



Organic Lettuce & Leafy Greens

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Introduction

Lettuce (*Lactuca sativa*), which includes loose leaf and heading types, is a member of the Asteraceae family. “Leafy greens” or “greens” are broad terms used for a number of vegetable crops with edible leaves. Plants in this group belong to several unrelated taxonomic plant families that include Asteraceae, Brassicaceae and Chenopodiaceae. Most lettuce and greens are cool-season crops that are planted in early spring or late summer in Kentucky. High tunnels can be used to extend the season.

Leafy greens and lettuce, among the most popular fresh market vegetables grown commercially in Kentucky, have excellent potential for organic production. Organic crops are produced using integrated pest management and fertilization methods that do not include synthetic compounds. Growers producing and selling lettuce and greens with an organic label must be certified by a USDA-approved state agency (e.g. the Kentucky Department of Agriculture) or private agency, plus follow production standards regulated by the National Organic Program (NOP).



Marketing

Local and regional marketing opportunities may be available for certified organically grown lettuce, greens and bagged salad and greens mixes. Direct retail markets include farmers markets and roadside stands. Leaf lettuce mixed with various greens (sometimes called ‘mesclun’) is a popular farmers market sales item. Salad greens can also be included in community supported agriculture (CSA) shares. Restaurants and health food stores may be interested in locally produced organic

products. Fresh wholesale market options for Kentucky include marketing through produce auctions, as well as sales to restaurants and local retailers.

Various food safety regulations and regulatory issues may apply to marketing lettuce and leafy greens.

Washing and packaging crops introduce many food safety concerns, and producers should engage in the appropriate training and food safety plan design to satisfy or exceed food safety regulations. Compliance with buyer food safety



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audits, as well as inspections verifying that handling practices meet certified organic standards, are other applicable regulatory and food safety issues. Applicable food safety regulations may vary according to crop and production scope; producers should consult with expert resources to verify all marketing and production practices comply with the applicable regulations.

Market Outlook

Nearly all types of lettuce and greens can be grown profitably in Kentucky. An increase in consumption of organic products, the rise in popularity of locally grown foods, and consumer preferences for more diverse fresh produce offerings may also favor demand growth for organic greens. Leafy greens or salad greens are consumed daily by many Americans, who continue seeking convenient fresh produce items, evidenced by the popularity of bagged salad greens, bagged chopped salad kits and in-store salad bars.



The U.S. per capita consumption of leaf and romaine lettuce (organic and conventional) reached an all-time high in 2017 at 15 pounds, declining to 12 pounds in 2018, then rebounding to approximately 14.4 pounds in 2020¹. Organic romaine shipments from major production areas increased from 2018 to 2019, according to USDA shipments data. Both branded and private label producers continue expanding organic lettuce mixes and other organic leafy green items. Local market growth for direct market organic greens can depend on product quality, customer interest and market channel. Well-flavored organic greens are very dependent on production management and postharvest handling, and consumers will always be most interested in expanding their purchases of great tasting greens.

Production Considerations

Plant and variety selection

Lettuce and leafy greens that have been successfully grown in Kentucky include the following, grouped by plant family:

CRUCIFER OR MUSTARD FAMILY (BRASSICACEAE) Arugula, broccoli raab, collards, kale (including flowering kale and Chinese kale), mustard greens and turnip greens
GOOSEFOOT FAMILY (CHENOPODIACEAE) Beet greens,

spinach (flat leaf and savoy) and Swiss chard

SUNFLOWER OR ASTER FAMILY (ASTERACEAE) Bibb (Boston), iceberg, leaf and romaine (cos) lettuce; chicory; dandelion; endive; escarole; and radicchio

Plant and cultivar selection is a critical decision for any commercial crop, but it is especially important in organic production. With fewer pest management options available, it is vital to identify selections with resistance and/or tolerance to as many locally prevalent diseases and insects as possible. Resistance or tolerance to downy mildew, lettuce mosaic virus, Rhizoctonia bottom rot and Sclerotinia drop is available in some lettuce cultivars. Additionally, some selections may have tolerance to physiological problems, including bolting, heat and/or tip burn.

Lettuce and leafy greens cultivars differ in a number of horticultural characteristics. These can include leaf texture (e.g. smooth or crinkled), shape (e.g. scalloped, ruffled, rounded or oak-leaf), color (e.g. various shades of greens, reds or bronze), and flavor (e.g. bitter, peppery, sweet or mild), as well as earliness (very early, early, mid- and late-season). Lettuce head types are categorized as solid head, loose head or loose leaf. Mesclun and other salad mixes should include a variety of leaf colors, textures and flavors.

Consumer demand and regional preferences often dictate varietal selection. Suitability for intended production practices must also be considered. Commercial growers should select only locally adapted varieties that have the qualities in demand by the market.

Site selection and soil preparation

Only land that has been free of prohibited substances (e.g. synthetic pesticides and petroleum-based fertilizers) for three years can be certified for organic production. Select sites for organic greens and lettuce that are well-drained, have a soil pH of 6 to 7, and are relatively high (4%-7%) in organic matter.

Organic matter can be incorporated into the soil through the application of animal manures, compost or cover crops. Generally there are no restrictions regarding the source of animal manure in organic pro-

duction systems; that is, it can come from conventional farming operations. However, the NOP does regulate the timing of the application of raw manure. In situations where the crop comes into close contact with the soil, as in the case of lettuce and greens, raw manure must be applied to the soil at least 120 days prior to harvesting the crop. There are no pre-harvest restrictions for composted manure or compost that has met NOP processing requirements. Soil fertility can also be enhanced by incorporating leguminous cover crops, and using approved natural fertilizers. Supplemental organic nutrient sources include bloodmeal, fishmeal, cottonseed meal and soybean meal.

Planting

Greens can be direct-seeded or transplanted to the field or high tunnel ground bed. In general, plants that are harvested as heads are transplanted while those harvested as individual leaves are seeded. In the field, pelleted seed is normally used for direct seeding with a simple push type seeder (such as one from Earthway or Planet Junior) or a vacuum seeder. Transplants are generally set by hand or with a waterwheel setter onto raised beds with plastic mulch. Greens can be seeded or transplanted every three to six weeks for a continuous harvest.

All seeds (including cover crop seed) and transplants used in organic production must be certified organic and either purchased from a reputable dealer or produced organically on the farm. Individual organic certifiers may permit the use of untreated conventional seed if suitable organic seed is unavailable; however, the grower must first conduct a reasonable search for certified organic seed. This generally means documenting the attempt to find certified organic seed of the specified variety from a minimum of three sources. Neither seed nor transplants can be treated with any prohibited substances, such as synthetic fungicides.

Lettuce and greens are seeded into cell plug trays in the greenhouse four to six weeks prior to being transplanted. Potting soils and fertilizers used in transplant production must be organically approved. Transplanting has the advantage of resulting in an earlier crop than direct seeding, as well as a more accurate plant spacing and final plant population. In addition, transplants are less exposed to insect damage, drought or other early season stresses, and face less competition from weeds. Transplanting also improves uniformity,



which is very important for some wholesale markets such as schools or hospitals.

Traditionally, greens have been grown as row crops with wide spacing. Today, Kentucky growers are planting at higher densities using raised beds with multiple rows per bed. Bed shaping machines commonly used in Kentucky will form a 6-inch-high raised bed 30 to 32 inches wide at the top with 5 to 6 feet between centers of the beds. Depending on the crop and between row spacing, two to three rows can be used per bed. This system, along with plastic mulch and drip irrigation, has proved to be very productive for many crops in this group, whether grown in the field or high tunnel. The moisture levels under the plastic must be carefully monitored with tensiometers or another type of soil moisture sensor (see [Soil Moisture Sensors for Irrigation Scheduling at https://extension.umn.edu/irrigation/soil-moisture-sensors-irrigation-scheduling](https://extension.umn.edu/irrigation/soil-moisture-sensors-irrigation-scheduling)). Plastic mulch is permitted in organic production if it is removed at the end of the harvest season. Black plastic enhances earliness by warming soils for spring plantings. Clear plastic can be used very early in the season in a high tunnel over a bed, but it is only temporary to warm the bed and would be removed when the soils warm because they do not provide any weed suppression. White plastic mulch can be used for late summer plantings when cooler soils are desirable. These crops can also be grown on raised beds without plastic; however, weed control with hand/mechanical cultivation becomes critical.

Pest management

Pest management in organic systems emphasizes prevention through good production and cultural methods. The goal is not necessarily the complete elimination of pest problems, but rather to manage insects

and diseases to keep crop damage within acceptable economic levels. Effective and economically efficient pest management in organic farming requires multiple strategies and an integrated systems approach. Monitoring pests through frequent crop inspections and accurate identification are essential to keeping ahead of potential problems.

Lettuce and greens are susceptible to a number of foliar diseases that can reduce the quality and marketability of leaves. These include downy mildew, powdery mildew and various fungal leaf spots. Young, tender plants are susceptible to damping-off, while older plants may succumb to *Rhizoctonia* bottom rot and *Sclerotinia* drop. Many lettuces and greens are susceptible to bolting (premature flower stalk production) during persistently hot weather and long days; however, some heat-tolerant cultivars are available. Tip burn, an abiotic disorder generally related to nutritional problems, can also affect lettuce and greens. Disease management strategies include: growing disease resistant cultivars, maintaining well-balanced fertility, managing soil moisture, practicing sanitation and using optimum planting densities.

Potential insect problems include cutworms, wireworms, aphids, flea beetles, leafminers, leafhoppers and grasshoppers. Whiteflies, aphids and slugs can be particularly problematic in high tunnel environments. Insect management strategies include hand picking, applying organically approved insecticides (e.g. insecticidal soap and Bt), and using physical barriers (e.g. row covers). Introducing and/or attracting natural predators can provide biological control of some pests.

If left unchecked, weeds compete with lettuce and greens for nutrients and moisture, harbor insect and disease pests, and reduce air circulation. In addition, weeds can contaminate the product when they are inadvertently harvested along with the crop. Since herbicides cannot be used, organic growers will need to implement alternative measures for weed control. Effective weed management begins with careful site selection; avoid sites where perennial noxious weeds have historically been difficult to control. The planned crop rotation program, as well as site preparation, should be directed at making sure existing weeds are under control prior to planting. Plastic mulch can be used to suppress weed development within rows,

while mowing and shallow cultivation techniques can manage weeds between rows.

Crop rotations are not only employed to improve soil quality, but also to disrupt the life cycles of insect pests, disease pathogens and weeds. Approved pesticides that have been listed in the grower's Organic System Plan can be used in organic production, but should be used as judiciously and as specific to the pest organism as possible. A list of approved products can be found on the [Organic Materials Review Institute \(OMRI\) website](#).

Organic crops must be protected from potential contamination by adjoining conventional farms, as well as from non-organic fields in split operations. The drift and run-off of prohibited substances, such as synthetic pesticides, can compromise the farm's organic certification status. Preventative strategies include the use of buffer zones and barriers, altering drainage patterns, posting "no spray" signs and cooperating with neighboring conventional farmers. Growers with split operations must take steps to prevent the commingling of their two systems.

Harvest

Only those crops that have met NOP production and certification standards, including the three-year minimum transition period, can be marketed and sold as certified organic or organic. This also means that products grown organically but harvested during the transition period cannot be marketed as organic. Harvesting operations, storage areas and packaging materials must comply with NOP standards. Growers with split operations must either use separate equipment and facilities for these operations or decontamination protocol must be followed before use in the organic portion of the enterprise. Packaging materials must be protected against potential contamination from prohibited substances.

Fresh lettuce and leafy greens may be harvested as whole plants (one harvest) or as individual leaves (multiple harvests) depending on the crop and the market. Because the harvested products are leaves, which rapidly lose water, care must be taken to cool, pack and sell them promptly. Some growers use very cold water to hydro-cool their products, thus removing field heat as quickly as possible.

Leaf lettuce and greens are harvestable as soon as the leaves are an edible size. Those salad greens that are to be sold in bags as a mesclun mix or braising mix are either hand-picked or cut with scissors, and then placed in bins. After washing, greens will need the excess water removed prior to bagging. This can be accomplished by hand (using mesh bags) or with a salad spinner.

Romaine and Boston lettuce are harvested as whole plants. They are cut at the base with a knife once heads have reached the desired size and density.

Arugula and some other greens are sold in bunches. The leaves are cut with a knife or scissors, leaving sufficient plant material for regrowth.

Turnip, mustard, collards and kale are harvested when the stalks are fairly young and tender. Rubber bands can be used to bunch three to five stalks together.

Endive and escarole must be harvested before a strong bitter taste and toughness develops that makes them unmarketable; the leaves are bound with rubber bands or produce ties.

Labor requirements

Organic systems generally are more labor intensive than conventional systems. This higher labor requirement is most often attributed to the increased time in managing weeds, and monitoring and managing pests.

The labor needed to produce a crop of green leafy vegetables will vary depending on weed control techniques, harvest method and harvest yield. Most budgets show labor needs of 20 to 40 hours for field preparation, planting and crop care. If black plastic is not used for weed control, then up to 80 hours of weeding labor may be required in addition to the 20 to 40 hours of production labor mentioned previously. Harvest and packing rates go from a low of five boxes per hour for bundled greens to 13 boxes per hour for intensive head lettuce production. Most budgets for greens have harvest labor of approximately 80 hours per acre, with some higher yielding crops requiring up to 120 hours of harvest labor.

Economic Considerations

Organic lettuce and green production systems can vary from farm to farm, creating difficulty in generalizing

cost of production and profitability estimates. Leafy greens cover a wide variety of crops from head lettuce to mustard greens. Production ranges from bare ground cultivation in single rows to multi-row, irrigated, densely planted raised beds. Season extension in greenhouses and high tunnels is also a possibility for this crop.

Initial startup investments may include specialized bed shapers, precision planters, bed cultivators, and/or plastic laying and transplanting equipment. Irrigation and post-harvest washing/cooling equipment may be required. Other expenses could include varying labor times and costs for moving lettuce and greens to market. Growers considering volume production of greens for wholesale markets need to address the post-harvest cooling and handling requirements for greens. Equipment and proper transportation may constitute a large percentage of lettuce handling and marketing expenses.

Profitability varies by crop type. Greens (mustard, turnip and collard) usually generate less income per acre than intensive head or leaf lettuce production, which requires higher production costs. Variable costs for producing 8,000 pounds of organic collard greens per acre were estimated between \$3,700 and \$4,200 for 2019, resulting in a breakeven price approaching \$10.50 per 20-pound box.

Production costs for organic head lettuce may approach or exceed \$10,000 per acre. 2016 breakeven estimates were in the range of \$15 per box of 48 bunches (there are usually six plants in a bunch), based on yields of 400 boxes per acre.

Breakeven prices for producers growing greens on a smaller scale are typically higher than these per acre estimates. A breakeven price of \$2.15 to \$2.55 per pound was estimated in 2019 for a 100-foot by 4-foot bed of mixed spring greens yielding 30 pounds.

Breakeven prices can vary widely based on farm management and production system. Producers should carefully develop a production budget for their own farm situation before beginning production.

¹Statista, <https://www.statista.com/statistics/257322/per-capita-consumption-of-fresh-lettuce-romaine-and-leaf-in-the-us/>

Selected Resources

- Kentucky Department of Agriculture Division of Value-added Plant Production: Organic Program (KDA) <https://www.kyagr.com/marketing/organic-marketing.html>
- Vegetable Production Guide for Commercial Growers, ID-36; includes Organic Manures and Fertilizers: Appendix H (pp. 124-126) (University of Kentucky) <http://www2.ca.uky.edu/agcomm/pubs/id/id36/id36.pdf>
- National Organic Program (Agricultural Marketing Service-USDA) <http://www.ams.usda.gov/nop>
- Organic Materials Review Institute (OMRI) <http://www.omri.org/>
- Organic Weed Management (eOrganic, 2013) <https://eorganic.org/node/2551>
- Organic Production and IPM Guide for Lettuce (Cornell University, 2016) 1.36 MB file <https://ecommons.cornell.edu/handle/1813/42895>
- Resource Guide to Organic and Sustainable Vegetable Production (NCAT-ATTRA, 2012) <https://attra.ncat.org/product/resource-guide-to-organic-and-sustainable-vegetable-production/>

- Extended Season Lettuce Production, CCD-WVU-FS-1, ANR-HORT-20-001 (West Virginia University, 2020) <https://www.uky.edu/ccd/sites/www.uky.edu/ccd/files/WVextendedseasonlettuce.pdf>
- Organic Vegetable Budgets (University of Georgia, 2009) <https://agecon.uga.edu/content/dam/caes-subsite/ag-econ/documents/extension/budgets/non-beef/2009OrgaVegbudget.pdf>
- Specialty Lettuce and Greens: Organic Production (NCAT-ATTRA, 2020) <https://attra.ncat.org/product/specialty-lettuce-greens-organic-production/>
- Vegetable Production Budgets (Iowa State University 2021) <https://www.extension.iastate.edu/agdm/crops/html/a1-17.html>

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