to smooth-leaf lettuces except that their leaves are more "frilly" and their flavor is often slightly more pronounced.

- Unusual types have particular characteristics, such as a pronounced oakleaf shape, differentiating them from the other families.

Several non-lettuce species are also regarded as specialty greens and may be grown either alone (for very limited markets) or with an assortment of small lettuces. The major types of non-lettuces include:

- Arugula, a plant of the mustard family; when eaten the initial flavor is somewhat peanutty, followed by spicy-hot.
- Mâche, while well known in Europe, is uncommon in North America outside Québec. With a delicate nutty flavor, the mildest of any greens, mâche (also known as "corn salad") will get lost in almost any blend and is best sold alone.
- Sorrel is also well known in Europe, but is almost totally unfamiliar to consumers this side of the Atlantic. It is a tart cool-weather plant, most commonly used in potato-based soups.
- Chicory embodies a range of species, including radicchio, witloof (Belgian endive), and leafy chicories. All have a bitter flavor and very particular cultural requirements.
- Oriental greens include a number of pungent species, most of them in the mustard and chrysanthemum families. Some examples are mizuna, tatsoi, and red mustard.
- Unusual types encompass several species (dandelion, fennel, and so on) best known in their traditional ethnic markets. They are particularly useful for adding an accent to otherwise ordinary mixes.

Many of the cultural techniques for lettuce and salad-mix production are similar, regardless of whether the crop is grown in a greenhouse or in the field. Contact Cooperative Extension or seed suppliers for varietal recommendations specific to your growing region. Take note that organically grown seed is required for organic production. Conventionally-grown untreated seed is permitted only if its organic equivalent is not available. Fungicide-treated seed is completely prohibited. For assistance in locating seed sources, please ask for the ATTRA publication *Suppliers of Organic and/or Non-GE Seeds and Plants*.

Soil Preparation

Lettuce prefers a sandy-loam soil high in organic matter. Lettuce is sensitive to soil acidity; lime should be added, if necessary, to adjust the pH to 6.5-7.0. Lettuce is also sensitive to excess salts, especially at germination. If the previous crop was heavily fertilized, leaching the soil through heavy irrigation might be advisable. Field-grown lettuce, especially, requires good drainage to avoid certain fungal diseases such as bottom rot.

Certified organic production requires that fertility be managed without the use of conventional fertilizers. Some ATTRA publications that may be useful in this regard are *Sustainable Soil Management*, *Overview of Cover Crops and Green Manures*, *Sources for Organic Fertilizers and Amendments*, *Alternative Soil Amendments*, and *Manures for Organic Crop Production*.

Propagation

Lettuce production frequently entails transplanting. There are a variety of methods for raising transplants. Most growers prefer plug trays for seedling production. Since the potting mix does not have to be screened thoroughly, as blocking mixes do, commercially available organic potting-

soil products can be used. This saves the screening and mixing time necessary when making your own soil-blocking mix. Since many commercially-available potting mixes contain wetting agents and chemical fertilizers, be certain the product is organic before purchasing or consider making your own with approved ingredients. For more information, please request ATTRA's *Organic Potting Mixes*.

If a large percentage of the crop is sold as mesclun, "baby-lettuce," or salad mix, many growers will seed specialty lettuce directly and skip the transplanting stage—after all, the market crop is often no bigger than a robust transplant. Transplanting is a more realistic option in situations where the target market desires full-sized greens. Lettuce seed germinates better if left uncovered. Germination temperature should be between 15 and 18°C (60-65°F), with relative humidity around 70%.

Some small-scale producers have expressed a preference for soil blocks—ejection-molded cubes of specially prepared potting mix. If you choose to adopt this transplant production system, soil blockers are available through Johnny's Selected Seeds (4) and other sources.

Crop Scheduling

The primary challenge of specialty lettuce growing is to ensure a steady supply through the marketing season; careful planning and timing of planting dates is critical, and difficult to do well without considerable experience growing lettuces and similar greens.

If the plan is to maintain a continuous supply of lettuce throughout the growing season, it is necessary to follow a different planting schedule than one might expect. Lettuces, like most plants, grow and mature at varying rates during different seasons. In cooler temperatures, short days, and the low light levels of autumn and winter, it is especially challenging to maintain a reasonably steady supply. In summer, for lettuce in the field, it is the length and severity of the hot dry period of midsummer that becomes a problem. The maturity time (planting to harvest) will double or triple for plantings to be harvested from September through February, so fall planting dates should be adjusted accordingly. It may be desirable to harvest every week, but this does not necessarily mean that crops should be planted at seven-day intervals.

The following schedule, recommended by a greenhouse lettuce producer in Britain, provides an example of seeding intervals required to time weekly harvesting from early November through April (5). The seemingly conflicting intervals probably reflect adjustments for varying day length, which has an effect on the growth rate of winter greens (6).

September 1-10	sow every 3 1/2 days
September 10-18	sow every 2 days
September 18-October 10	sow every 3 1/2 days
October 10-November 15	sow every 7 days
November 15-December 15	sow every 10 days

Adapt this schedule to suit your local conditions. By keeping detailed planting and harvesting records over time, you can gradually develop a fine-tuned schedule that suits your farm location and mix of greens. Your state's Cooperative Extension vegetable specialist may also have a sowing schedule that can be adapted.

Dutch growers space lettuces at 15 to 20 plants per square yard. The growing period determines the actual density. A 12" x 12" spacing equates to approximately 16 plants per square yard, while

a 10" x 10" spacing is 20 plants per square yard. The tighter spacing is used in the slower growing period of winter. Equal spacing between plants and between rows produces more uniform heads.

For production on a small scale, a lawn roller, with studs attached at appropriate spacing, will both mark the correct spacing and punch transplant holes in the soil. It will save a lot of time, both at planting and at cultivation time. In general, lettuce plants held as seedlings for more than three to four weeks take a relatively long time to mature and don't produce good heads. Seedlings that might appear too young to transplant often grow very quickly and make beautiful heads. Considerable field experience suggests it is wise to transplant a small, healthy, hearty plant.

Deeper, less-frequent waterings are preferred to lighter, more-frequent irrigation. Spot watering may be necessary in places (such as the edges of beds) that dry out quickly. The crop should not suffer for water, but it is also important to keep the soil surface from being wet for long periods of time. This reduces disease pressure.

Summer Lettuce in the Midsouth

Lettuce is a cool-weather crop, and growing it in hot weather takes special care. In fact, some people insist it is impossible to grow good lettuce in the summer in the South. On the other hand, some people are doing it. Berryville, Arkansas market gardener Patrice Gros says his trick is to use 50% shade cloth. Since lettuce seeds do not germinate well at high temperatures, many summer growers either plant lettuce in flats in cooler rooms or pretreat the seed. Mr. Gros plants three times as much seed as usual to obtain the same number of plants. He also finds that variety selection is important. Some cultivars have been bred to perform better than others in hot weather. Plenty of water is crictical—he always waters his summer lettuces mid-day (7).

Pest Management: Insects

Luckily, lettuce is attacked by relatively few insect pests, primarily aphids and thrips. Both are fairly well controlled with an insecticidal soap, such as M-Pede™ brand (also sold to gardeners as the Safer™ brand). If the water is hard, the spray solution should be mixed with softened or distilled water because the calcium in hard water sequesters the fatty acids and greatly reduces the potency of the spray.

Young plants are sometimes subject to pressure from flea beetles. Arugula seems especially attractive to this pest. The most effective non-chemical control is a light row cover such as Agribon+™ AG-12 insect barrier, which can exclude most pests while providing a more sheltered microclimate. To learn about a wider range of control options, ask for ATTRA's *Flea Beetle: Organic Control Options* publication. For additional information about types and sources of row covers, see ATTRA's *Season Extension Techniques for Market Gardeners*.

Cutworms can also be a problem. If present in the soil, the best non-chemical approach may be to hunt them down (dig in the soil near affected plants) and crush them. Cutworms curl up when dug out of the soil. ATTRA provides additional information on control of cutworms in its *Organic Field Corn Production* publication.

Insect and disease pest problems in greenhouse production are similar to those of field production, yet unique because of the modified enclosed environment inside a greenhouse. Fortunately, great strides have been made in recent years in developing effective greenhouse IPM programs. European and Canadian researchers have developed the use of many control tactics for greenhouse pests.

Integrated pest management (IPM) programs monitor pest levels with such tools as pheromone traps, yellow sticky cards, and on-site examination of plants with a hand lens. Buildup of pest populations can be detected and treated before they reach injurious levels. Cultural methods may be altered to make the environment less favorable for particular pests. Physical barriers such as insect screens may be used to prevent some types of pests from entering a greenhouse. It is helpful to remove infested material from the greenhouse to physically reduce pest populations. Screening air intakes to the greenhouse is also effective—especially as a means to control thrips. Several natural predators can be obtained and released to reduce aphid and thrips numbers to acceptable levels. ATTRA has additional information on this subject in its *Integrated Pest Management for Greenhouse Crops* publication.

Pest Management: Diseases

While few diseases other than damping-off affect *young* lettuces and greens, older plants face more challenges. The limited number of fungicides and other disease control agents available to organic growers makes disease prevention crucial in organic production. The cool moist conditions typical of fall and spring production may encourage diseases in the field. *Sclerotinia* drop is caused by fungi that attack the lower leaves in contact with the soil, producing a cottony growth. Eventually the entire plant may "collapse," with the leaves dropping down on one another in succession. Bottom rot, caused by *Rhizoctonia* species, is another potentially serious soil-borne fungal disease of cool-season lettuce. It occurs on nearly mature plants, first appearing as slightly-sunken rust-colored lesions (plus or minus some amber ooze) of varying size. Affected plants will have a very short shelf life if harvested, and may decompose into a slimy black mass.

New biofungicides have been developed that can assist in disease management. An example is SoilGard™, a product of Thermo Trilogy, Inc. It contains the naturally-occurring fungus *Gliocadium virens*, which can be used to control disease-causing *Fusarium*, *Pythium*, *Rhizoctonia*, and *Sclerotinia* fungi. For more information on managing soil-borne pathogens, ask for the ATTRA publication *Sustainable Management of Soil-borne Plant Diseases*.

Foliar sprays of compost- and plant-extracts (e.g., horsetail, stinging nettle, valerian) are being tested for their use as fungal-disease suppressants. To test the disease-suppressive potential of compost watery extracts, researchers in Germany combined one part well-rotted manure-based compost to six parts water and let it sit for one week. It was then filtered and used as a spray. Applied every five to ten days, the extract prevented powdery mildew, downy mildew, late blight, botrytis blight, and anthracnose on tomatoes, beans, potatoes, grapes, and sugar beets. It was also effective in preventing damping-off diseases (8). ATTRA has additional information on this subject, if you are interested.

A disease (actually, "physiological disorder") of particular concern on lettuce is tipburn. Tipburn occurs when a sudden change in weather causes more rapid transpiration than water uptake. Symptoms include browning and rotting of the edges of internal leaves, which may not be visible from the outside of the head. This disorder is related to calcium deficiency and is aggravated by high soil fertility and high temperatures. On greenhouse lettuce it is particularly a problem during sunny early-spring days; in the field, it can be a problem if irrigation is mismanaged during hot

weather. Assurance of adequate calcium and avoidance of excess nitrogen and potassium will work to minimize problems. Minimal venting (thus decreased transpiration) during the critical period is also important for greenhouse-grown lettuces. Shading may also be used to reduce transpiration, as may watering by mist or spray as long as it doesn't compromise disease control. Acid soils and high soil salt content increase risk.

Pest Management: Weeds

Many greens crops are poor competitors with weeds. Additionally, weeds growing within rows can inadvertantly be harvested along with the crop and contaminate the product. As a result, considerable effort may be expended in cultivation and handweeding to assure a clean field.

Crop rotations that include careful selection of cover crops can go a long way in reducing weeds in vegetable crops. In some instances, the residues of cover crops are left in place and the crop is seeded or transplanted into it. The residue mulch conserves moisture, reduces erosion, and may suppress weeds through smothering (if the residue cover is dense) and through allelopathy. (Allelopathy refers to natural chemicals in some crop residues that suppress weed seed germination; rye straw is especially well noted for this characteristic.) The sensitivity of small-seeded crops like lettuce, however, may require extra pains in making such systems work well.

Nitrate Accumulation

If lettuces or other leafy greens are to be grown during periods of reduced light, there is a significant health risk associated with nitrate accumulation in the crop. See the enclosure on nitrate accumulation for further details.

Harvesting

Small-scale production usually entails laborious hand-cutting of greens using a sharp knife. In recent years, however, some small greens harvesters have come onto the market. Unfortunately, small-scale salad harvesting equipment is still a rather new phenomenon—especially in this country—and very little information has been published to date. A 1997 article by Byczynski (9) indicated that three different harvesters were on the U.S. market at that time. These were the Green Crop Harvester™, the Quick Cut Salad Harvester, and the Enha Pro. A production guide from Oregon State University (10) provides the following updated information on these machines:

- The Green Crop Harvester is made in England. The sole U.S. distributors are C. and K. Anderson, Fresh Herb Co., 4114 Oxford Rd., Longmont, CO. The cost is in the neighborhood of $20,000 for a four-foot-wide model which hold the greens upright by chain-driven sweeps and cuts the greens with a reciprocating knife (like a hedge trimmer).
- The Quick Cut harvester is an Italian battery-powered walk-behind machine with a 39", 48" or 54"-wide head and a band-saw cutter. Cost is approximately $11,000. The Quick Cut is sold by Ferrari Tractor CIE, P.O. Box 1045, Gridley, CA 95948; and by David Washburn and Meg Anderson of Red Cardinal Farm, 9694 75th St. North, Stillwater, MN 55082.
- The Enha Pro is a human-powered machine designed by Norbert Hufnagl, Field of Dreams, 117 Fredon Springdale Rd., Newton, NJ 07860. Cost is around $2,400 for a two-head unit and $3,000 for a three-head unit.

A fourth unit is the Ortomec™, sold by Sutton Ag Enterprises (11). The pull-type model sells for $25,465; the self-propelled model sells for $49,303.

Post-harvest Handling

While specialty lettuces command higher prices than ordinary iceberg, they also demand specialty handling. They should be immersed in near-freezing water almost immediately after harvest. Rapid removal of field heat is essential to maintaining product quality, and is a key element of professional handling. Depending on how the greens are cut, it may be helpful to pack any free leaves or smaller plants loosely into a mesh sack to keep them "corralled" during the hydro-cooling process. The University of Wisconsin has developed an excellent fact sheet on the use of mesh produce bags for this purpose (12).

Another critical (and demanding) component of handling is careful and thorough washing, followed by equally careful and thorough sorting. Greens are almost always eaten raw, and many consumers do not wish to go to the trouble of re-washing or picking through the evening's salad. Most professional lettuce growers will say that few things drive customers away faster than dirty, gritty, or poor-quality greens. Once the greens are well washed, gently drained dry, and ruthlessly graded, they should be packed into their final retail container (one that allows a bit of breathing), and returned immediately to a near-freezing high-humidity (95%) environment. They should be kept under those conditions until delivery to the retailer or the final consumer.

Commonly, greens are harvested from individual beds and are mixed after harvest. One mesclun grower advised extra care be taken at this stage since the tender leaves are very susceptible to bruising during the mixing process. He only mixes the greens as he bags them, after the washing and drying process.

After cutting, the salad greens need to be pre-washed and dried for best post-harvest quality. A restaurant- or industrial-scale salad spinner is an efficient machine for washing and drying the greens. These machines can be ordered through restaurant supply stores; prices range from $650 to $1,500. You could also order direct from a company in California that manufactures the "Greens Machine," available in five- and ten-gallon capacity models. Contact them at:

Dito Deans
4231 Pacific (#27)
Rockland, California, 95677
916-652-5824

In recent years, Johnny's Selected Seeds (3) has also been marketing salad spinners. Johnny's 2000 catalog featured a five-gallon unit that sold for $214.50. The 2001 catalog features a smaller spinner for $25.75.

Homemade greens spinners are not uncommon among small-scale producers. Jay Fulbright (13), a greenhouse mesclun grower in Arkansas, uses Kenmore extra-large-capacity washers (with the agitators removed) to spin-dry his salad mix. Prior to spinning, the ingredients are mixed in 100-gallon tanks, then transfered to a rinsing tank. Approximately 10 pounds of the loose mix is spun for about three minutes per load.

For additional information on post-harvest requirements for vegetables, ask for ATTRA's *Post-harvest Handling of Fruits & Vegetables* publication.

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1 Foss Hill Road
Albion, ME 04910-9731
207-437-4395
800-437-4290 Fax
http://www.johnnyseeds.com

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746 Vertin Ave.
Salinas, CA 93901
831-422-9693
831-422-4201 Fax

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Additional Electronic Resources:

http://www.ipgri.cgiar.org
Click on "Crops/Species" and read the document entitled "Rocket: A Mediterranean Crop for the World."

http://www.sfc.ucdavis.edu/cgi-bin/spec_crop.exe/
This website of the University of California Small Farm Center features several vegetable links, including Arugula, Radicchio, Endive, and Belgian Endive.

http://www.ces.ncsu.edu/depts/hort/hil/hil-11.html
This website of North Carolina State University has many useful links, including "Lettuce Production and Greens for Market."

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